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Efficacy of Multifaceted Treatment for Children with Learning Difficulties

JYVÄSKYLÄ STUDIES IN EDUCATION, PSYCHOLOGY AND SOCIAL RESEARCH 125

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UNIVERSITY OF JYVÄSKYLÄ

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ABSTRACT

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The present study focused on the relative efficacies of two interventions for children with learning difficulties. The first treatment group participated for two years in a structured multifaceted neurocognitive treatment developed in Santiago de Chile for children coming from lower or lower middle class families (CDA treatment). The second group participated for one year in a treatment that provided an enriched environment and the supervision of school tasks (HSA treatment), and for a second year in CDA treatment. The study was a two year long traditional between-group pre-post measurement experiment with three measurement points. Outcomes on neurocognitive, academic, and behavioral measures were studied. Special interest was focused on the comorbidity of attentional deficits and academic problems. The results indicated that significant gains occurred during both treatment years on most of the measures used. No major differences were found between the treatment groups; but parents whose children participated in CDA treatment, which included a parents' group, reported more improvement in home behavior. Pretreatment negative behavioral traits were associated with lesser academic growth in the group participating in HSA treatment. Inattention rather than hyperactivity-impulsivity was found to be associated with academic problems. On the basis of these findings it was concluded that it was beneficial to continue treatment for a second consecutive year. The findings emphasize the importance of including parents in the treatment of children with learning difficulties. They also suggest that affective and behavioral variables should not be neglected in interventions for learning difficulties, and that inattention and hyperactivity-impulsivity might have differential importance for both the occurrence of academic problems as well as for the treatment outcome. The study shows the multiple nature of the phenomenon treated as well as the difficulties related to group designs. The combination of a group and single case design would allow for the more careful study of the interactional and psychological mechanisms mediating effective interventions.

Keywords: learning difficulties, neurocognitive treatment, Attention Deficit Hyperactivity Disorder subtypes, comorbidity

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CONTENTS

LIST OF PUBLICATIONS

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II. Lamminmäki, T., Ahonen, T., Todd de Barra, H., Tolvanen, A., Michelsson, K., & Lyytinen, H. (1997). Two-year group treatment for children with learning difficulties: Assessing effects of treatment duration and pretreatment characteristics. *Journal of Learning Disabilities, 30.*

III. Lamminmäki, T., Ahonen, T., Närhi, V., Lyytinen, H., & Todd de Barra, H. (1995). Attention-Deficit/Hyperactivity Disorder subtypes: Are their differences in academic problems? *Developmental Neuropsychology, 11,* 297-310.

IV. Lamminmäki, T., Ahonen, T., Todd de Barra, H., Tolvanen, A., & Lyytinen, H. (submitted). Contribution of ADHD characteristics to the academic treatment outcome of children with learning difficulties.

1 INTRODUCTION

The field of learning difficulties has experienced an unprecedented growth during the past decades, and much of the research efforts has concentrated on understanding the multiple nature of deficits occurring in learning. Despite this, much less attention has been paid to the development of means for alleviating these difficulties. The need for treatment methods is motivated especially when the long-term outcome of learning difficulties are examined. It is well known, for instance, that learning difficulties constitute an increased risk for class retention, school drop-out, and affect later success in life. These risks are further elevated when children coming from disadvantaged backgrounds are considered.

The multiple nature of learning related problems is widely accepted, and is also reflected in the discussion concerning the definition of learning disabilities. Plenty of research on the characteristics of specific disabilities has been carried out since the much broader concept of minimal brain dysfunction (MBD) was put aside. During the past decade research has proceeded towards understanding the simultaneous occurrence of several disabilities. This multivariate nature of learning difficulties should be taken into account when planning treatments. It implies that no simple or straightforward treatments can be found. At the same time, intervention research should aim towards understanding how this complexity affects treatment outcome, and identify the important elements in the treatment process.

The present thesis discusses the efficacy of a multifaceted group treatment method created for children with learning difficulties. The method is known by the name CDA which refers to a Chilean institute, Corporación para el Desarrollo del Aprendizaje, where the method has been developed by Helena Todd de Barra (see Todd de Barra, 1991). It was created for the needs of children who demonstrate MBD symptoms and come from low-income areas of Santiago de Chile.

The thesis consists of four publications (Studies I-IV) each of which has a specific topic. Studies I and II address treatment effects by contrasting two

treatments with different characteristics. Development was followed over a two year period focusing on general treatment outcomes and on how children's pretreatment performance predicts outcome. Studies III and IV focus on a specific subgroup of children addressing the question of how a more detailed analysis of the child's difficulties contributes to an understanding of treatment efficacy. Study III concerns the co-occurrence of attention deficits and academic problems, and Study IV focuses on the relationship between academic outcome and both the initial levels and changes in inattention and hyperactivity.

2 LEARNING DIFFICULTIES AND THEIR TREATMENT

2.1 Learning difficulties and their co-occurrence

Despite the growth in research concerning learning difficulties, the definition of learning disabilities still engenders controversy and contention. During the field's short history several definitions have been suggested but clear consensus has not been reached. The term has its historical roots in Strauss and Lehtinen's (1947) definition of a brain-injured child where *minimal brain damage* was assumed to be the cause of disturbances in normal learning. From here on the focus shifted away from brain damage as an etiological concept to the behavioral characteristics defining the child, and "damage" was replaced by "dysfunction". When defining minimal brain dysfunction (MBD) Clements (1966) listed the ten most frequently cited characteristics of children with MBD to be: hyperactivity, perceptual-motor impairments, emotional lability, general co-ordination deficits, disorders of attention, impulsivity, disorders of memory and thinking, special learning disabilities, disorders of speech and hearing, and equivocal neurological signs and EEG irregularities. With the enlarging of this definition the learning difficulties manifested by children in school were commonly linked to the MBD condition.

The MBD concept was criticised for its etiological emphasis and umbrella-like nature (see Satz & Fletcher, 1980; Taylor, 1984), and a more educationally informative description focusing on reduced learning performance and academic achievement deficits was preferred. Concurrent with the attempts to operationalize the parameters of learning disabilities several new definitions were proposed including those focusing on the discrepancy between general IQ and academic performance (for a review see e.g. Fletcher, 1992) and academic achievement deficits (Schere, Richardson, & Bialer, 1980). Despite the problems associated with discrepancy definition, consensus appears to have emerged claming that individuals with learning disabilities display a discrepancy

between ability and achievement, i.e. they do not perform at the level at which they seem capable. As Keogh (1987) has suggested this general category based on discrepancy can be seen as one end of a hypothetical continuum ranging from specific syndromes (e.g., dyslexia) to this rather broad definition. She also argues that it is not possible to find a single definition that would identify a single condition, and that consequently we must adopt a multidefinitional approach to learning disabilities.

The lack of clear agreement on the definition of learning disabilities has resulted in a failure to define the parameters for the condition, which has in turn influenced research efforts as well as the development of a commonly accepted theory or framework concerning learning disabilities (see Swanson, 1988). This lack of precision in sample definition complicates the interpretation of research findings and limits generalization and possibilities for replication (see Keogh, 1986). This becomes a problem also in the field of intervention research which has as its main goal the provision of practically useful methods to improve the functioning of individuals characterized as having learning difficulties. Both methodological and theoretical pluralism, as well as the discrepancy between basic and applied research, restrains the application of research findings in the everyday life of children with learning related difficulties.

When discussing the advantages and disadvantages of different sample selection criteria used in research, Srcuggs (1990) argues that the rigorous screening for specific characteristics prior to inclusion in a study results in narrowly defined samples. These may be less representative of, and perhaps less valid for the more heterogeneous classroom samples teachers are daily faced with. On the other hand, more broadly defined samples may provide greater external validity for intervention effectiveness while sacrificing precision in sample definition. In terms of intervention research he concludes that all children included in intervention studies should be shown to exhibit some deficit in the area targeted for intervention. When discussing definition related problems Keogh (1987) argues that learning disabilities must be conceptualized by the reason for the research, and that consequently intervention research may require a different definition than research focusing merely on the condition.

As noticed already by Strauss and Lehtinen (1947) and Clements (1966), the difficulties of children identified as having learning deficits are not restricted to one area of cognitive or social functioning but instead several difficulties co-occur. Despite this, a large part of the research on learning difficulties is restricted to only one specific deficit. In the case when the sample is restricted to include children who demonstrate a deficit *only* in the area under investigation (e.g., reading difficulties) it is probably not a representative sample of the whole population identified as having difficulties in that particular area. For example, reading disability has often been found to co-occur with attention deficit disorders (e.g., Carlson, Lahey and Neeper, 1986; Barkley, DuPaul and McMurray, 1990; Hynd, Alison, Semrud-Clikeman, Nieves, Huettner, & Lahey, 1991). On the other hand, several studies concerning particular deficits do not report on other possible deficits the

participants of the study might demonstrate, nor do they speculate on the possible consequences of the co-occurrence.

Studies concerning the co-occurrence of developmental disorders have concentrated mainly on the comorbidity of mental or behavioral disorders such as Conduct Disorder, Oppositional Defiant Disorder, and Attention Deficit Disorder as well as anxiety (for a review see Nottelmann & Jensen, 1995). Some studies have focused on the co-occurrence of two specific learning difficulties (e.g., on arithmetic and reading-spelling disabilities see e.g. Rourke & Strang, 1983; Räsänen & Ahonen, 1995, and on attention disorders and reading disabilities see e.g., Pennington, Groisser, & Welsh, 1993; Närhi & Ahonen, 1995) which have given valuable information about the core deficits underlying the manifested difficulties. Despite the increasing interest in the existence and nature of co-occurrence there have been surprisingly few studies concerning the treatment of comorbid conditions (Hinshaw, 1992) and few studies discuss the possible effects that co-occurrence might have on the treatment process or outcome.

2.2 Treatment services available for children with learning difficulties

Despite the fact that developmental disorders and learning difficulties have been extensively studied during the last decades researchers have paid little attention to the implications of the growing diagnostic knowledge for treatment planning or to the efficacy of treatment methods. The need for finding effective ways to support children with different kinds of developmental disorders is especially motivated when their problems are seen from a long-term perspective. Longitudinal studies have demonstrated that developmental disorders (e.g., perceptual dysfunction, attention deficit, developmental co-ordination disorder) and learning difficulties often have effects not only on academic performance but also on personality and emotional development (e.g., Gillberg & Gillberg, 1989; Ahonen, 1990; Fischer, Barkley, Edelbrock, & Smallish, 1990; Cantell, Smyth, & Ahonen, 1994; Hellgren, Gillberg, Bågenholm, & Gillberg, 1994). These studies indicate that children do not always outgrow their problems by adolescence. Furthermore, neurological signs, learning difficulties and emotional disorders in childhood have an association with later success in life, that is, school completion, employment, and monthly income (Spreen, 1989). It is also known that learning difficulties constitute an elevated risk for class retention (McLeskey, Lancaster, & Grizzle, 1995) and school drop-out (Gage, 1990). The risks are further elevated when children from disadvantaged backgrounds are considered (Howe, 1986; Fad & Ryser, 1993).

Most of the help offered for children with learning related difficulties takes place within their school, and a large number of them are fully mainstreamed without receiving adequate support (see Osborne, Schulte, & McKinney, 1991; Bateman, 1992). Despite the development of different forms of adaptive teaching (on adaptive teaching and aptitude-treatment interaction see

e.g., Corno & Snow, 1986, and Speece, 1990), the ability of a general education class teacher to take into account the diverse aptitudes of all the children is limited. The majority of students with learning difficulties need special services or individual adaptations in curricular material that cannot necessarily be organized in a general education setting (see Simmons, Fuchs, & Fuchs, 1991). In many countries schools have special education teachers as well as special resource rooms where students with learning difficulties are placed for several hours a day, although resource room practice has led to a variety of concerns, e.g. for students missing academic subjects while attending the resource room program (Sansone & Zigmond, 1986; Osborne, Schulte, & McKinney, 1991; see also Haynes & Jenkins, 1986; Zigmond, 1995).

The situation is further complicated in deprived areas where schools must often diminish special services to meet basic expenses and few resources are available for children with special needs. The problem is also severe in developing countries where the economic challenges faced by the state are even greater, and they have no resources for setting up diagnostic centers or special education systems. Both drop-out rates and grade repetitions are known to be especially high in these countries (UNESCO, 1994). Socioeconomic status (SES) of the family is known to be a powerful variable in determining both the probability of learning difficulties as well as their outcome (see e.g., Werner, 1980; Schonhout & Satz, 1983). It is plausible that in developing countries socio-cultural and economic factors further increase the initial difficulty presumingly caused by neurocognitive deficits. In Chile, for example, many children diagnosed as having reading difficulties come from low SES backgrounds and have a poor prognosis (Bravo, 1995). Other family related factors as well as the teacher, school, and community factors also contribute to a high rate of school drop-out in developing countries (Wechsler & Oakland, 1990).

As mentioned above special education teachers have, in many countries, the major responsibility for supporting children with learning difficulties. It might be expected, however, that also developmental neuropsychology can assist in the process of developing interventions for these children. But, this implies, in accordance with a main belief in traditional neuropsychology that effective intervention must be based on individual strengths and weaknesses, and that only careful assessment of the underlying cognitive structures can provide the information needed for such intervention (see e.g., Hartlage & Telzrow, 1983; Wilson, 1991; Rourke, 1994). Although the traditional neuropsychological approach of individual treatment plans based on careful assessment and individually planned exercises is far beyond the scope of any school system more cost-effective compromises might be developed.

The majority of cognitively or neuropsychologically oriented studies concerned with treatment are directed toward *specific* learning disabilities, of which reading disability is probably the most studied (for a review see Wise & Olson, 1991). In remedial techniques for children with dyslexia there has lately been a large emphasis on cognitive approaches (see e.g., Seymour & Bunce, 1994). In the field of mathematical disabilities the remediation has mainly focused on the supposed underlying cognitive deficits (for a review see Geary, 1994), and has been rather narrowly focused on specific operations or skills (e.g., Lombardo & Bott, 1985; Howell, Sidorenko, & Jurica, 1987). The studies

concerning perceptual-motor skills mostly report no improvement (for a review see Kavale & Matson, 1983) and studies on perceptual skills find no increase in academic performance although positive effects can be seen in perceptual skills themselves (e.g., Obrzut, Hansen, & Heath, 1982). The research on attention deficit disorders has emphasized the importance of a multimodal approach and the sufficient duration of treatment more than the studies on specific learning difficulties (Dinklage & Barkley, 1992). On the other hand, the newest intervention efforts based on a careful analysis of the underlying perceptual deficits have given promising results on reading development (Merzenich, Jenkins, Johnston, Schreiner, Miller, & Tallal, 1996; Tallal et al., 1996) as well as on motor coordination (Shoemaker, Dickson, & Kalverboer, 1994).

When conducting a large meta-analysis on the efficacy of interventions for learning disabilities Kavale (1990a; 1990b; Kavale & Dobbins, 1993) found that the effect sizes (ES) were low. The best ESs were found for behavior modification (.93) and stimulant drugs (.58), and the poorest for perceptual-motor training (.08) and special class placement (-.12). When discussing the problems related to process training, Kavale (1990a) concludes that for processes such as language, which are reasonably well understood, the assumption that the processes should be considered in treatment is applicable and accounts for the benefits of psycholinguistic training (ES = .39), whereas in the case of perceptual-motor training and modality-based instruction there is a lack of understanding concerning the basic processes.

Based on Kavale's finding, it can be asked whether intervention should focus on the remediation of specific academic or social skills or whether it should concentrate on the remediation of underlying cognitive processes. According to Scruggs (1990) the former case might be accused as treating symptoms rather than causes and the latter case for faulty theorizing as supported by Kavale's meta-analysis. Also, Hinshaw (1992, p. 896) concludes that "the long history of intervention efforts directed toward ameliorating basic perceptual process, psychological process, or both that allegedly underlie learning difficulties is misguided". He argues that interventions providing instruction in the precise deficient academic skills has most empirical justification. It can be argued, however, that process training is potentially effective but to date has simply not been properly conducted or measured (Scruggs, 1990). Moreover, it might well be that combining the training of supposed underlying cognitive processes with the training of academic skills would yield positive results (see e.g., Lundberg, Frost, & Petersen, 1988 for phonological awareness and reading instruction). It might also be expected that the concideration of comorbidity, as well as emotional and behavioral factors in the treatment would produce better outcome than concentration on either cognitive processes or academic skills alone.

The present study discussess the efficacy of a multifaceted group treatment for children with learning difficulties by comparing it to a control treatment. The multifaceted treatment includes both process and academic training as well as emotional and behavioral support. Outcomes after one and two treatment years on neurocognitive, academic, and behavioral measures are reported. Also, the comorbidity of attentional and academic problems as well as it's importance for treatment outcome are discussed.

3 CDA TREATMENT AS AN EXAMPLE OF A MULTIFACETED TREATMENT

3.1 Basic characteristics of CDA treatment

CDA treatment is a neurocognitive treatment method for children with difficulties in learning. It has been developed in Santiago de Chile, at a center known by the name Corporación para el Desarrollo del Aprendizaje. A more detailed description of CDA treatment can be found in the Manual of Methodology CDA (Todd de Barra, 1991). Since the treatment center has focused on serving lower or lower middle class families most of the children attend state-subsidized schools where the pupil-teacher ratio is high, and consequently, the possibilities for providing individual attention are few. Therefore CDA treatment has been designed to be supportive to the school curriculum and functions partly as a substitution for the lack of a special education program aiming to help the children achieve better and avoid dropping-out of school.

CDA treatment is applied in a group comprising of children with similar kinds of difficulties and of about the same age. The exercises are completed either as group work or individually within the group situation. The CDA treatment center emphasizes the spectrum of difficulties rather than the severity of any single disorder, and the children attending the treatment often demonstrate several difficulties. For this reason consideration of the co-occurrence of several cognitive deficits is one of the leading principles in the treatment, and different disciplines (e.g., psychology, speech therapy, physiotherapy) are represented in the center. Also, a comprehensive evaluation of the child's strong and weak areas is completed before starting the treatment. Individual treatment plans are designed according to the child's existing skills, knowledge, and behavior. This information guides the therapists in choosing the difficulty level of the exercises given to the child. From this point on, the

treatment follows preestablished programs based on theoretical assumptions concerning skill development (see Todd de Barra, 1991).

Along with cognitive development, social and emotional aspects are also considered and given equal importance both in the treatment and in the present study. The CDA therapists are trained to use certain communication and interaction methods with the children, and fixed procedures and behavioral rules known by the children are used regarding both organization of the workshops and behavior during the treatment sessions. Finally, the parents are integrated into the treatment through parents' group sessions held by a psychologist.

3.2 Aims of studies I and II

The main goal of Study I and Study II was to analyze the general treatment effects by comparing CDA treatment to a control treatment. The study was a two year long traditional between-group pre-post measurement experiment with three measurement points. The control treatment resembled CDA treatment in the amount and type of attention given without the preestablished programs, parents' group, and individualized plans. It consisted of homework assistance, reading exercises, group activities (plays, memory games, etc.), and emotional support. This control treatment was named Homework Supervision and Assistance (HSA) treatment. It was administered by nonprofessional adults trained to work with underprivileged children. HSA treatment was less structured than CDA treatment in the sense that less strict procedures and rules were used regarding behavior during the sessions.

Study I reported results of the treatments at the end of the first treatment year. The primary aim of Study I was to study treatment efficacy by contrasting the two different treatments. The efficacies were compared in terms of three types of outcome: (a) measures of neurocognitive development, (b) performance on school achievement tests, and (c) measures of behavior both in school and at home. Differences between the age groups were likewise analyzed. The relative efficacies of the treatments were studied also by analyzing what percentage of the children showed improvement. Special interest was directed toward the change occurring among children who had weak results in pretreatment assessment. Study II reported results after two treatment years. Two major questions were addressed in Study II, firstly, the effect of treatment duration, i.e. whether improvement still occurred during the second treatment year, and secondly, the connection between pretreatment neurocognitive and behavioral characteristics and academic outcomes.

Because CDA treatment included individual treatment plans, professional therapists as well as having a broader treatment focus and paying more attention to behavior, it was expected that more improvement would occur in CDA treatment. On the basis of the differences in the treatments it was expected that different characteristics of the child would be connected to academic outcomes in these two treatment groups.

3.3 Methods

Participants

The participants were 129 school aged children referred to the CDA remediation center for their learning difficulties. The children came from lower or lower middle class families. They were referred by their teachers who were concerned about the learning difficulties manifested by the children despite having a normal IQ. The 129 children participated in an assessment procedure consisting of a neuropsychological test battery, school achievement tests, and behavioral questionnaires. As a result of this assessment, 19 children were excluded from the study because of an IQ score lower than 80.

Half of the children participated in CDA treatment for two years. This group will be referred to as the CDA+CDA group. The other half participated in HSA treatment for the first treatment year and in CDA treatment during the second year. This group will be referred to as the HSA+CDA group.

Group assignment

The 110 children were assigned into the treatment groups through a quasirandomization procedure that balanced the groups according to gender, age, IQ, and socioeconomic status. This provided 54 children for the CDA+CDA group and 56 children for the HSA+CDA group. Five children from the CDA+CDA and 11 children from the HSA+CDA group did not take part in the second assessment after the first treatment year. Thus, the number of children included in Study I was 49 in the CDA group and 45 in the HSA group.

A further 11 children from the CDA+CDA and 9 children from the HSA+CDA group did not participate in the third assessment after the second treatment year. These children were not included in Study II. Hence, the number of children included in Study II was 38 in the CDA+CDA and 36 in the HSA+CDA group.

Treatments

Both groups participated in the treatment once a week for two hours. The children did not receive any other therapeutic assistance during the course of this study.

CDA treatment. The treatment was based on subprograms each of which focused on training specific area of cognitive skill. The children worked in groups comprising 14 children and three therapists. The therapists included psychologists, speech therapists, physiotherapists, and special teachers; selection depended on the workshop. Each group was further divided into two subgroups, which worked in separate rooms with one therapist each. The third therapist worked individually with one child at a time. The children's parents

participated in a parents' group for one hour per week. The content of each two hour treatment session was as follows.

1. Orientation in time and space (10 minutes). Exercises related to time and space and related vocabulary, as well as exercises of verbal and numerical sequencing, classification, and conceptualization.

2. Language/verbal skills (25 minutes). The language related part of the subprogram included exercises regarding the phonemic, syntactic, semantic, and pragmatic aspects of language. The reading and writing related parts included exercises aimed at strengthening the basic skills supporting their learning. When needed, remediation of speech problems was also included.

3. Expressive skills and emotional growth (25 minutes). Acquisition of vocabulary covering physical and emotional concepts as well as exercises aimed at improving self-esteem and tolerance of frustration.

4. Perceptual skills (15 minutes). Exercises of visuo-motor and fine-motor functions using paper-and-pencil tasks and movement.

5. Numerical skills (15 minutes). Acquisition and application of mathematical concepts starting from the basic understanding of quantity, spatial, and temporal orientation advancing to more complicated mathematical concepts and operations.

6. Application and integration of practised skills (30 minutes). The aim of this period was to promote the application of skills previously rehearsed using games, to provide a relaxed atmosphere at the end of the treatment session, and an opportunity for peer modelling and practice of social skills.

7. Parents' group (60 minutes). This discussion forum aimed at providing information concerning the treatment and the problems faced by the family, and to advise the parents regarding child management techniques.

HSA treatment. The HSA treatment groups comprised 18 children and three instructors. Groups were further divided into three subgroups comprising six children per one adult. The HSA treatment sessions consisted of games, homework assistance, reading exercises, and different kinds of group activities (e.g., role playing and motor exercises). The instructors were primary school teachers or mothers whose children had previously been treated in the remediation center. They were trained to work with disadvantaged children with learning difficulties. No parents' group was included in this treatment, but the parents gathered once a week for the last two months of the first treatment year and were given advice on appropriate physical activities and nutrition. Hence, the main differences between the treatments were that CDA had a broader approach, used preestablished treatment programs, made individual plans, had professional therapists, paid more attention to behavioral and emotional components, and offered a parents' group.

Measures

Three sets of outcome variables were formed by grouping measures assessing conceptually related constructs into discrete sets: (a) neurocognitive, (b) school achievement, and (c) behavioral outcome. The scores used for the statistical analyses were age or grade normed to reduce the effect of developmental

change occurring naturally during the treatment period. In the behavioral variables separate norms were used for boys and girls.

Neurocognitive development. For the analysis of neurocognitive outcome, five variables were formed to avoid the risk of overinterpreting random effects associated with using multiple measures. The following variables were formed:
*1. **Language***: Wechsler Intelligence Scale for Children-Revised (WISC-R) Vocabulary and Similarities subtests (Wechsler, 1974); Fluency-test (Lezak, 1983).
*2. **Perception***: WISC-R Picture Completion (Wechsler, 1974); Woodcock Spatial Relations and Visual Matching (Woodcock, 1982).
*3. **Visuo-constructive***: WISC-R Block Design and Object Assembly (Wechsler, 1974); Developmental Test of Visual-Motor Integration (VMI; Beery, 1982).
*4. **Memory***: Verbal Selective Reminding (Buschke & Fuld, 1974); Spatial Memory (Grossi, Orsini, Monetti, & DeMichele, 1979).
*5. **Fine-motor***: Test of Motor Impairment (TOMI) Shifting Pegs and Threading Nuts subtests (Stott, Moyes, & Henderson, 1984); Repetitive and Successive Finger Movements (Denckla, 1973).

School achievement. Improvement in school achievement was investigated using the Woodcock Spanish Psycho-Educational Battery (Woodcock, 1982) Reading, Mathematics, and Writing grade equivalent standard scores.

Behavior. To study the behavioral changes that took place during the treatment, three questionnaires were used. From the Academic Performance Rating Scale (APRS; DuPaul, Rapport, & Perriello, 1990) the Total score was used to assess a child's productivity and accuracy in completing school work. The Attention and Hyperactivity subscale scores from the ADD-H Comprehensive Teacher's Rating Scale (ACTeRS; Ullman, Sleator, & Spraque, 1988) were used to evaluate changes in classroom behavior. The Total score from the Revised Child Behavior Checklist (CBCL; Achenbach, 1991) for parents was used to evaluate changes in home behavior.

Statistical analyses of the first year results (Study I)

To analyze the outcome after the first treatment year separate 2(Group) x 2(Pre-Post) x 4(Age) multivariate analyses of variance (MANOVAs) were performed on the neurocognitive and academic outcome variables; 2(Group) x 2(Pre-Post) x 4(Age) ANOVAs were used with the third set. A MANOVA was not used with the third set because of missing data. Age groups used in the analyses were the following: 6 to 7 (n = 32), 8 (n = 20), 9 (n = 20) and 10 to 11 (n = 22) years.

To analyze the association among improvement, initial level, and treatment group a Logit model analysis was used. For this purpose dichotomic variables were created for initial level (weak or not weak) and for improvement (improved or not improved). The initial level variable was formed according to performance in pretreatment assessment separately for each outcome variable. Children belonging to the lowest 25 % will be referred to as the Initially Weak

Children, and the rest of the children (75%) will be referred to as the Not Initially Weak Children. The improvement variable was formed from the difference score between pretreatment assessment and assessment after one year of treatment. Improvement of at least .5 standard deviations indicated that improvement had occurred while a smaller difference score indicated no improvement.

Statistical analyses of the second year results (Study II)

In order to analyze the treatment efficacy throughout the two year long treatment period repeated measures MANOVAs with profile analysis contrasts were performed. The relationships of the neurocognitive and behavioral variables to academic treatment outcome were investigated by constructing a structural equation model (LISREL; Jöreskog & Sörbom, 1979). The model was built on the hypothesis that the above mentioned five neurocognitive variables would have a common underlying factor (Neurocognitive level) and the behavioral variables two underlying factors; one for Negative behavior (Hyperactivity and Oppositional scales from the ACTeRS) and one for Positive behavior (Attention and Social skills scales from the ACTeRS). The relationships of these three factors to both level of academic performance and linear improvement in academic measures across the three measurements was investigated. Due to missing data the number of children included in this analysis was 38 for the CDA+CDA group and 32 for the HSA+CDA group. The *z*-scores for each variable were used in the analysis. For technical reasons, the regression coefficient of Language functions was fixed at one.

3.4 Outcome after the first treatment year (Study I)

Neurocognitive development

In a comparison between the average pretreatment and posttreatment neurocognitive scores both treatment groups improved significantly. The univariate F-tests showed significant improvements in Language, Visuo-constructive, Memory, and Fine-motor functions. Improvements in Perceptual functions approached significance.

The Logit model analysis for Language functions indicated that the main effects of both belonging to the Initially Weak Children group and belonging to CDA treatment approached significance. Near significant main effects for initial status were also found in Perceptual and Visuo-constructive functions; belonging to the Initially Weak Children group was associated with improvement. Significant main effects were found in Memory and Fine-motor functions indicating that initial performance levels were associated with improvement. The improvement shown by the Initially Weak Children and the Initially not Weak Children on the neurocognitive variable is shown in figure 1.

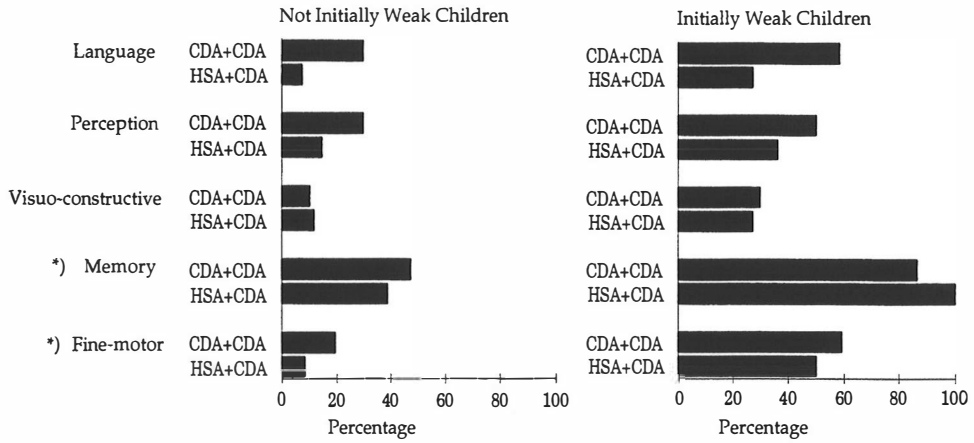

FIGURE 1 Percentage of children showing improvement on the neurocognitive variables. *) indicates a significant ($p < .05$) association between the weak initial performance level and the occurrence of improvement.

School achievement

In a comparison between the average pretreatment and posttreatment school achievement scores both groups improved significantly. Univariate F-tests showed significant improvement in Reading.

Despite the fact that the scores were normed according to the grade level there were differences between the age groups. In Mathematics the 9 year-old children differed significantly from all the other age groups. In Writing the 8 year-old children differed significantly from the 6 to 7 and 9 year-old children.

The Logit model analysis for Reading indicated that the treatment group had a significant main effect on improvement; belonging to HSA treatment was associated with improvement. For Mathematics the main effect of the initial performance level was significant; the weak initial performance level was again associated with improvement. The improvement shown by the Initially Weak and the Initially not Weak Children on academic variables is shown in figure 2.

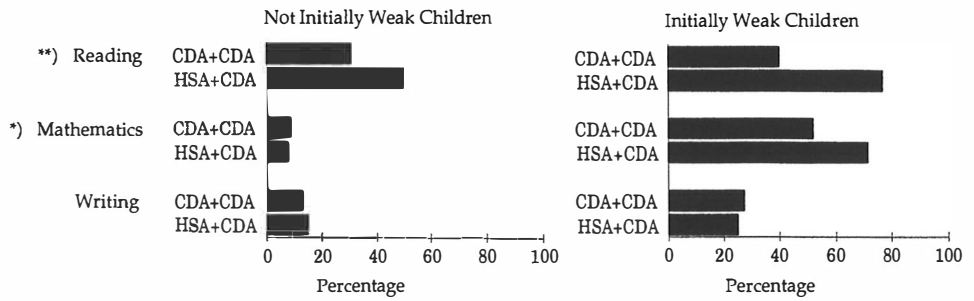

FIGURE 2 Percentage of children showing improvement on the school achievement variables. *) indicates a significant ($p < .05$) association between the weak initial performance level and the occurrence of improvement; **) indicates a significant ($p < .05$) association between belonging to the HSA+CDA group and the occurrence of improvement.

Behavior

ANOVA for the APRS Total score indicated that both groups improved significantly, but no other effects were significant. ANOVA for the ACTeRS Attention score showed that both groups improved significantly, but that there were differences between the age groups. The 8 year-old children improved most in both groups and differed significantly from the 6 to 7 and 9 year-old children. The analysis for the ACTeRS Hyperactivity score showed no significant effects. ANOVA for the CBCL Total score showed that the children in CDA treatment improved significantly more than the children in HSA treatment, but that no other effects were significant.

The Logit model analysis for the APRS Total score and Attention indicated that the main effect of the initial performance level approached significance; the initially low level was associated with improvement in both scores. For the CBCL Total score the main effect of the treatment group was significant indicating that belonging to CDA treatment was associated with improvement. The improvement shown by the Initially Weak Children and the Initially not Weak Children on each behavioral variable in shown in figure 3.

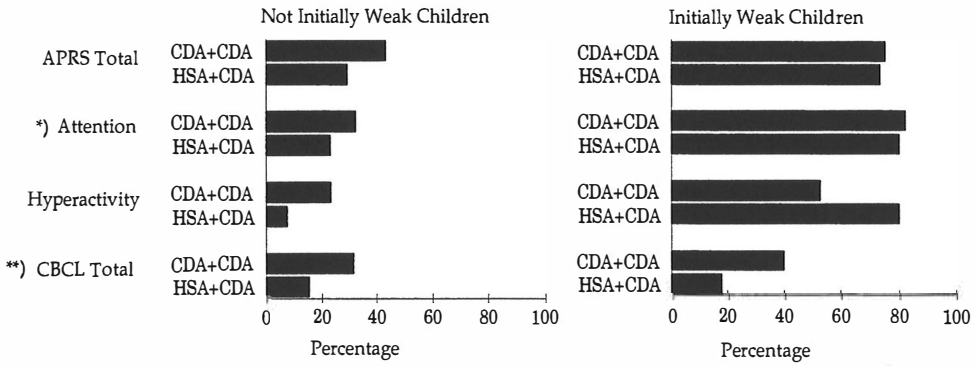

FIGURE 3 Percentage of children showing improvement on the behavioral variables. *) indicates a significant ($p < .05$) association between the weak initial performance level and the occurrence of improvement. **) indicates a significant ($p < .05$) association between belonging to the CDA+CDA group and the occurrence of improvement.

3.5 Outcome after two treatment years (Study II)

Neurocognitive development

The MANOVA results for the neurocognitive variables indicated that there were no differences between the groups in either the profile shape or profile level (see figure 4). The results for Language and Memory showed significant improvement occurring during both years. The results for Perception also showed significant improvement, which occurred only during the second treatment year. For Visuo-constructive functions, no significant effects were

found. Significant changes were found in Fine-motor functions during both treatment years indicating improvement during the first year and decline during the second year.

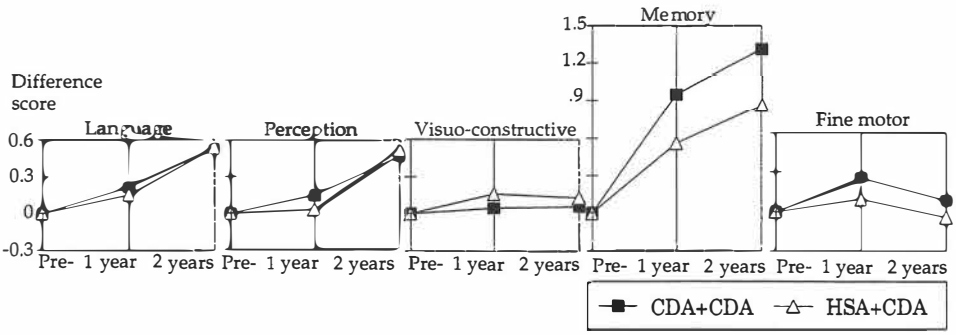

FIGURE 4 Growth in neurocognitive measures during the two treatment years.

School achievement

The MANOVA results for Reading showed significant improvement occurring during both years. A nearly significant differentiation between the treatment groups was found for the second year indicating more improvement in the CDA+CDA group. The results for Mathematics showed no group differences in either the shape or the level of the profiles, but did show significant improvement occurring during the second treatment year. For Writing, no significant effects were found. For the school achievement results see figure 5.

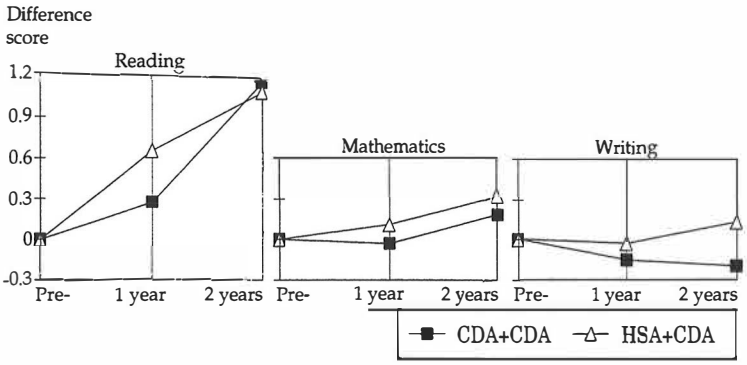

FIGURE 5 Growth in academic achievement measures during the two treatment years.

Behavior

In the MANOVA for behavioral variables (see figure 6) no significant effects could be seen in either the ACTeRS Attention or Hyperactivity scores. The ARPS Total score indicated significant improvement occurring during the first treatment year in both groups. The results for CBCL Total score showed that the improvement was significantly dependent on the treatment group; the CDA+CDA group showed more improvement during the first treatment year.

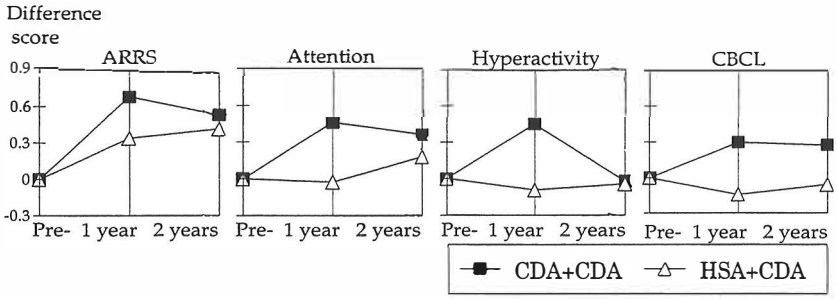

FIGURE 6 Growth in behavioral measures during the two treatment years.

The estimated structural equation models are illustrated in figures 7 and 8. An equal connection between Neurocognitive level and Level of academic performance was found for both groups. Two differences were detected between the groups. First, the CDA+CDA group showed a connection between Positive behavior and Neurocognitive level, and second, the HSA+CDA group showed a connection between Negative behavior and Linear improvement indicating that the increasing amount of negative behavior was associated with less academic improvement.

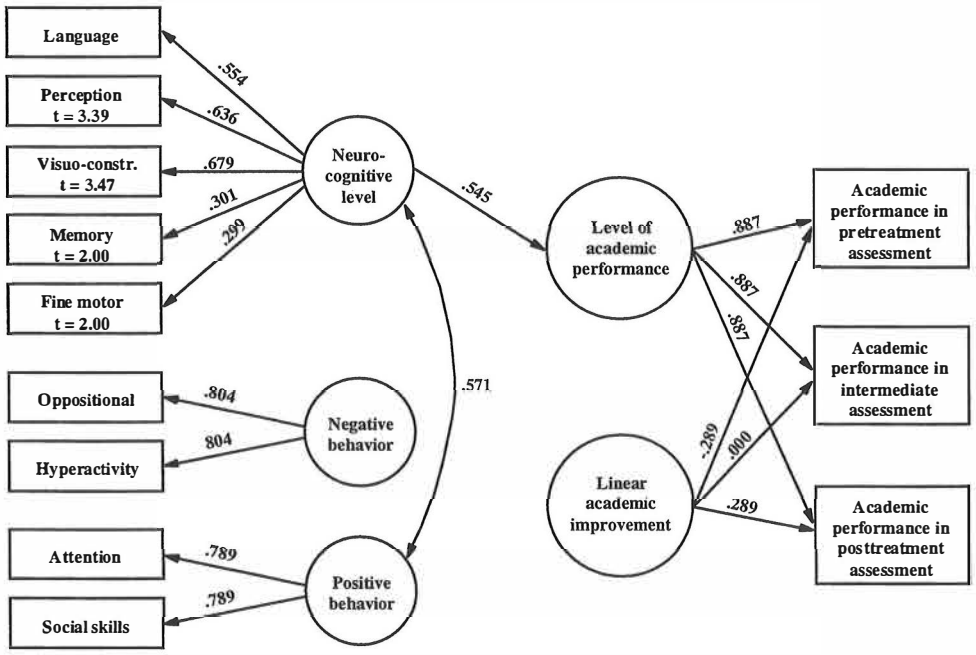

FIGURE 7 Estimated structural equation model of the connections between neurocognitive and behavioral pretreatment measures and academic achievement in the CDA+CDA group.

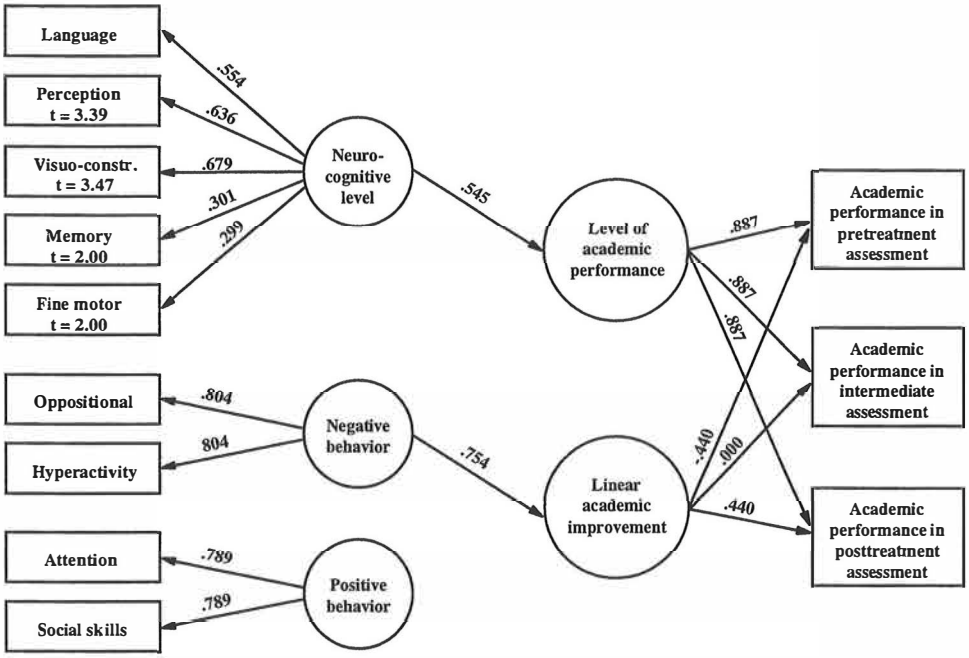

FIGURE 8 Estimated structural equation model of the connections between neurocognitive and behavioral pretreatment measures and academic achievement in the HSA+CDA group.

When the children who dropped out before completing two years in treatment (n = 36) were compared to those who completed two years (n = 74), no differences existed between the groups in either age, SES, Verbal IQ, Performance IQ, or Full Scale IQ. A statistically significant difference was found in the ACTeRS Attention score indicating poorer attentional skills among those children who did not complete their treatment. Also, nearly significant differences were found in academic skills, and when an average score of the three academic measures (Reading, Mathematics, and Writing) was used a significant difference was detected indicating that children who dropped out had initially weaker performance on this score than the children who completed two treatment years.

3.6 Discussion of the general treatment effects

The findings after one year of treatment (Study I) indicated that both groups improved significantly on most of the measures. The differences between the treatment groups were lower than expected. The results obtained after two treatment years (Study II) indicated that further improvement occurred during

the second year. On the basis of these findings it was concluded that it was beneficial to continue the treatments for a second consecutive year.

On the *neurocognitive variables* most improvement could be seen in memory functions, which together with the improvement observed in teacher ratings of both academic behavior and attention during the first year may reflect maturation in more general organizational or executive abilities. Contrary to what was expected, no differences existed between the groups in neurocognitive measures. However, the percentage of children showing improvement after the first treatment year was higher in the CDA+CDA group on several neurocognitive variables. Although the effect did not reach significance there seems to be a consistent trend. With caution, it might be speculated that this trend resulted from the use of individual treatment plans and the consideration of individual profiles. Because of this slightly better improvement of the CDA+CDA group in neurocognitive skills it was supposed that further remediation of this group might be more beneficial and that the improved skills together with additional exercises would generalize to academic achievement. This assumption proved to be only partly true since the CDA+CDA group achieved better gains in reading during the second treatment year, but the difference between the treatment groups did not reach significance.

Of the *academic variables* the best gains were achieved in reading, where both groups showed significant improvement during the first year. Unexpectedly, the percentage of children showing improvement in reading was higher in the HSA+CDA group than in the CDA+CDA group. This effect may be due to the fact that HSA treatment focused more on reading by giving more time to school tasks while CDA treatment's Language sessions also included other aspects of language. Since the HSA+CDA group focused on homework tasks it ensured that the children practised reading at the expected grade level, whereas the CDA+CDA group used exercises rehearsing more basic linguistic skills. The second year results showed that the CDA+CDA group reached the reading level of the HSA+CDA group during the second year when the exercises were more demanding and closer to the reading level expected from the children. It might be that more intensive rehearsing of reading itself is needed when the reading skill is just being learned, and that the skills facilitating further growth in reading are developed by reading itself (see Stanovich, 1986). Based on the academic gains of the HSA+CDA group it seems that inclusion of homework instruction also in CDA treatment might yield positive results.

It can be concluded that both treatments produced significant gains in neurocognitive and academic skills with no major differences between the groups. As the CDA program included preestablished programs and individual treatment plans, more specific improvement was expected to occur in the CDA+CDA group than in the HSA+CDA group especially during the first year. A number of explanations may be put forward to account for not finding the expected results. It might be that individualization was not so essential for the treatment effects in this population. Alternatively, it is possible that the level of individualization in the CDA+CDA group was not sufficient, and perhaps more specific information concerning the child's neurocognitive

strengths and weaknesses should have been used in adapting the treatment efforts for each child. The encouraging point in these results is that even nonprofessional support seems to benefit children with learning difficulties coming from disadvantaged backgrounds.

One might also ask how individually tailored a treatment given in a group can be. Futterweit and Ruff (1993) emphasize the interactive nature and multiplicity of the causes of developmental changes and the difficulty in managing the complexity of this individual process. They note that an individualized treatment program should have the necessary flexibility and complexity which may be impractical to implement with groups. They also argue that focusing on one aspect of the process has a risk of overemphasizing that component. The provision of a rich and varied environment that can be explored and interacted with freely can be beneficial since it offers the balanced multiplicity of components needed for development. From this point of view, it can be argued that CDA treatment had it's strengths in preestablished programs, professional therapists, parents' groups and individually planned treatments, whereas HSA was able to offer the sufficient amount of different components needed to support development, as well as enough individual freedom to explore them to warrant positive outcome.

Despite the differences between the two treatments there were also several similarities, which can account for the positive effects found. Both treatments aimed at creating a positive atmosphere and feelings of security and stability. Perhaps similarities in the social contexts were also important for the final outcomes. This may be true especially, because the children came from lower or lower middle class backgrounds and many of them were environmentally deprived without much support from their family, which may be one additional reason for their poor school performance. In this situation the emotional support and feelings of security provided by both treatment groups may have had an important impact on their academic achievement and motivation.

The greatest difference between the treatment groups was found on *behavioral variables* after the first year. In all behavioral variables the CDA+CDA group showed more improvement, but the only significant difference was found in the differential change in the parents' ratings of their child's behavior during the first year. It is interesting to observe that although the parents' program followed by the HSA+CDA parents during the second year was the same as the one followed by the CDA+CDA parents during the first year, the same amount of improvement did not occur. It would appear, on the basis of these results, that the parents should be actively involved in the treatment of their children from the beginning of the process.

It is not clear whether the findings were due to real changes in the child's home behavior, or to changes in the parents' way of perceiving their child's behavior. In both cases, however, parents' involvement had significance for the families. This is understandable from the point of view that the continuity in a child's behavior can be seen as a property of a system rather than as a characteristic of the individual, and accordingly, a change in behavior results from interactions between individuals within that system (Sameroff & Fiese, 1990). From this perspective, one might expect that an active involvement of

teachers, who also are an important part of the child's everyday life, would offer a good source of support and yield positive results even though the treatment itself would be given outside the school system (see e.g., Ahonen, Luotoniemi, Nokelainen, Savelius, & Tasola, 1994).

It is noteworthy that the percentages of children showing improvement after the first treatment year were especially high among the children who performed at a low level in the pretreatment assessment. It might be that, because the children came from lower or lower middle class families the weakest children were socially or environmentally more deprived and the stimulation offered by both treatments lessened this deprivation. One could also speculate that the weakest children with most obvious difficulties were more easily helped even by nonprofessionals, that is, they might benefit from any help soon after the treatment has started but the main difficulties in the treatment are confronted after some time. This assumption gained no support from the second year results since improvement was still observed during that year.

With regard to the question presented in Study II, connections between pretreatment neurocognitive and behavioral characteristics and academic growth were detected for both groups via the LISREL-analysis. A positive connection between neurocognitive level and level of academic performance was found for both groups. A difference between the models was found in the relationship between behavior and academic improvement which indicated that increased negative behavior was associated with less academic improvement in the HSA+CDA group.

The finding concerning the differential importance of the behavioral variables may result from the nature of the treatments discussed above. HSA treatment did not include components focusing on the behavioral problems of the child while in the CDA treatment program this was an in-built factor. Since CDA considered both behavioral and emotional factors as an important part of the treatment also those children manifesting maladaptive behavior, like oppositionality and hyperactivity, benefited from the treatment, while in HSA these traits could have been a reason for them not experiencing a good outcome. This would seem to indicate that a treatment with known behavioral rules and clear organization is better able to control for the negative effects of behavior and is thus more suitable for children with behavior problems than a treatment with less structure and a lower level of external control for behavior. This would mean that behavioral factors should be considered as an important part of the treatment process of children demonstrating both academic and behavioral problems.

Based on these results it would seem that individual differences rather than treatment characteristics were important for treatment outcome. Because behavioral variables seemed to play an important role for academic treatment gains, it is of interest to study in more detail the association between behavioral characteristcs and treatment outcome. Therefore, Studies III and IV focus on a specific subgroup of the sample and address the questions concerning the comorbidity of attentional and academic problems as well as the relationship between behavioral characteristics (inattention and hypercativity) and academic treatment outcome after the first treatment year.

4 COMORBIDITY AND TREATMENT OUTCOME

4.1 Co-occurrence of Attention Deficit Hyperactivity Disorder (ADHD) and academic problems

Children with Attention Deficit Hyperactivity Disorder (ADHD) comprise a heterogeneous group. During the last few decades different diagnostic criteria (e.g., DSM-III, DSM-III-R, DSM-IV, ICD-10) have been introduced to help both researchers and clinicians understand and handle the heterogeneity of this group of children. The newest diagnostic criteria for ADHD introduced in the DSM-IV (APA, 1994) suggested three subtypes: predominantly inattentive, predominantly hyperactive-impulsive, and combined type. This division gave for the first time the possibility to investigate dimensions of both inattention and hyperactivity-impulsivity independent from each other.

The changes in the diagnostic criteria from the DSM-III to the DSM-III-R complicates the interpretation of the studies concerning comorbidity between attention deficit and academic problems. Studies measuring academic achievement and using the DSM-III criteria for attention deficit disorder have found that children with attention deficits show more problems in reading compared to normal children (e.g., Carlson, et al., 1986; Barkley, et al., 1990). There is also some evidence showing that especially children with attention deficit without hyperactivity are more prone to have problems in arithmetic than control children (e.g., Carlson et al., 1986; Hynd et al., 1991). Contrary to these results Barkley et al. (1990) found that children with attention deficit without hyperactivity did not differ from a control group on the arithmetic subtest of the WISC-R, but that both children with attention deficit with hyperactivity and learning disabled children performed significantly worse than the control group.

In studies using the DSM-III-R diagnostic criteria for ADHD, reading problems have been reported to have a rather high prevalence among ADHD children (August & Garfinkel, 1989; August & Garfinkel, 1990; Gilger,

Pennington, & DeFries, 1992; Pennington, Groisser, & Welsh, 1993) and mathematical problems have also been associated with ADHD (Zentall, 1990; Zentall & Ferkis, 1993). It can be concluded that the studies using DSM-III-R criteria also report findings that academic problems are more common among children with attention deficits than among control children.

Given this often found co-occurrence as well as the pervasiveness and persistence of ADHD much scientific attention as a result has been devoted to its treatment, and several treatment approaches have been introduced (for a review see Ross & Ross, 1982). Among the most studied are pharmacological therapies (for a review see Rosenberg, 1987; Swanson et al., 1993) as well as cognitive-behavioral (e.g., Meichenbaum & Goodman, 1971; Douglas, Parry, Marton, & Garson, 1976; Kendall, 1993), and behavioral treatments (for a review see Dinklage & Barkley, 1992; see also DuPaul, Guevremont, & Barkley, 1992, and Paniagua, 1992). The importance of involving parents in the treatment process has also been stressed (e.g., Barkley, 1987; 1990). The effectiveness of pharmacological treatments has often been shown but it's use has also been criticised because the effects are short-lived and not all children seem to benefit from them (see e.g., Whalen & Henker, 1991). More equivocal results have been obtained using cognitive training (e.g., Abikoff, 1991) while a combination of behavioral and pharmacological methods has shown to be promising (Abramowitz, Eckstrand, O'Leary, & Dulcan, 1992; Hoza, Pelham, Sams, & Carlson, 1992; DuPaul & Barkley, 1993). The treatment results as well as the large number of comorbid disorders associated with ADHD have led researchers and practitioners to search for solutions in multimodal treatments where several approaches are combined (see for review Dinklage & Barkley, 1992; see also Nathan, 1992).

None of the presently available treatments are effective for all children with ADHD, and to date we know very little about the differences between ADHD subtypes in their response to treatment, although there is some evidence to show that these have somewhat differential responses to medical treatment (Barkley, DuPaul, & McMurray, 1991). Because of the differences in the diagnostic criteria, no clear hypothesis based on earlier literature can be made about the academic problems shown by the new subtypes, or whether the subtypes have any prognostic value in terms of treatment outcome.

The new classification has provided a possibility to study separately the association of both inattention and hyperactivity-impulsivity with academic problems. There is some evidence suggesting an association between inattention and academic problems (Lahey et al., 1994; Baumgaertel, Wolreich, & Dietrich, 1995), and consequently, it is of interest whether inattention and hyperactivity-impulsivity are relevant also for academic treatment outcome. It is also of interest how the level of ADHD symptoms is connected with academic treatment outcome. Because both inattention and hyperactivity-impulsivity are of trait-like nature it is merely a question of definition when a child shows these traits to the level that he or she can be diagnosed as ADHD. It can be expected, however, that more prominent deficits have more importance for treatment outcomes.

4.2 Aims of studies III and IV

Studies III and IV focused on a specific subgroup of the sample to see whether a more detailed pretreatment diagnosis and analysis of the child's difficulty would help to understand the efficacy of the treatments after one treatment year. These studies addressed questions concerning the co-occurrence of Attention Deficit Hyperactivity Disorder (ADHD) and academic problems, as well as the relationship between academic treatment outcome and both inattention and hyperactivity.

The question addressed in Study III concerned the occurrence of academic problems among the three ADHD subtypes defined according to the DSM-IV. Study IV focused on the relationship between academic outcome and both the initial level and changes in inattention and hyperactivity during the first treatment year. Based on the literature it was expected that differences between the subtypes would exist in the occurrence of academic problems. It was also expected that inattention and hyperactivity would have different relationship with academic outcome depending of the level of ADHD symptoms.

4.3 Methods

Participants and diagnostic procedure

The subjects of Study III were derived from the 110 children who participated in the study after the 19 children were excluded because of an IQ score lower than 80. The attention deficit disorders were diagnosed using the ACTeRS, which includes 24 behavioral items relevant to behavior in the classroom. For the porposes of Study III the children were diagnosed as Predominantly Hyperactive-Impulsive (ADHD/hyp) if their ACTeRS Attention score was 19 or more and their Hyperactivity score was 18 or more. They were diagnosed as Predominantly Inattentive (ADHD/att) if their ACTeRS Attention score was 15 or less and their Hyperactivity score 11 or less. They were diagnosed as belonging to the group of Combined Type (ADHD/com) if their ACTeRS Attention score was 15 or less and their Hyperactivity score was 18 or more. The clinical control (nonADHD) group was selected from the same pool with the criteria that their ACTeRS Attention score was 19 or more and their Hyperactivity score 11 or less. With this procedure 22 children were assigned as nonADHD, 8 as ADHD/hyp, 20 as ADHD/att and 17 as ADHD/com (giving the total of 67 children). The rest of the initial 110 children could not be diagnosed into any of the diagnostic groups and were not included in Study III.

In Study IV, the ADHD/hyp, ADHD/att, and ADHD/com groups were combined to form one group, and inattention and hypercativity were analyzed as continuous traits within this group. The group will be referred to as the ADHD group. Also the children that could not be regarded as nonADHD or ADHD were included in Study IV, and will be referred to as the semiADHD group. Two children from the nonADHD group, five children from the

semiADHD group and nine children from the ADHD group did not take part in the assessment after the treatment year. Two teachers from the nonADHD group, seven from the semiADHD, and eight from the ADHD group failed to return the ACTeRS questionnaires after the treatment year. These children with missing data were not included in Study IV. The final number of children included was 18 (9 in CDA and 9 in HSA) in the nonADHD group, 31 (20 in CDA and 11 in HSA) in the semiADHD group, and 28 (16 in CDA and 12 in HSA) in the ADHD group.

Statistical analyses (Study III and Study IV)

An ANOVA was used in Study III to analyze the differences between the ADHD subtypes in Reading, Mathematics, and Writing. To further analyze the association between academic problems and both inattention and hyperactivity, Logit model analysis was used. For this purpose dichotomic variables were formed to indicate the presence of academic problems, inattention and hyperactivity. The presence of academic problems (AP) was determined according to the performance on the Woodcock Reading, Mathematics and Writing tests. AP was identified if the child's score was 1.5 standard deviations or more below the grade expectancy in Reading, Mathematics, or Writing. Additionally, percentages of APs demonstrated by each subtype were counted.

In Study IV, an ANOVA was used to analyze the differences between the nonADHD, semiADHD, and ADHD groups in their pretreatment academic performance. A MANOVA was performed to analyze academic treatment outcome and the differences between the treatment groups and the ADHD-level groups; 2(Group) x 2(Pre-Post) x 3(ADHD-level). To analyze the differences between the nonADHD, semiADHD, and ADHD groups in the relationships between academic outcome and inattention and hyperactivity simultaneous regression models were constructed using LISREL (Jöreskog & Sörbom, 1979). Separate models were constructed for each academic outcome variable (Reading, Mathematics, and Writing). The academic outcome after the treatment year was included in the model as a dependent variable, and pretreatment level in the academic variable, attention (the ACTeRS Attention subscale score) and hyperactivity (the ACTeRS Hyperactivity subscale score) as well as changes in both attention and hyperactivity were included as independent variables. The treatment group was also included in the model.

4.4 Occurrence of academic problems in ADHD subtypes (Study III)

The ADHD subtype groups did not differ significantly in chronological age or WISC-R Verbal, Performance, or Full Scale IQ. Notable differences were found between the subtypes in the percentages of academic problems (figure 9). The ADHD/att group and the ADHD/com group showed more academic problems than the nonADHD group or the ADHD/hyp group. The percentage

of Reading problems was highest in the ADHD/att group and of Mathematic problems in the ADHD/com group.

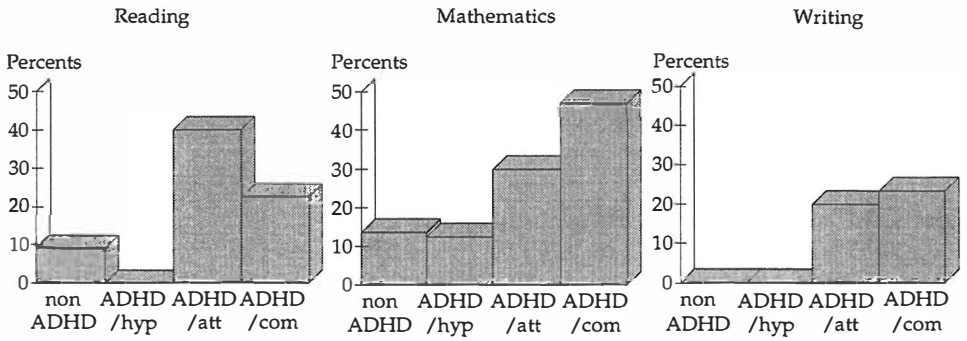

FIGURE 9 Percentages of children with academic problems in the ADHD subgroups.

The ANOVA revealed a near-significant difference between the group means in the Woodcock Reading and Mathematics tests. In the Woodcock Writing test there was a significant difference between the groups. The ADHD/att group performed worst (-.83) and the ADHD/hyp group best (.12).

The Logit model analysis results indicated that presence of Inattention had a significant main effect on the presence of academic problems; increased Inattention was associated with increased academic problems. The main effect of Hyperactivity and the interaction between Inattention and Hyperactivity were ignorable.

4.5 Contribution of ADHD characteristics to the academic treatment outcomes (Study IV)

The ANOVA for pretreatment measures indicated that there were no differences between the nonADHD, semiADHD, and ADHD groups in Reading or Writing, but in Mathematics the ADHD group was significantly poorer than the nonADHD group. The MANOVA results indicated that both treatment groups improved significantly in Reading, but there were no differences between the treatment groups or the ADHD-level groups in treatment outcome. Also no other interactions were detected.

The regression models for Reading indicated that the pretreatment (initial) reading level was associated with outcome after the treatment year in the semiADHD group and in the ADHD group, but not in the nonADHD group (see table 1). A positive change in the Attention score was associated with good reading outcome in the ADHD group. This finding indicated that positive change in attention was associated with increasing positive outcome in reading. The models for Mathematics indicated that the initial level in Mathematics was connected to final outcome in the semiADHD and ADHD groups, but not in the nonADHD group. The initial Hyperactivity score was associated with outcome in the ADHD group indicating that high initial

hyperactivity level was associated with good outcome. The models for Writing indicated that the initial Writing level as well as the initial Attention score were associated with outcome in the nonADHD group. Only the initial writing level was associated with outcome in the semiADHD and ADHD groups.

TABLE 1 Regression models for the nonADHD, semiADHD and ADHD groups explaining academic outcome in Reading, Mathematics, and Writing. Standard coefficients and their t-values are indicated for all variables included in the models.

	Group					
	nonADHD		*semiADHD*		*ADHD*	
Variables	*Stand. coeff.*	*t-value*	*Stand. coeff.*	*t-value*	*Stand. coeff.*	*t-value*
Outcome in Reading						
Independent variables						
Initial reading level	-	-	.748	5.92	.825	7.384
Initial attention level	-	-	-	-	-	-
Initial hyperactivity level	-	-	-	-	-	-
Change in attention	-	-	-	-	.273	2.446
Change in hyperactivity	-	-	-	-	-	
Treatment group	-	-	-	-	-	-
Goodness of fit index	.949		.961		.952	
Outcome in Mathematics						
Independent variables						
Initial math. level	-	-	.650	4.488	.567	3.138
Initial attention level	-	-	-	-	-	-
Initial hyperactivity level	-	-	-	-	-.469	-3.138
Change in attention	-	-	-	-	-	-
Change in hyperactivity	-	-	-	-	-	-
Treatment group	-	-	-	-	-	-
Goodness of fit index	.941		.973		.981	
Outcome in Writing						
Independent variables						
Initial writing level	.469	2.508	.730	5.601	.693	4.791
Initial attention level	.410	2.191	-	-	-	-
Initial hyperactivity level	-	-	-	-	-	-
Change in attention	-	-	-	-	-	-
Change in hyperactivity	-	-	-	-	-	-
Treatment group	-	-	-	-	-	-
Goodness of fit index	.972		.974		.933	

4.6 Discussion on comorbidity and treatment outcomes

The results of Study III suggested that there were differences in the prevalence of academic problems between the Attention Deficit Hyperactivity Disorder subtypes (predominantly inattentive, predominantly hyperactive-impulsive, and combined type) as was expected. According to the results it would seem that academic problems are related to inattention rather than to hyperactivity-impulsivity. Also, when analyzing treatment outcome in Study IV improvement of attention was found to be related to improvement in reading.

In Study IV no main effect for treatment group was found in either reading, mathematics, or writing outcome, but both treatment groups improved in reading. Also no differences in treatment outcome were detected between the nonADHD, semiADHD and ADHD groups. This finding indicated that the level of ADHD symptoms as such was not important for academic treatment outcome. On the other hand, differences were detected between the ADHD-level groups when the quality of ADHD was taken into account. That is, inattention, hyperactivity, and change in both inattention and hyperactivity had a different relationship with outcome in the ADHD group than in the semiADHD group or in the nonADHD group. Hence, it would appear that individual rather than treatment characteristics were important for academic treatment outcome.

None of the independent variables were associated with outcomes in reading and mathematics in the nonADHD group (i.e. clinical control group). Based on this, it would seem that although the same amount of improvement occurred in all the groups, it was not predictable in terms of the attention related variables or the pretreatment performance in the nonADHD group. The lack of association between the initial attention and hyperactivity levels and outcome might be due to the small variance in inattention and hyperactivity in this group. It can be concluded that among the nonADHD children the pretreatment performance level was not so important for treatment outcome as in the other groups.

The relationship between a positive change in attention and good reading outcome can be associated with research findings indicating that children with attention deficits without hyperactivity might be more vulnerable for experiencing academic difficulties than children demonstrating hyperactivity (e.g. Carlson, et al., 1986; Hynd, et al., 1991). Hence, it might be assumed that reading difficulties are closely related to inattention among children with ADHD, and consequently improvement of attention is also reflected in reading or vice versa, but the results of Study IV do not provide information about the nature of this relationship.

Children with attention deficits without hyperactivity symptoms have also been characterised as more anxious, socially withdrawn, shy, depressed, daydreamy, and having a more sluggish cognitive tempo than children with attentional deficits with hyperactivity (see Edelbrock, Costello & Kessler, 1984; Lahey, Schaughency, Strauss & Frame, 1984; Lahey, Schaughency, Hynd, Carlson & Nieves, 1987; Barkley, et al., 1990). It might be speculated that these characteristics are intervening in the treatment process in such a way that both

attention and reading show improvement simultaneously. This would mean that the consideration of emotional and social factors is important in treatment of children with comorbid inattention and academic difficulties.

The finding that a high initial level of hyperactivity was associated with a positive outcome in mathematics was rather surprising. It did not seem to be due to association between a high initial hyperactivity score and a poor initial score in mathematics. Moreover, it was not due to a lack of inattention among the hyperactive children improving in mathematics, or due to effects of Full Scale IQ. One way to understand this finding would be that those children with a high hyperactivity level somehow learned to control their impulsivity in a situation such as solving mathematical problems which requires effortful processing, although for some reason, this change could not (yet) be seen as a change in their Hyperactivity score. It can be concluded that no clear explanations could be found for the finding that the initially high hyperactivity level was associated with good outcome in mathematics. Anyhow, the result indicates that even high hyperactivity did not impede improvement in mathematics.

The results of Studies III and IV would seem to indicate that some differences between ADHD subtypes can be found in the occurrence of academic problems, and that hyperactivity and inattention seem to be differentially associated with both academic problems and treatment outcome. The findings suggest that the quality of attentional deficit is more important than the actual level of ADHD symptoms. Based on these results it seems that the presence of inattention and hyperactivity-impulsivity should be taken into account when planning treatment for children with ADHD. It can be concluded that these results support the view that the consideration of the mere diagnosis of ADHD does not suffice, but that the dimensions suggested by the DSM-IV can give relevant information when planning treatment for children with ADHD. Further research is needed, however, to understand what kind of treatments are most beneficial for each ADHD subtype.

5 GENERAL DISCUSSION

5.1 Main findings

The present study reports the results of a two year long treatment efficacy study of children with learning difficulties. Two group interventions, one with a multifaceted neurocognitive approach (CDA) and one consisting mainly of homework support (HSA) were compared. Outcomes on neurocognitive, academic, and behavioral measures were studied. The findings after one treatment year indicated that both groups improved their performance significantly on most of the outcome measures. The results after two treatment years indicated that improvement continued to occur also during the second year. On the basis of these findings it was concluded that it was beneficial to continue the treatment for a second consecutive year.

Despite the differences in the treatments used no major differences in the outcomes were found, and it can be concluded that both treatments had elements needed for helping children with learning difficulties coming from low-income areas. CDA treatment probably had it's strengths in a broader focus, and it's use of preestablished programs, professional therapists, parents' groups, and individually planned treatments, whereas HSA was able to offer the sufficient amount of different components needed to support development as well as enough individual freedom to explore them to warrant a positive outcome. The main common element in the treatments was that they aimed at a supporting and positively encouraging atmosphere, and it seems that such variables might have a critical importance for treatment outcome. The results suggested that affective and behavioral variables should not be neglected in interventions for learning difficulties.

The only significant difference between the treatment groups was found on the parents' rating of their child's behavior after the first treatment year; the CDA+CDA parents indicating significantly more positive change. This finding emphasizes the importance of including parents in the treatment of children

with learning difficulties. The results also provide evidence for the view that parents should be involved in the treatment from the beginning of the process. Based on this, it might be expected that also a more active involvement of teachers might be beneficial for treatment outcome.

The importance of behavioral factors was indicated by the finding that maladaptive behavior observed at pretreatment assessment was associated with less academic growth in the group participating in the homework supervision treatment but not in the neurocognitive treatment group. Further support was given by the finding that children with poorer attentional skill and a lower academic performance level were those who dropped out of the treatments. Additionally, the finding concerning the differential importance of inattention and hyperactivity for academic problems and academic treatment outcomes also denotes the significance of the behavioral components.

The differential effect of behavioral factors in the two treatments can be understood from the perspective of the structure of the treatments and the amount of external support for adaptive behavior and attention offered to the children. It would appear that a treatment with fixed behavioral principles and clear organization is better able to control for the negative effects of maladaptive behavior and is thus more suitable for children with behavioral difficulties than a treatment with less structure and a lower level of external control for behavior. This finding is in accordance with the view expressed by Hinshaw (1992) stating that children with comorbid behavioral and achievement problems benefit from interventions combining academic instruction with behavioral programming. Further intervention research should take into account the fact that many children needing academic support also manifest emotional or behavioral problems which have to be considered in any treatment.

When viewed from the perspective of the background of the participants the results of the present study were encouraging. It seems that group based support can greatly benefit children coming from lower or lower middle class families. In state-subsidized schools the classes are often large and teachers have few opportunities to provide individual help. In addition, these schools seldom have the possibilities to offer extra support for their students; that is, there are no special education services available. In these circumstances children with learning difficulties run a high risk for dropping out of school. Many families have a low income and have no financial possibilities to search for help outside the school system, and thus any help provided should be in the main cost-free for the family. In these circumstances it is important that the support is cost-effective for the organizers. The CDA institute has achieved this e.g. by bringing different professionals together under the same roof, by creating preestablished treatment programs to reduce the time used for planning, and by using both time and space efficiently.

In Latin America children are often under pressure to leave school and contribute to family income (Graham-Brawn, 1991), and therefore, any support helping the children to stay in school is important and may have a major influence on their future. Because parents' knowledge concerning both learning difficulties and behavioral problems is low, and because their respect for school learning compared to work done by the child to increase the family

income might also be low it is especially important to include the family in the treatment. To fight against educational inequalities and school drop-out several support group projects have been set up in Latin America to help children with school problems coming from low-income areas (e.g., Genescá & Neves, 1990; Vacarro, 1990; Guttman, 1993). Many of them have taken place outside the school system and have used people from the community to participate in the work. These projects have not been studied in detail, but according to the experiences reported and the results of the present study they seem to be an effective way to help children with learning difficulties coming from low-income areas.

To summarize the efficacy of CDA treatment in comparison to HSA treatment the effect sizes (ES = X_{CDA}-X_{HSA}/SD_{HSA}, where X_{CDA} = average score for the CDA+CDA group on outcome measure, X_{HSA} = average score for the HSA+CDA group on an outcome measure, and SD_{HSA} = standard deviation of the HSA+CDA group) after the first treatment year were counted for each outcome area and are presented in figure 10. The ESs indicate that the neurocognitively oriented treatment with more external control and structure was most beneficial in behavior, as discussed above, while homework focused treatment had it's best gains in academic skills. Although significant differences were not found on the neurocognitive variables, the ESs suggest a tendency that neurocognitively oriented treatment was more effective in that area than the homework support treatment.

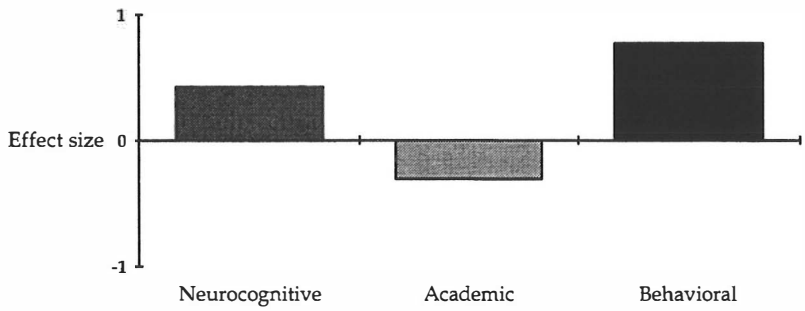

FIGURE 10 Effects sizes of neurocognitive development, academic skills, and behavior for CDA treatment after the first treatment year.

These results bring up the question of the appropriate focus in treatments of learning difficulties. As Kavale (1990a, 1990b) has shown, treatments focusing on basic processes have not been very effective for children with learning difficulties. He argues (1990a) that intervention techniques based on direct and effective instructional practices are from 5 to 10 times more effective than practices attempting to influence unobservable constructs like e.g. perception. White (1988) has demonstrated that treatment including academically focused, teacher-directed learning with sequenced, structured material and high levels of student involvement produced a high ES (.84). Also Hinshaw (1992) has questioned the rationale of treating processes instead of concentrating on the area in which the child faces problems. The results of the present study can be

interpreted to be supportive of these views, because the treatment including the training of neurocognitive skills had poorer gains in academic skills after the first treatment year than the one focusing only on more school related skills. It is also important to consider, however, whether the improvement in neurocognitive variables would, after some time, influence positively on academic skills, and thus have an even better final outcome than treatment focusing mainly on academic skills. A longer follow-up is needed to answer this question.

On the other hand, it might well be that the problem is not one of where to focus but instead of how it is done and how the effects are measured. As Scruggs (1990) argues, it might well be that process focused treatments are effective but have not been measured well enough. Alternatively, because the development of treatment methods for learning difficulties is still a relatively young field and because the theoretical conceptualization is still in its infancy, the problem might lie in a lack of knowledge of how to use the theoretical information concerning the underlying cognitive processes or deficits in treatment planning. The difficulty lies mainly in the lack of both theoretical knowledge and empirical evidence on how to translate the assessment data into effective educational procedures (see e.g. Reynolds, 1981; Rourke, 1994). Therefore, further research is needed to understand how both the information concerning the child's cognitive skills and existing knowledge as well as the neurocognitive understanding should best be used in treatment planning.

The theoretical frameworks for the treatment of learning difficulties have been borrowed mainly from special education, behaviorism, cognitive, information processing and neuropsychological theories. A neurocognitively oriented treatment has its roots in classical neuropsychological treatment (e.g., Luria's theories), but it is well known that several problems are involved in translating the information and methods of treatment created for adults suffering from e.g. head injuries to the treatment of children with developmental problems. The difficulties relate largely to the continuing changes occurring in the brain throughout the development which confound the study of neuropsychological functions and deficits related to them. Because of the developmental dimension, treatment models used with adults are inappropriate with children; with them the training focuses on abilities that are still in the process of development (Brawn & Morgan, 1986). The matter is further complicated when the influences of the environment on an immature organism are considered (Brown & Morgan, 1986; Rattan & Dean, 1986). As a result, there is an obvious lack of information regarding the developing brain as well as a lack of knowledge concerning core deficits underlying academic underachievement. It can be concluded, that these insufficiencies in the theoretical basis hinder the development of effective process training programs for difficulties in learning.

The field of cognitive training has created processing models which allow the identification of specific target functions for therapy, and the selection of an effective treatment depends crucially on a theory about which information processing functions or components are impaired and which are not affected (Howard & Patterson, 1989; Howard, 1992). Although the field of cognitive training has developed sophisticated ways for identifying information

processing systems that are intact and those that are impaired Caramazza (1989) warns us not to confuse theories of cognitive processing with theories of rehabilitation. He sees that "despite mature cognitive neuropsychology will constitute an essential ingredient for the development of a theoretically informed therapeutic practice - the promise of cognitive neuropsychology as a guide for the choice of intervention strategies is still largely unfulfilled" (Caramazza, 1989, p. 396).

It can be concluded that in the field of learning difficulties the instructional application of neuropsychological theories is still largely based on intuition. The difficulty in finding an effective treatment has its roots in basic research's usefulness for practical intervention work. These two lines of work are still far apart from each other; for example, researchers concerned with subtyping seldom conduct intervention research and vice versa (see e.g., Kavale, 1988; Swanson 1988). To find effective treatment methods these two fields should come together. The theoretical knowledge concerning learning difficulties is an essential, although not sufficient starting point for effective treatment, and the best intervention research should be based on valid theories and frameworks.

It should be remembered, however, that any treatment is holistic by its nature and does not respond kindly to reductionism (Trexler & Thomas, 1992), and that overspecifications should be avoided (Kavale, 1990a). Even an empirically validated theoretical basis is not a sufficient guide to effective treatment. The intervening variables related to the context and individual variation should be considered in an ecologically valid research. As suggested by the results of the present study such variables as treatment atmosphere, parental involvement, behavioral traits, and the nature of comorbidity might have notable importance for treatment outcome. Also, individual differences make it difficult to discern any common features that would predict outcome. It seems likely that in addition to the questions of *what*, *why*, and *how* something is done with the child during the treatment process, also the questions *by whom*, *with whom*, and *where* it is done are essential.

The main difficulties in conducting intervention research are related to the multifaceted nature of learning difficulties. No theory alone can account for the diversity and heterogeneity of children with learning difficulties, and thus, diverse theories are needed. From the perspective of intervention research the main requirement of any definition of learning disabilities is that it should create a functional link between identification and instructional needs (see e.g., Keogh, 1987; Kavale, Forness, & Lorsbach, 1991). Although future intervention research should make efforts to find theory driven treatments for specific cognitive deficits, it should also focus on more practical guidelines for planning effective treatments by using the existing knowledge concerning e.g., motivation, social skills, group dynamics, emotional as well as family and environmental factors.

5.2 Methodological considerations

The intervention under investigation was created for clinical needs and was applied in the same way it would be even without the presence of the research. This "natural setting" had both advantages and disadvantages. One of the major limitations was related to subject selection. Since treatment groups were equivalents prior to treatments there were no major threats for the internal validity of the study, but there were subject selection related problems associated with external validity and generalization of the results. Because the treatment center uses unpublished tests to screen the children before they are admitted into the treatment program, a replication of this screening phase would be difficult elsewhere. Also, since no tests standardized with large samples in Chile were available, specific diagnostic information about the children could not be given, and the subject selection remains somewhat scanty.

Because the remediation center served children with academic difficulties and expected them to have deficits in several areas of cognitive functioning, the participants of the study formed a rather heterogeneous group, which complicated the interpretation of the results. Although at group level significant gains were found, the results gave no clear answer to the question of who benefits from the treatments. Due to the heterogeneity of the sample more specific relations between pretreatment assessment and outcome measures could not be found. A more narrowly specified sample might have given more specific results. On the other hand, the advantage gained from the heterogeneity was the increased ecological validity; the sample studied resembled the children normally attending the treatment center as well as the children classroom teachers are faced with.

Due to the theoretical insufficiency (i.e. lack of an explicit theoretical or conceptual framework) of the neurocognitive treatment it can be categorized as an ill-defined intervention, and a broader view at effectiveness is recommended when studying such interventions (see Rog, 1994). For this reason it was not possible to make a clear a priori hypothesis on any specific effects. Also, due to the multifaceted nature of the neurocognitive treatment as well as to the several similarities and differences between the treatments compared, it was difficult to discern the effective components from the less important ones, which poses a threat to the construct validity of the study. An ideal experimental design for studying such a multifaceted treatment method would include multiple comparison groups, which would control for all the components supposed to be affecting the outcome (for methodological issues see e.g., Wong, 1990). Perhaps the greatest problems related to that kind of design, in addition to the practical ones, would be those related to the ecological validity and overspecification mentioned above.

A related issue concerns the selection of appropriate outcome measures, which was complicated by the multifaceted nature of the neurocognitive treatment. Since several skills were treated with several methods simultaneously it was impossible to assess all relevant areas, and compromises had to be made. These problems might have led to a selection of measures that

were not sensitive to the subtle changes that might have occurred in the neurocognitive treatment. Perhaps more specific measures instead of the rather broad measures of cognitive functioning would have shown more gains also in the neurocognitive areas. But, again, a more specified theoretical framework would be needed in order to make such specific selections. It can be surmised that also the above mentioned heterogeneity as well as the norms used have obscured the possible changes, but due to ethical reasons a non-treatment group could not be used, and age or grade norms had to be used to discern the effects related to maturation.

The fact that a nontreatment group was not used poses a threat to the internal validity of the study, and the present design does not allow us to be sure that the obtained results would be specific to the treatments offered. Theoretically, it might be possible that the children improved their performance due to the repetition of the tests. Although, as the time between the assessments was a whole year, it is very unlikely that significant gains would have been reached only by repeating the tests without any intervention.

One of the main critics voiced regarding group designs in intervention studies concerns the fact that individual differences are masked in a large number of participants (Jacobson & Truax, 1991). The improvement is often reported at a group level and in terms of statistical significance. It should be noted, however, that statistical significance and clinical significance are not identical. It might be surmised that because statistically significant improvement occurred on almost all outcome measures, including the one concerning school performance and behavior, the treatments had an important impact for the everyday life of the children. However, because no follow-up data or data concerning the everyday life of the participants were gathered, the long-term effects or generalization of the observed improvement on an everyday level could not be clearly demonstrated. Again, a longer follow-up period would be needed to discern the long-term effects from the immediate ones. Longitudinal studies are needed also in the area of intervention, not only to investigate long-term outcomes, but also because different aspects of the problems are relevant at different developmental levels and important diagnostic information can be gathered by following the children for a longer period of time (see Lyon, 1987).

Yet another problem with group designs concerns the timing of the improvement; group designs consist mainly of pre- and posttreatment measures which give no information about the improvement process. One effective way to study both individual differences as well as treatment processes as such would be the inclusion of a single case design, which would require more resources than were available in the present study. The need of a more individually oriented design is further supported by the results pinpointing the importance of behavioral and emotional factors in the treatment process; in order to study them a carefully planned single case design would be needed.

When analyzed in a single case level it can easily be understood that several individual characteristics of the child and his or her environment may come to influence the outcome. To illustrate this in the present sample the cases of two girls (A and B) from the CDA+CDA group are shortly described. As can

be seen from table 2 they were of about the same age, had an average Full Scale IQ, and had reading difficulties along with writing difficulties as their main problems. Both had good skills in mathematics and had no attention deficit problems.

TABLE 2 Pretreatment assessment results for girls A and B.

Variable	*Girl A*	*Girl B*
Age (months)	110	100
WISC-R FIQ	95	100
Woodcock (z-scores)		
Reading	-.93	-.80
Mathematics	.67	-.13
Writing	-.87	-.80
ACTeRS (raw scores)		
Attention	21	20
Hyperactivity	15	8
Oppositional	21	6
Social skills	22	22

Variable	*Girl A*	*Girl B*
Neurocognitive functions (z-scores)		
Language	-1.42	-.49
Perception	-.23	-.67
Visuo-constusctive	-.13	.16
Memory	-3.78	.83
Fine-motor	.83	.15
CBCL (t-scores)		
Internalizing	60	68
Externalizing	60	71

Despite these pretreatment similarities the girls had rather different growth curves in reading as can be seen from figure 11. During the first treatment year, A improved her reading skills to above the grade level, whereas B improved hardly at all. After two treatment years both had above grade level reading skills. The reasons for the differential improvement cannot be found in the pretreatment scores of either academic performance, attention or IQ. It might be due to A's initially poor language skills and poor memory, or her high oppositionality which all show improvement during the first year. Alternatively, the reasons might be in B's larger problems in home behavior. Or, they might be in the children's motivation, family situation, self-efficacy, or other variables not measured in the present study. Anyhow, this case description shows the complexity of any treatment process, as well as the difficulties individual characteristics and several intervening variables create for simple reasoning. In a group study the affecting factors are easily missed in the heterogeneity of the sample, and only a more individually and clinically oriented study can shed light on these matters (see e.g., Seron, 1997).

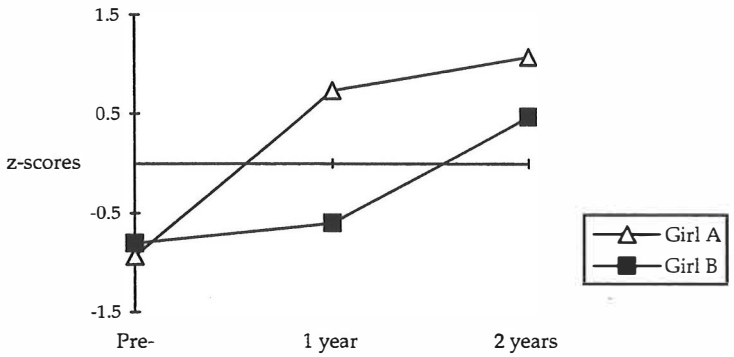

FIGURE 11 Reading improvement of girls A and B during the two treatment years.

6 CONCLUSIONS

The present findings pinpoint to the importance of the individual characteristics of the children as well as to the significance of behavioral and emotional factors in a treatment for children with learning difficulties. They also denote the importance of a clear conceptual and methodological framework in an intervention study. Although the findings are instructive and clinically interesting, they would have been even more enlightening if both the conceptual and methodological problems had been overcome.

From the conceptual point of view a more specific theoretical framework would have helped in designing the study, that is, in specifying both the sample and the measures, and in interpreting the results. Methodological issues are at least as diverse as the conceptual ones, and they explain a lot of the failures or ambiguities in results of intervention research as well as the fact that so few studies are carried out in this field. The present study shows the difficulties faced when trying to interpret outcome of a multicomponent treatment. Clearer contrasts between experimental and control groups are needed to discern the effective components from the less important ones. Also, it shows the limitation of a group design, where the heterogeneity of the sample hinders the finding of meaningful connections between variables. A more narrowly specified sample would help the interpretation of the results, but would easily lead to an overspecified study with poor ecological validity.

The study shows the multiple nature of the phenomenon treated. It does not suffice to include neurocognitive, academic and behavioral variables in an intervention study with learning difficulties. To understand the intervening variables a more versatile approach in terms of both measures and design is needed. A combination of group and single case design would allow us to study more carefully the interactional and psychological mechanisms that mediate effective interventions. That kind of design conducted within a certain theoretical framework might help to find such effective variables that would ultimately provide information valuable also outside the research environment and would help in instruction planning for children with learning difficulties.

YHTEENVETO

Tutkimuksessa arvioitiin Chilessä kehitetyn neurokognitiivisen ryhmäkuntoutusmenetelmän (CDA) vaikuttavuutta lapsilla, joilla on oppimisen vaikeuksia. CDA-kuntoutus on kehitetty sosiaalisesti heikoissa oloissa eläville lapsille, joilla on ongelmia useissa oppimiseen liittyvissä taidoissa. Tämän vuoksi CDA on laaja-alainen ja terapeutit edustavat eri ammattikuntia. Neurokognitiivisten taitojen ja koulutaitojen harjoittamisen lisäksi CDA:ssa huomioidaan perhe psykologin vetämän vanhempainryhmän kautta. Myös lapsen emotionaalisen kehityksen ja käyttäytymisen tukeminen ovat olleellinen osa kuntoutusta. Kuntouttajat ovat kouluttautuneet käyttämään tiettyjä kommunikaation ja vuorovaikutuksen tapoja lasten kanssa. Lisäksi viikottaiset kuntoutuskerrat noudattavat tiettyä samana toistuvaa toimintakavaa, minkä tavoitteena on luoda jatkuvuuden ja turvallisuuden tunnetta.

Tutkimuksessa seurattiin kahden vuoden ajan CDA-kuntoutukseen osallistuneita lapsia. Heidän kehitystään arvioitiin neurokognitiivisilla ja koulusaavutustesteillä sekä käyttäytymisen arviointilomakkeilla. CDA-kuntoutusta verrattiin vähemmän systemaattiseen kontrollikuntoutukseen (HSA), jossa lapset tekivät ohjatusti läksyjä sekä osallistuivat ryhmätöihin ja -peleihin. HSA-kuntoutus toimi vuoden ajan, minkä jälkeen siinä olleet lapset siirtyivät CDA-kuntoutukseen.

Tutkimuksen ensisijaisena tavoitteena oli arvioida CDA-kuntoutuksen vaikuttavuutta neurokognitiiviseen kehitykseen, koulutaitoihin ja käyttäytymiseen sekä arvioida lasten alkuarvioinnin tulosten merkitystä lopputulosta ennustettaessa. Erityisen tarkastelun kohteeksi tutkimuksessa otettiin tarkkaavuuden ongelmat ja niiden yhteys oppimisen ongelmiin sekä näiden ongelmien yhdessäilmenemisen merkitys lasten kuntoutuksesta saamaan hyötyyn.

Tutkimuksessa ilmeni, että vastoin oletuksia HSA- ja CDA-kuntoutuksen välillä ei ilmenyt eroja; kummatkin ryhmät hyötyivät kuntoutuksesta. Parantamista esiintyi vielä toisenkin kuntoutusvuoden aikana, mikä osoittaa, että kuntoutusta oli hyödyllistä jatkaa ensimmäisen vuoden jälkeen. Eniten

kussakin taidossa paransivat lapset, jotka olivat kyseisessä taidossa heikkoja alkuarvioinnissa. Merkittävä ero ryhmien välillä ilmeni vanhempain arvioinneissa lasten käyttäytymisestä; CDA-ryhmän vanhemmat kokivat enemmän parannusta lasten käyttäytymisessä kotona. Toinen mielenkiintoinen ero ryhmien välillä oli, että HSA-ryhmässä sopeutumaton käyttäytyminen (oppositionalisuus ja hyperaktiivisuus) oli yhteydessä heikompaan kehitykseen koulutaidoissa. Erityisesti tarkkaamattomuuden havaittiin olevan yhteydessä heikkoihin koulutaidoihin.

Tuloksista voidaan päätellä, että erityisesti vanhempien sekä käyttäytymisen ja tunne-elämän tekijöiden huomioiminen on ensisijaisen tärkeää kuntoutettaessa lapsia, joilla on oppimisen vaikeuksia. Tulosten perusteella näyttäisi siltä, että systemaattinen kuntoutus, jossa noudatettaan tiettyjä lapsille tuttuja käyttäytymismuotoja ja jossa sekä lapsen tarkkaavuutta että myönteistä käyttäytymistä tuetaan ulkoisesti, pystyy paremmin auttamaan niitä lapsia, joilla on sekä ongelmia oppimisessa että sopeutumatonta käyttäytymistä. Tarkkavaisuuden ongelman osalta voidaan todeta, että tarkkamattomuudella ja hyperaktiivisuus-impulsiivisuudella näyttäisi olevan erilainen merkitys sekä oppimisen ongelmien ilmenemiselle että niiden kuntoutukselle. Lisäksi voidaan todeta, että kuntoutuksen arviointia ryhmäasetelmilla hankaloittaa mm. lasten vaikeuksien heterogeenisuus ja kehityksen yksilöllisyys. Tämän vuoksi olisikin syytä pyrkiä yhdistämään yksittäistapaustutkimuksen menetelmiä myös ryhmäasetelmiin.

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