Association Between Attention Deficit–Hyperactivity Disorder and Learning Disorders

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This article discusses the relationship between attention deficit–hyperactivity disorder (ADHD) and learning disability (LD). The relevant literature is outlined, and empirical data are presented from a prospective follow-up study of 600 speech/language-impaired children. The data show an increased prevalence of both LD and ADHD among children with early speech/language impairments. Furthermore, LD was strongly associated with ADHD in both the initial and follow-up samples. Also, the children with LD had increased rates of other psychiatric disorders (e.g., behavior disorders, mood disorders, anxiety disorders). The implications of these data are discussed with regard to the possible etiology of the ADHD-LD association, treatment for children with LD and ADHD, and promising hypotheses for future research.

This article discusses the association between attention deficit–hyperactivity disorder (ADHD) and learning disability (LD). There are difficulties with the definitional boundaries of all of these terms, as is illustrated below. Nonetheless, the recent research literature (including our own studies of children with speech/language disabilities) suggests that there may be some type of association between the two problems. The present article briefly reviews that literature and presents several competing hypotheses regarding the possibility of an association. Five specific questions are addressed:

1. Is ADHD associated with LD to a degree greater than that predicted by change?
2. Is such an association specific between LD and ADHD, or is it instead an association between LD and disruptive behavior disorders in general? (The class of Disruptive Behavior Disorders includes not only ADHD, but also conduct disorder and oppositional defiant disorder.)
3. Is there an association between LD and other types of psychiatric disorders (especially the “Emotional” or “Internalizing” disorders)?
4. How might (i.e., through what mechanisms) ADHD and LD have come to be associated?
5. What are the treatment implications of the answers to the above four questions?

Before examining the research literature, some discussion of definitional problems will be provided, because generalizations across studies are valid only when the studies use comparable definitions and diagnostic criteria.

DEFINITIONAL ISSUES: ADHD

ADHD refers to a syndrome involving symptoms such as attentional impairments, impulsivity, and motor overactivity. Throughout the years, a number of terms have been used for this syndrome: The earliest works referred to a Brain Damage Behavior syndrome (Cantwell, 1986); but the failure to demonstrate “true brain damage” resulted in the later use of terms such as minimal brain damage and minimal brain dysfunction (MBD). These early approaches were etiological rather than descriptive, in that they implied that some form of brain damage or central nervous system dysfunction was responsible for the behavioral symptoms.

Later approaches moved away from etiologically based terminology, focusing instead on behavioral descriptions. Insofar as motor overactivity was first viewed as the primary symptom of the disorder, terms such as hyperactivity and hyperkinesis became popular. Later, the cognitive studies of Douglas (1972, 1976, 1980) led to the widely accepted view of the disorder as being primarily a deficit in attention and concentration abilities. As a result, DSM-III (the American Psychiatric Association's diagnostic nomenclature published in 1980) coined the term attention deficit disorder with hyperactivity (ADDH).

Much of the work dealing with ADHD used rather vague descriptions of the disorder. For example, in Barkley's (1982) review of 20 years of scientific papers on the syndrome, he found that the majority of works provided no diagnostic criteria. Thus, most authors used nothing more than their own opinions as the means of determining whether the syndrome was present. As a result, it is likely that many early studies in the literature include children with a variety of different problems under the diagnostic rubrics of MBD, hyperactivity, or ADDH.

DSM-III was a landmark in official diagnostic nomenclature. In contrast to its predecessors (including DSM-I, DSM-II, and the various editions of the International Classification of Diseases), it provided detailed descriptions and specific diagnostic criteria for each disorder. The DSM-III definition of ADDH consisted of three major criteria: The first specified multidimensional symptoms (requiring symptoms in the dimensions of inattention, impulsivity, and motor hyperactivity). The second specified an age of onset (prior to 7 years); and the third required a duration (of at least 6 months).

Although the DSM-III criteria were specific in that they outlined particular requisite symptoms, they were not operational in the true sense of the word, because they did not spell out a diagnostic process to determine the presence of those symptoms. Loney (1983) and Barkley (1982) provided examples of how the diagnostic criteria for ADDH may be operationalized. Loney's (1983) work, for example, used various mathematical and statistical procedures to determine the combinations of specific categorical and dimensional criteria that resulted in the greatest reliability.

The most recent of the behaviorally
oriented terms is ADHD. This term is coined for DSM-III-R, the 1987 version of DSM-III. Whereas the DSM-III category of ADDH was a multidimensional monothetic category (that is, it required certain symptoms in three specific areas), the DSM-III-R category of ADHD was a unidimensional polythetic category that did not require any specific symptom or set of symptoms. Instead, DSM-III-R allowed any 8 symptoms to be selected from a set of a possible 14. The duration and age of onset criteria in DSM-III-R remained the same as in DSM-III. Since polythetic categories tend to be broader than monothetic categories, it is likely that there will be more children meeting the DSM-III-R criteria for ADHD than there were for the DSM-III category ADDH. Nonetheless, there is likely to be substantial overlap among the patients specified by these two DSM definitions.

DEFINITIONAL ISSUES: LD

The definition of LD is even more problematic. Various terms have been used, including academic performance problems, academic underachievement, academic retardation, academic backwardness, educational backwardness, learning disorders, learning disabilities, MBD, perceptual handicap, reading retardation, and dyslexia. These terms have been used to represent different types of problems, although they are sometimes used interchangeably.

In order to distinguish LD from poor academic performance that is the result of a child being younger than his or her peers, or having mild intellectual retardation, age and IQ must be taken into account. Academic retardation and educational underachievement are two terms that have been used to refer to children who perform academically below the levels expected from their age and IQ. As noted by Rutter (1974), however, it is not simple to determine the "expected levels" of a child's performance or to define what constitutes being "significantly below" those levels. One of the better methods (Rutter, Tizard, & Whitmore, 1970) calculates expected performance from a regression equation based on correlations in the general population between educational performance, chronological age, and intelligence level. Then, a cut-off for academic underachievement is set at a level that is relatively infrequent in the general population. Theoretically, this selects those children likely to have the poorest prognoses. Nonetheless, much of the learning research, especially that dealing with psychiatric aspects, has used methods that are less valid (such as achievement ratios, discrepancies between mental age and achievement age, or discrepancies between achievement age and chronological age).

Another problem has to do with more subtle, theoretical distinctions, such as the difference between learning disability, learning deficit, and learning disorder. As pointed out elsewhere (Cantwell, 1986), ability is a term best used to describe an underlying, often inferred capacity, whereas performance is best used to describe observable and quantifiable behavior. Deficit is best used to describe something that is less than expected; and, finally, disorder is best used to describe a recurring pattern causing some degree of distress, disadvantage, or dysfunction. Thus, an observed, lower than normal performance in one aspect of learning (i.e., reading) measured by a standardized test is a performance deficit. The disability or disabilities that may have led to it cannot be observed, but rather are inferred. However, these distinctions in terminology are not maintained in most of the literature.

The DSM-III and DSM-III-R definitions of specific reading disorder require performance on a standardized, individually administered test of reading skill that is significantly below the expected level, given the individual's schooling, chronological age, and mental age. Because there is no mention of underlying inferred capacities, these definitions are of learning disorder, not learning disability. The definitions may be inconsistently applied because they do not specify either the degree of performance deficit or the operational procedures for determining the deficit.

The most common definition of learning disabilities was developed in 1967 by the National Advisory Committee on Handicapped Children, and later became the basis for the federal definition found in U.S. Public Law 94-142 (the Education for All Handicapped Children Act of 1975). That definition is as follows:

"Specific learning disability"... means... a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which disorder may manifest itself in an imperfect ability to listen, think, speak, read, write, spell, or to do mathematical calculations. (Federal Register, 1977, p. 64)

Such conditions as perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia are included in the definition, but learning problems that are primarily the result of visual, hearing, or motor handicaps; mental retardation; emotional disturbance; or environmental, cultural, or economic disadvantage are excluded (Federal Register, 1977, Section 121A(5)).

Although widely used, the above definition has difficulties that have been noted by various authors (Barkley, 1981; Hammill, Leigh, McNutt, & Larsen, 1987; Interagency Committee on Learning Disabilities (ICLD), 1987; Share, Richardson, & Bialer, 1980). Like the DSM definitions, it does not specify how far behind a child must be. Furthermore, the focus on underlying psychological processes is problematic, because we do not know what those processes are (Butler, 1984), nor is it clear how they can be measured. Furthermore, it is not clear how the exclusions are to be made, particularly since the inclusionary and exclusionary conditions may overlap with LD and with each other, intertwined in such a way that it becomes impossible to disentangle the direction of effect.

Partly as a result of these difficulties, the National Joint Committee on Learning Disabilities revised the definition in 1981 (Hammill et al., 1987; Interagency Committee on Learning Disabilities, 1987). The revised definition reads:

Learning disabilities is a generic term that refers to a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning, or mathematical abilities. These disorders are intrinsic to the individual and presumed to be due to central nervous system dysfunction. Even though a learning disability may occur concomitantly with other handicapping conditions (e.g., sensory impairment, mental retardation, social and emotional disturbance) or environmental
influences (e.g., cultural differences, insufficient or appropriate instruction, psychogenic factors), it is not the direct result of those conditions or influences. (ICLD, 1987, p. 221)

Although this definition has been considered to be a substantial improvement over the P.L. 94-142 definition, it nevertheless has problems similar to those outlined above. Unfortunately, those problems are still present in the most recent definition proposed by the Interagency Committee on Learning Disabilities (1987). This latest definition amended the 1981 definition by (a) expanding the list of manifestations to include difficulties in the acquisition and use of social skills and (b) expanding the list of handicaps that may occur concomitantly to include attention deficit disorder.

Clearly there are many definitional issues that have not been resolved and that are central both to the delivery of clinical services and to research. Our present understanding of the association between ADHD and LD is hampered by differences across studies in the definitions, the inclusionary and exclusionary criteria, and the operational diagnostic procedures.

**ASSOCIATION OF ADHD AND LD**

An early study (Cantwell & Satterfield, 1978) found a high prevalence of academic performance problems in boys with ADHD as compared to age-matched boys with similar IQs who did not have attention problems. In that study, ADHD was diagnosed using behavioral criteria similar to those eventually published in DSM-III-R, and expected achievement levels were established using a regression equation based on age and Performance IQ (PIQ). More than one third of the ADHD boys were found to be at least 1 year below their expected levels in two of the academic subjects tested (i.e., reading, spelling, or mathematics). As well as being behind in more academic subjects, the children with ADHD were also more behind in the individual subjects.

Similar findings have been reported in the literature in both cross-sectional (Anderson, Williams, McGee, & Silva, 1987; Holborow & Berry, 1986; Lambert & Sandoval, 1980) and longitudinal (Charles & Schain, 1981; Huessy & Cohen, 1976) studies of children with hyperactivity. Follow-up studies of children with hyperactivity typically report that these children are destined for school failure, learning problems, and/or LD. For example, in Huessy and Cohen’s (1976) follow-up study, half of the sample had experienced school failure by the time they reached ninth grade. Lambert and Sandoval (1980) examined underachievement (defined as a discrepancy between actual and IQ/age-appropriate achievement) in boys with and without hyperactivity. They found that 53% of the boys with hyperactivity (versus only 11% of the controls) were underachieving in either reading or math. In another follow-up study, Charles and Schain (1981) reported that the majority of preschoolers with hyperactivity functioned below grade-level expectations in reading and math, once they were in school.

Furthermore, an association between learning difficulties and hyperactivity has been reported in several epidemiological studies. For example, Holborow and Berry (1986) used teacher questionnaires to determine the presence of hyperactivity and learning problems in a large epidemiological sample of elementary school children. They found that 27% of the children with hyperactivity also had learning difficulties. More recently, Anderson et al. (1987) reported that 80% of 11-year-olds with ADDH (per DSM-III criteria) had learning difficulties (being at least 2 years behind) in reading, spelling, mathematics, or written language.

Thus, although each of these studies has used slightly different definitions of ADHD and learning difficulties, they all support the hypothesis that academic difficulties and school failure are likely to be found in children with ADHD. This in turn suggests an association between LD and ADHD. Below, the nature of such an association is explored in more detail.

**SPECIFICITY OF THE ASSOCIATION BETWEEN LD AND ADHD**

DSM-III-R groups ADHD, along with conduct disorder and oppositional disorder, into a general category of psychiatric disorders called “disruptive behavior disorders.” Other psychiatric classification systems have also grouped these disorders under the name “externalizing disorders” (Achenbach, 1985). Such grouping raises the question of whether the assumption of LD is with only ADHD, or whether LD is also associated with disruptive behavior disorders in general.

Rutter (1974) suggested that specific reading retardation is one type of learning problem that is associated with behavior disorders in general. Rutter’s seminal epidemiologic study on the Isle of Wight (Rutter et al., 1970) found that approximately one third of the children with conduct disorder also had specific reading retardation, and, conversely, one third of the children with reading retardation also had conduct disorder. Although the diagnosis of ADHD was not used in this study, the children in the concurrent disorders group were characterized by symptoms suggestive of the ADHD syndrome.

There is also a substantial literature suggesting that children with conduct disorders, delinquency, or antisocial behavior have high rates of learning difficulties (Baker & Cantwell, in press; Hunt & Cohen, 1984; Lewis, Shanok, Balla, & Bard, 1980; Melzter, Roditi, & Fenton, 1986; Zinkus & Gottlieb, 1978). Studies of delinquent children and adolescents reveal that reading disability in particular is very common. Thus, it would seem that other disruptive behavior disorders are also associated with LD.

In Rutter et al.’s (1970) epidemiological study, the researchers compared three subgroups of children: those with pure conduct disorder, those with pure specific reading retardation, and those with concurrent conduct disorder plus specific reading retardation. It was found that the children with concurrent disorders most strongly resembled those with pure specific reading retardation. From this, the researchers concluded that the conduct disorder may have arisen in the children with concurrent disorders as a consequence of experiences with school failure.

Other research studies support that conclusion for at least a subgroup of children who have both LD and conduct disorder. Studies examining the natural history of LD in delinquent children report that the onset of LD precedes de-
linquent behaviors about half the time (Offord, Poushinsky, & Sullivan, 1978). Furthermore, there is evidence of various subtypes of delinquency, only one of which is associated with LD (Meltzer et al., 1986).

Our own work has examined the prevalence and types of psychiatric disorders and learning disorders found in children with speech and language impairments (SLI). These children constitute a particularly relevant sample because they are at risk for both psychiatric and learning problems (Baker & Cantwell, in press; Cantwell & Baker, 1987a).

Our initial sample consisted of 600 SLI children, 69% male, ranging in age from 1 to 16 years, with a mean age of 5.6 years. Three hundred of these children were followed up 4 to 5 years later (at a mean age of 9.1 years). These studies are described in more detail elsewhere (Baker & Cantwell, 1987; Cantwell & Baker, 1985, 1987b).

Psychiatric diagnoses using DSM-III diagnostic criteria revealed that initially 50% of the 600 children had a psychiatric illness. ADDH was by far the most common diagnosis, occurring in 19% of the children. However, oppositional and/or conduct disorders were found in an additional 7% of the group, making a total of 26% of the children who had some type of disruptive behavior disorder.

Forty-two children in the initial sample had LD (see Note). Although this was a small proportion (7%) of the entire sample, it nonetheless represented a considerable proportion (more than 25%) of the children who were school aged.

Behavioral and emotional problems were very common in the children with LD: 74% were diagnosed as having some type of psychiatric illness (as opposed to 50% in the total sample). For the children who had LD, the most common psychiatric diagnosis was ADDH. Forty percent had ADDH, and another 9% had either oppositional disorder or conduct disorder. Thus, a total of 49% of the children with LD also had a concurrent disruptive behavior disorder. Hence, although disruptive behavior disorder in general and ADDH in particular are common in SLI children in general, they are even more common in speech and language disordered children with LD.

Four to five years later, 60% of the 300 children followed were found to be psychiatrically ill. Again, ADDH was the most common diagnosis, occurring in 37% of the follow-up sample. Another 8% had a diagnosis of either oppositional or conduct disorder, making a total of 45% with some type of disruptive behavior disorder.

At follow-up, 91 of the 300 children had LD. Seventy-nine percent of these had some psychiatric diagnosis (compared to only 60% of the total sample). Again, ADDH was by far the most common diagnosis, present in 53% of the LD subsample. Another 5% of the children with LD had either oppositional or conduct disorder. Thus, at follow-up, the disruptive behavior disorders, and in particular ADDH, were again strongly associated with the diagnosis of LD.

From the initial sample of 600 children, subsamples were drawn with and without LD, matched for chronological age and Performance IQ levels. Comparisons of these two subsamples again revealed a striking association between LD and behavior disorder. Psychiatric illness was present in 84% of the children with LD, versus only 49% of their matched controls. Sixty-eight percent of the children with LD had a behavior disorder, versus only 40% of the control children. These comparisons are both significantly different at the .001 level.

Furthermore, 45% of the children with LD had a diagnosis of pure behavioral disorder, as opposed to only 30% of the matched control group. This was significant at the .03 level. This analysis again suggests a strong association between psychiatric disorder and LD, and, in particular, between the disruptive behavior disorders and LD.

When specific types of behavioral diagnoses were considered, again ADDH was by far the most common diagnosis. It was present in 63% of the children with LD, but in only 30% of the children in the matched comparison group. This difference was significant at the .001 level.

ASSOCIATION OF LD WITH EMOTIONAL DISORDERS

Emotional disorders are characterized by problems such as anxiety, depression, or mood disturbance. Rutter (1974) suggested that, while there is some tendency toward an increased rate of emotional disorders in children with LD, the strongest association to LD is from behavior disorders. However, other authors have suggested that depression and anxiety may also be associated with LD.

Several authors (Hunt & Cohen, 1984; Petti, 1978; Poznanski, 1982; Weinberg, Rutman, & Sullivan, 1973) have pointed out that problems in school performance and decreased concentration abilities are core symptoms of the depressive syndrome in children. Weinberg and Rehmert (1983) described an association between learning problems, depression, and hyperactivity in children attending a special school for learning disabilities. However, there have been no systematic studies examining either the prevalence of LD in depressed children or the prevalence of depression in LD children.

Similarly, there have been no systematic studies examining either the prevalence of LD in children with anxiety disorders or the prevalence of anxiety symptoms or disorders in children with LD. Nonetheless, Hunt and Cohen (1984) suggested that anxiety disordered children may be at risk for the development of learning problems. Two theoretical mechanisms for such a risk are (a) the impaired attention, perception, memory, or abstraction that may occur in the highly aroused anxious state and (b) absence from school that may be a response to the child's anxiety.

In our sample of 600 children with speech and language disorders, emotional disorders were also found to be relatively common. In all, 14% of the children had an emotional disorder (4% with a mood disorder and 10% with an anxiety disorder). At follow-up, 18% of the children had some type of emotional disorder (4% with a mood disorder and 14% with an anxiety disorder).

Mood disorders were more common in those children who had LD. Initially, 17% of the children with LD had a mood disorder diagnosis, while only 2% had an anxiety disorder diagnosis. At follow-up, emotional disorder was present among 35% of the children with LD. The children with LD had a slightly lower rate (10%) of mood disorder, but a much higher rate (25%) of anxiety disorder. This indicates that the association of LD
to the disruptive behavior disorders may not be as specific as some authors have suggested. Both anxiety and mood disorders may also be common in children with LD, at least among those with early speech and language difficulties.

The comparison of the matched groups of children with and without LD again revealed elevated rates of emotional disorders associated with LD. Emotional disorders were present in 35% of the children with LD, versus only 17% of the children without LD. This difference was significant at the .001 level. The most prevalent emotional disorders were anxiety disorders; these were present in 24% of the children with LD and 11% of the matched controls (a significant difference at the .001 level).

The majority of children with LD did not have a pure emotional disorder, however. In fact, 23% of the children with LD (versus 10% of the controls) had comorbid behavioral and emotional disorders. This difference was statistically significant at the .001 level. Hence, although our data show an association between emotional disorders and LD, they also show that emotional disorders, when present in children with LD, are likely to be accompanied by disruptive behavior disorders.

This issue of co-morbidity is one that needs to be addressed in research studies. For example, the co-morbidity of behavior and emotional disorders may make it seem as though LD is associated with both diagnoses when, in reality, the association is being carried by only one of these diagnoses.

THE NATURE OF THE ASSOCIATION

When two conditions, such as ADHD and LD, are found to be associated with each other, that association may be the result of various mechanisms. First, the ADHD may lead to the LD. Second, the LD may lead to the ADHD. Third, there may be common background factors that lead independently to ADHD and LD (in which case the association between ADHD and LD would be indirect).

Intuitively, it seems likely that ADHD would lead to LD, in light of the core deficits of ADHD. That is, children who have difficulty with sustaining attention over time or difficulty with selective attention would be expected to have academic performance problems. Likewise, children who have cognitive and behavioral impulsivity would be expected to have academic problems because they make decisions too rapidly or based upon inadequate data. Children who have fidgety, restless behavior also may not be able to put in enough time at a stretch in order to succeed academically.

Although this explanation of the association between LD and ADHD makes intuitive sense, there is scant evidence that ADHD itself, as a diagnosis, leads directly to learning difficulties. In fact, there are many children who have the ADHD syndrome and do not have LD. As pointed out by McGee and Share (1988), longitudinal prospective follow-up studies are needed of preschool children with ADHD, concentrating on academic and cognitive factors. The continuity of preschool ADHD with grade-school ADHD, and their associations to the development of learning problems and LD, needs to be traced. Additionally, overlaps between ADHD and other problems, such as speech and language disorders and conduct disorder, need to be taken into account in order for a longitudinal study to be meaningful. It may be that these other associated problems, and not the ADHD itself, lead to the learning difficulties.

Another type of useful study would compare children who have ADHD but do not have learning problems to children who have both ADHD and LD. One such study (Halperin, Gittelman, Klein, & Rudel, 1984) compared two groups of children who were hyperactive, one group with achievement scores average relative to their age and IQ, and another with reading disability relative to age and IQ. The study found minimal differences between the two groups in demographic, behavioral, or neuropsychological measures.

Cunningham and Barkley (1978) were among the early investigators who proposed that the reverse mechanism of association might be true—that is, that problems with academic performance might lead to a clinical picture of ADHD in grade school. Again, the type of longitudinal studies necessary to establish this have not really been done. The work of McGee and colleagues (McGee, Share, Moffitt, Williams, & Silva, 1986; McGee, Share, Anderson, & Silva, 1986; McGee, Williams, Moffitt, & Anderson, 1989) suggests that children who have significant reading difficulties that persist over time are at increased risk for behavior problems. Although ADHD behaviors were common in the boys with LD in that study, conduct disorder symptoms and anxiety symptoms were also found. Hence, the association with LD was not specific to ADHD.

The last possible mechanism of association—that LD and ADHD are related to each other because of common underlying factors—also seems intuitively plausible. Such underlying factors could be environmental, organic, or cognitive. Several studies have demonstrated, for example, that individuals with the ADHD syndrome tend to have less efficient cognitive styles (Cotugno, 1987; Douglas, 1972, 1976, 1980) and lower IQ scores (Ackerman, Anhalt, Dykman, & Holcomb, 1986). Furthermore, in a national probability sample of youngsters, below average attentiveness was found to be significantly associated with lower performance on tests of intelligence and achievement (Goldstein, 1987). However, considerable work is needed to clarify the nature of cognitive functioning and academic performance in children with ADHD, LD, and ADHD plus LD. Unfortunately, such work will necessarily be complicated by theoretical and measurement complexities. For example, the lower cognitive test scores that are obtained by a child with ADHD may not truly represent a learning disorder distinct from ADHD, but rather may be an artifact of the measurement process.

The work of Douglas (1980) provides some insights into the nature of the cognitive functioning of children with ADHD and LD, and suggests that different types of cognitive disabilities may underlie the two disorders. In particular, Douglas's work indicates that children with ADHD have specific difficulties with the strategic problem-solving skills that are necessary for learning to occur. When children with ADHD were compared to nondisabled children on paired-associate learning tasks requiring the children to devise their own memory strategies, the children with ADHD did worse than their non-
disabled peers. However, when these children were compared on a similar task involving pairs that were associated in a known and consistent way, the responses of the two groups were quite similar. Furthermore, the children with ADHD tended to do less well on memory tasks in a free recall situation, although they were not different from nondisabled students in a cued recall situation. If Douglas is correct, this would argue against the hypothesis that common underlying cognitive deficits lead to both LD and ADHD.

On the other hand, McGee and Share (1988) pointed out that there are many pitfalls in the research on cognition that compares children with ADHD or LD. For example, they cite the Ackerman studies (Ackerman, Anhalt, Dykman, & Holcomb, 1986; Ackerman, Holcomb, & Dykman, 1986) that purported to demonstrate differences between non-ADHD LD children versus ADHD non-LD children in automatic and effortful processing. McGee and Share (1988) criticized those studies on the grounds of overlap in the diagnoses between the two groups. They also cited their own failure (McGee et al., 1988) to replicate the Felton study (Felton, Wood, Brown, Campbell, & Harter, 1987) demonstrating different underlying cognitive deficits in ADHD children versus children with LD. Thus, further investigation is needed comparing children with pure LD, children with pure ADHD, and children with both ADHD and LD.

The definitions of LD reviewed at the beginning of this paper reflect the widely held belief that LD is intrinsic to the individual and most likely due to some type of central nervous system dysfunction. Our own work, reviewed above, suggests that speech and language disorders may in fact be a common background factor to both LD and psychiatric disorder, and in particular to ADHD. The data from our initial and follow-up studies of children with early speech and language difficulties lead to the following conclusions:

1. There is an increased prevalence of psychiatric disorders, of both the disruptive behavioral type and the emotional type, in children with speech and language disorders. Specifically, ADHD is quite common. However, so are anxiety disorders.
2. There is an increased prevalence of learning disorders in children with speech and language disorder.
3. There seems to be a specific association between the presence of a psychiatric disorder and the presence of LD in SLI children. This specific association is strongest for the disruptive behavior disorders.

Particularly relevant to these conclusions is the recent work of August and Garfinkel (1989), who identified two subtypes of ADHD, which they called “behavioral” and “cognitive.” In addition to inattention, impulsivity, and overactivity, the cognitive subtype of the disorder was characterized by severe academic underachievement and neuropsychological skill deficits having to do with the encoding and retrieval of linguistic information. Such deficits are characteristic of childhood language disorders and of reading disabilities. These findings point to the need for additional studies of cognition, especially verbal/linguistic cognition, in children with ADHD and LD.

TREATMENT IMPLICATIONS

Our own research and the other literature reviewed here indicate that ADHD and LD are associated to a much greater degree than would occur by chance. However, the nature of this association remains unclear. The direction of effect (that is, LD leading to ADHD, ADHD leading to LD, or some other mechanism) is important for treatment implications. If ADHD leads to LD, then we could postulate that treatment of the ADHD would lead to improvement in academic performance. If LD leads to ADHD, concentration on the academic performance problems might be a preferable treatment approach. In such a circumstance, successful treatment of the learning problems might then result in the behavioral abnormalities improving secondarily. If there were common underlying factors that led to both ADHD and LD, then treatment directed at these underlying factors should reasonably lead to improvement in both areas of deficit.

The treatment for children with ADHD that has been most investigated is stimulant medication. Gittelman-Klein's (1987) review provides a good overview of the relevant studies. She points out that the Douglas study (Douglas, Barr, O'Neil, & Britton, 1986) was one of the few, if not the only, studies to investigate stimulant effect on academic performance using a research design free of methodological problems. Douglas found that methylphenidate produced significant improvement on both arithmetic and language task performance. Similarly, a 3-year multimodality study (Satterfield, Cantwell, & Satterfield, 1979) combining stimulants with various other forms of intervention also found significant improvements in academic performance over time. However, there is no significant evidence to suggest that stimulants produce a positive effect on the academic performance of children with LD who do not have associated ADHD.

Gittelman-Klein's (1987) review indicates that there has been very little research comparing the cognitive and academic effects of various combinations of stimulant medications with other interventions. This is rather disappointing, because one would naturally assume that the addition of another type of intervention specific to a particular parameter of dysfunction might additively improve the outcome, as compared to stimulant medication alone.

McGee and Share's (1988) review notes that there have been studies focusing on the treatment of LD and accompanying classroom behavior problems. Most, if not all, of those were very short-term studies employing small numbers of subjects whose psychiatric diagnoses were often questionable. More research is needed to determine the best treatment approaches for all types of children with ADHD, children with LD, and children with ADHD/LD.

CONCLUSIONS

This paper has not addressed some of the issues that would be pertinent to a definitive statement regarding the nature of the relationship between ADHD and LD. Briefly, some key issues are the possibility that there are subtypes of ADHD and/or subtypes of LD, and there is an association only between certain of those subtypes. There is evidence
from family studies, neurophysiologic studies, biochemical studies, and response to stimulant treatment studies that children with ADHD (diagnosed by whatever criteria) are not a homogeneous group.

One possibility is that underlying components of attention may differentiate subgroups of ADHD children. The work of Anthony and his colleagues (Anthony, Mersky, Ahearn, Kellam, & Eaton, 1988) supports this hypothesis. These researchers used a neuropsychological battery involving four components of attention (focused, sustained, shift, and encoding) to determine the existence of distinctive attentional profiles that were associated with different teacher assessments of adaptive behavior, academic competence, and time-sampled observations of behavior. More work of this nature needs to be done. Clearly, attention is not a unitary phenomenon, and subotyping of attention along meaningful lines may help to clarify the interrelationship of certain types of attentional deficits with ADHD and LD.

August and Garfinkel’s (1989) identification of behavioral and cognitive subtypes of ADHD is another particularly promising neuropsychological study. The further delineation of the nature of underlying linguistic deficits that are present in children with ADHD and/or LD should do much to advance our understanding of both child development and psychopathology.

The issue of the subtypes of LD has also not been addressed. Clearly, all children with reading disorder are not alike. Most likely, all forms of LD, be they reading, spelling, math, or some combination thereof, are of multifactorial etiology. As we have noted elsewhere (Baker & Cantwell, 1989), there is reason to believe that among phenomenologic and etiologic factors associated with LD, linguistic problems are probably the most important. However, there are some children with LD who have underlying visual-perceptual problems, and there probably are groups with various combinations of linguistic, visual-perceptual, memory, and attention problems. Ecologic and environmental variables may also be important for some children who suffered poor teaching or inadequate educational opportunities.

Future research should concentrate on subtypes of the population with ADHD and subtypes of the population with LD, in order to divine the degree and nature of the relationship between these two broad groups of disorders. A promising starting place would be with preschool children, especially those that can be identified as being at risk for both ADHD and LD. Our work with speech and language disordered children has shown them to be one such group. Following such children over time, and examining the continuing or discontinuing interrelationships between ADHD and LD, would hopefully help to clarify the relationship. Following preschool children with attentional difficulties would also be helpful.

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NOTE

For convenience, we use the term LD to describe these children, although we recognize that it is a poorly defined term. The P.L. 94-142 and ICLD definitions were not specifically used in our study, although they would nonetheless apply to these children. The study used DSM-III (American Psychiatric Association, 1980) criteria for specific developmental learning disorder and operational criteria requiring a statistically significant discrepancy between expected and actual academic achievement based on McLeod’s (1978) formulae using nonverbal Wechsler Intelligence Scale for Children-Revised (WISC-R) (Wechsler, 1974 IQ), chronological age, Wide Range Achievement Test (Jastak, Bijou, & Jastak, 1976) scores, and Gray Oral Reading Test (Gray, 1967) scores.

REFERENCES


