



AMERICAN
SPEECH-LANGUAGE-
HEARING
ASSOCIATION

Roles of Audiologists and Speech-Language Pathologists Working With Persons With Attention Deficit Hyperactivity Disorder

ASHA Ad Hoc Committee on Attention Deficit Hyperactivity Disorder

Reference this material as: American Speech-Language-Hearing Association. (1997). *Roles of Audiologists and Speech-Language Pathologists Working With Persons With Attention Deficit Hyperactivity Disorder* [Technical Report]. Available from www.asha.org/policy.

Index terms: ADHD

DOI: 10.1044/policy.TR1997-00255

© Copyright 1997 American Speech-Language-Hearing Association. All rights reserved.

Disclaimer: The American Speech-Language-Hearing Association disclaims any liability to any party for the accuracy, completeness, or availability of these documents, or for any damages arising out of the use of the documents and any information they contain.

About This Document

This technical report was prepared by the ASHA Ad Hoc Committee on Attention Deficit Hyperactivity Disorder: Carol Westby, chair; Barbara J. Ehren; Judith L. Heyer; Ann Hunter; Laura Rae Klingler; and Louise Zingeser, ex officio. Crystal Cooper, 1994–1996 Vice President for Professional Practices in Speech-Language Pathology, served as the monitoring officer. The contributions of the ASHA Executive Board and peer reviewers are gratefully acknowledged. Technical reports provide information to members on special issues affecting the delivery of service and/or serve as a basis for the development of a position statement.

Introduction

Speech-language pathologists and audiologists are increasingly involved with students with attention deficit/hyperactivity disorder (ADHD). They are often among the first to evaluate children and youth suspected of having ADHD because of the co-occurrence of ADHD with language learning disabilities and central auditory processing disorders; 17% to 38% of children diagnosed with speech and language disorders also have ADHD (Bleichman, Hood, & Inglis, 1990; Cantwell & Baker, 1985; Cantwell, Baker, & Mattison, 1979); and depending on the definition, approximately 25% to 50% of children with ADHD have some type of learning disability (August & Garfinkel, 1990; Barkley, 1990; Landau & Milich, 1988; Love & Thompson, 1988; Zentall, 1988). As a result of the Office of Civil Rights memorandum on ADHD (OCR, 1993), schools are making more accommodations for the needs of students with ADHD and are providing a wider range of services for such students (Reid & Katsiyannis, 1995). Because of the comorbidity of ADHD with speech and language disorders and changing federal guidelines, speech-language pathologists and audiologists are being asked to serve in multiple roles in working with individuals with ADHD and their families. They serve as evaluators, educational program designers, collaborative consultants with classroom teachers, consultants to other disciplines, and primary interventionists facilitating the development of language and learning strategies in children and adolescents with ADHD. Consequently, speech-language pathologists and audiologists must be aware of current perspectives on ADHD to function effectively in working with students with ADHD.

There are many unanswered questions regarding the nature, diagnosis, and effective intervention strategies for individuals with ADHD. It is the intention of this report to provide speech-language pathologists and audiologists with information regarding current philosophies in the nature, diagnosis of, and intervention for ADHD so that they can work more effectively on teams of professionals who serve students with ADHD. This report reviews current concepts in the definition of attention deficit disorder and hyperactivity, characteristics of persons with ADHD, and recommended approaches to assessment and intervention with individuals with ADHD. It concludes with recommended guidelines for knowledge and skills needed by speech/language pathologists and audiologists who work with children and youth with ADHD.

History

Through the years, the terms applied to conditions involving impaired attention and activity levels have varied and the defining characteristics used to diagnose these conditions have changed. ADHD is now recognized as the most common

neurobehavioral disorder of childhood, affecting children from preschool through school-age and often continuing into adult life (Shaywitz, Fletcher, & Shaywitz, 1994). Current estimates of the prevalence of ADHD are 3% to 7% of children with a ratio of three males to one female (Hynd, Hern, Voeller, & Marshall, 1991). The diagnosis of ADHD is based on observational criteria. Currently, it is defined as a cluster of behavioral characteristics involving impaired attention, distractibility, impulsivity and activity levels (both hyper- and hypo-activity; Barkley, 1990). The disorder is pervasive, affecting all areas of individuals' interactions with their environment, has its onset in early childhood, is chronic throughout development, and is not due to mental retardation, severe emotional disturbance, gross brain damage, severe sensory or motor deficits, or severe language delay. "Attention deficit/hyperactivity disorder" is the most recent of many terms used to describe persons with these characteristics. An attempt to label children with a cluster of behavioral characteristics involving impaired attention, distractibility, impulsivity, and hyperactivity was first seen in the literature as early as 1902. These children were labeled as having "defective moral control" because it was assumed that they had control of these behaviors but lacked the morals required to follow prescribed behavioral rules. In 1920 the focus of the problem shifted to the hyperactivity or restlessness, and the disorder was labeled "restlessness syndrome." A group of children who survived the encephalitis epidemic in the late 1920's and early 1930's mirrored children described with "restlessness syndrome" and for the first time a possible organic cause was considered. Because hyperactivity was the most obvious behavior, the 1950's brought a new term, "hyperactivity syndrome." Children with moderate to severe hyperactivity were thought to be experiencing hyperactivity due to brain dysfunction, probably within the frontal lobe of the brain. The term "minimal brain dysfunction" evolved from this conceptualization. At that time, mildly impaired children were thought to have developed the symptoms due to psychological causes.

In 1968, the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-II; American Psychiatric Association) published a new diagnostic category "hyperkinetic reaction of childhood," which was described as a developmental phenomenon beginning early in life and waning in adolescence. The primary features were overactivity, restlessness, distractibility, and short attention span. The focus of the disorder was excessive activity levels and the prognosis was relatively benign. In DSM-III (1980) the condition was renamed "attention deficit disorder [ADD]." An increased importance was placed on inattention and impulsivity and a decreased emphasis was placed on hyperactivity. Clearer guidelines were developed, thus giving greater reliability to the diagnosis. In 1987, DSM-III was revised and the subcategory of ADD without hyperactivity, seen in 1980, was replaced with a category "undifferentiated ADD [UADD]" (DSM-III-R, 1987). Most recently, DSM-IV (1994) changed the description of the individual with ADD. The diagnostic criteria were separated into two categories: inattention and hyperactivity/impulsivity (see Appendix A). As in most psychiatric and psychologic disorders, the diagnosis is based on judgments made from behavioral observations rather than on performance on standardized tests (as in the identification of mental handicaps) or on analysis of medical tests (as in the identification of diabetes). Consequently, there can be considerable disagreement regarding the identification of ADHD in individuals.

Characteristics

Current research supports the idea of two distinct characteristics of ADHD, inattention and/or hyperactivity-impulsivity. These two types of characteristics relate to two subtypes of ADHD—a purely inattentive subtype that relates to the cognitive domain, and the hyperactive/impulsive subtype that corresponds to the behavioral domain (Shaywitz, Fletcher, & Shaywitz, 1994). Inattention is, however, also generally a characteristic of the hyperactive/impulsive subtype. The cognitive domain and the inattention type of ADHD related to learning disabilities; the behavioral domain and hyperactivity related to oppositional and conduct disorders.

Children with the hyperactivity-impulsivity component display a variety of difficulties. They are easily distracted and have problems with sustained attention, organizational skills, and sequencing. These children may appear to be forgetful, not due to impaired primary memory skills, but due to problems with working memory and poor use of organizational strategies. These deficits can be best understood as executive dysfunction (Denckla, 1996; Pennington, 1991). In fact, the concept of a deficit in executive functioning has considerable explanatory power for understanding the nature of ADHD behaviors. According to Denckla and Reader (1993), executive functioning (EF) consists of proactive processes that:

...are largely future-oriented (one is tempted to label these processes as 'attention to the future'), such as working memory, set maintenance, and planning and organization (also known as anticipatory control). At the highest level, EF implies metacognition (i.e., knowing what we know and what we need to know, and generating strategies to acquire what we need).
...EF is the cognitive and neuropsychological operative of ... voluntary control: setting goals, self-monitoring progress toward goals, and appreciating when goals are reached (p. 433).

Executive dysfunction can contribute to the pragmatic problems observed in students with ADHD:

- blurring out answers before questions have been completed
- difficulty waiting one's turn
- interrupting others
- difficulty negotiating peer interactions

Children with inattention may have difficulty with all components of attentional skills.

Children with ADHD also tend to have additional problems in the following areas:

- Academic Performance:
 - Underachievement
 - Increased variability of performance
 - Increased incidence of learning disabilities
 - (Note: Attentional components of ADHD can create a skill deficit in academic achievement over an extended period of time).
- Social Skills Difficulties:
 - Egocentrism
 - Immaturity
 - Underresponsiveness to social feedback cues

- Poor social acceptance
- Emotional Immaturity/Behavioral Difficulties;
 - Overarousal
 - Overreactions to events
 - Poorly controlled affect
 - Poor self-esteem
 - Low frustration tolerance
 - Noncompliance
 - Failure to predict consequences of actions or utterances
 - Disregard for consequences
- Association Control:
 - Inability to refocus attention once distraction has occurred
 - Free flight of ideas: one thought triggers another and another until the focus or response has little relationship to the original stimuli

Recently, the conceptualizations of ADHD as a primary problem of attention or impulsivity have begun to lose their explanatory and prescriptive power, and are being replaced by theories founded on executive function deficits rather than attentional deficits. The problem with attention may not be so much one of distractibility, but of less persistence or effort on tasks that have little intrinsic appeal or minimal immediate consequences for completion (Barkley, 1990). Rather than being distracted, the child fails to follow through on rules or instructions when presented with competing, highly rewarding activities. Problems with attention cannot be separated from problems with impulsivity or a deficiency in inhibiting behavior in response to situational demands. In fact, there is increasing evidence that behavioral disinhibition, or poor self-regulation of behavior, rather than inattention is the basis of the disorder because it better discriminates children with ADHD from normal children and children with other psychiatric disorders. Indeed, the poor inhibitory regulation of behavior, which can be the result of executive dysfunction, may be the cause of the attention problems. Barkley (1990) concluded that poor regulation and inhibition are the hallmarks of ADHD. He hypothesized that **difficulty with adherence to rules and instructions** is a primary deficit of children with ADHD. Based on this conceptualization, Barkley (1990) provided the following redefinition of ADHD:

ADHD consists of developmental deficiencies in the regulation and maintenance of behavior by rules and consequences. These deficiencies give rise to problems with inhibiting, initiating, or sustaining responses to tasks or stimuli and adhering to rules or instructions, particularly in situations where consequences for such behavior are delayed, weak, or nonexistent (p.71).

This redefinition of ADHD has significant implications for how the social and academic deficits of children with ADHD are understood and treated. Although sustained attention has been considered the primary deficit in ADHD, research findings indicate that behavioral or response inhibition is a more consistent and pervasive characteristic of ADHD.

Barkley used the theory of Bronowski (1977) regarding the evolution of human language to explain how the deficit in response inhibition leads to the behavioral characteristics of ADHD. Bronowski theorized that the human brain's increased ability to inhibit action allows the following four specific abilities to emerge:

- **Separation of affect.** This ability allows persons to delay their emotional reaction to a situation and separate the content from the emotional charge of a message. It leads to a more rational, logical evaluation of the message. The individual with ADHD is hypothesized to be less well developed in this capacity, and thus more frequently reacts to events in an impulsive and emotional fashion.
- **Prolongation.** This allows persons to sustain mental representations through the use of language and imagery. It allows the individual to continue to process and react to a stimulus long after the external event has passed. Such prolongation gives the individual an opportunity to reflect on past learning and think about future consequences before embarking on a course of action.
- **Internalization.** This is the process whereby language is used to communicate with oneself. It permits the development of rule-governed behavior, a central ingredient to the social interaction of humans. Individuals with ADHD have been observed to exhibit deficits in their ability to govern their behavior according to rules.
- **Reconstitution.** This is the ability to analyze and synthesize information. It is hypothesized to help humans to develop new and creative ways of responding to life events. The ability to problem solve is closely related to reconstitution.

These abilities are essential for appropriate executive functioning. Language is essential but not sufficient for the development of these abilities. The important role of language for the development of these abilities may account for the relatively high comorbidity of language disorders and ADHD. Many of the difficulties encountered by individuals with ADHD are related to deficits in separation of affect, in prolongation, in internalization, and in reconstitution. Deficits in these areas result in the inability to predict, plan, and inhibit, and in language-related deficits such as poor topic maintenance, inappropriate topic switching, poor problem solving, and the inability to produce coherent extended discourse such as stories and expository texts. All of these deficits may be amenable to intervention by speech-language pathologists.

Secondary ADHD

A primary diagnosis of ADHD, according to the DSM-IV, requires that the individual not have other conditions that could account for the inattention, impulsivity, and hyperactivity that is observed. Many children who exhibit inattention, impulsivity, and hyperactivity, however, have identified medical, psychiatric, learning, or social conditions that are associated with their ADHD characteristics. For these children, ADHD characteristics are secondary to other primary causes. The most commonly identified types of secondary ADHD are:

- Neurotoxic and medically induced ADHD
 - lead toxicity
 - fetal alcohol syndrome
 - maternal crack/cocaine addiction
- Traumatic brain injury.
- ADHD induced by anxiety or depression

- Situational inattention, boredom
- Inattention due to limited cognition or learning disabilities
- Cultural variations and/or expectations

When the specific criteria defined in DSM-IV are used to confirm a diagnosis of ADHD, it becomes apparent that the inattention seen in children in the above subgroups may not fit these guidelines. A sudden onset as seen in medically related problems, inability to attend to the task due to cognitive limitations or difficulties that surface only in a specific environment do not support a primary diagnosis of ADHD. The child may be inattentive, hyperactive and/or display impulsivity, however; it is important to differentiate between primary ADHD and those children who may have the characteristics of ADHD that are secondary to another cause. This differentiation becomes especially important when considering treatment strategies and/or school placement.

Because children with ADHD display difficulties with rule-governed behavior in a variety of situations, differential diagnosis between children with ADHD and/or conduct disorders or oppositional defiant behavior is often difficult. Not all unacceptable behaviors seen in ADHD should be attributed to oppositional defiant behavior, although there can be co-occurrence. Children with oppositional defiant behavior actively defy adult requests or rules. They are often angry, resentful, spiteful and/or vindictive (DSM-IV, 1994). Conversely, ADHD children may begin to comply, but are unable to complete requests and/or required tasks due to impulsivity, forgetfulness, or distractibility. Although children with ADHD may have an accompanying behavioral component, it is often associated with the impulsivity, inability to develop rule-governed behavior, and poor internal control.

Particular care must be taken when diagnosing ADHD in children from culturally/linguistically different backgrounds. The behavioral reactions that these children exhibit in a variety of situations may reflect child-rearing practices and/or cultural norms that result in differences in behavior and expectations. It is important to understand cultural influences before assigning a diagnostic label of ADHD to these children. In addition, many children have not had an organized group experience such as preschool prior to entering kindergarten. Thus, the behavioral restrictions required to be successful in a structured group are novel to them and may result in apparent attentional difficulties. It is necessary to allow such children a reasonable period of adjustment before assigning a diagnosis of ADHD.

Assessment of Students With ADHD

Historically, a medical model has been employed for diagnosis of and intervention with individuals with ADHD. Damico and Augustine (1995) reported that many parents and teachers believe that physicians can objectively and accurately diagnose ADHD on the basis of some medical procedure, even though research and the physicians themselves do not support such a belief (Damico & Augustine, 1995). Diagnosis of ADHD is based solely on the observation of behaviors. Hence, although many expect that only a physician should make the diagnosis, in fact, physicians are seldom in the best position to make such a diagnosis. One physician reported:

... we must simply rely on behavioral scales and the ratings of the parents and teachers themselves. They are the real experts in this diagnosis... because all the decisions are based on behavior. They are really my

sources. In effect they make the diagnosis and I put the stamp of credibility on it. Now, medication... that's an entirely different issue.... (Interview; R.L. 10-3-92, reported in Damico & Augustine, 1995).

The primary functions of physicians with students with ADHD are to exclude medically remediable causes of ADHD, determine contraindications to medication use, discuss medication options, and prescribe medication. Ideally, diagnosis of ADHD in a student should be done by an interdisciplinary team composed of parents and a variety of professionals who work with the child (Burcham & DeMers, 1995). Some health plans and educational programs, however, require that the diagnosis be given by a physician. This should not preclude team involvement in the process. Because of the high comorbidity of ADHD and language-learning disabilities, speech-language pathologists and audiologists should be part of teams working with students with ADHD. As speech-language pathologists increasingly work with social and academic language skills within classrooms, they are in a position to gather critical information related to the diagnosis of students with ADHD. Considering the co-occurrence of language-learning disabilities and ADHD, they have important roles in the assessment of students' strengths and needs, and the development and implementation of intervention plans.

If speech-language pathologists and audiologists are to work effectively on teams responsible for the diagnosis, assessment, and treatment of students with ADHD, they must be familiar with the assessment tools that are used with students with ADHD, and they should understand the interrelationships between ADHD and language deficits. Traditionally, speech-language pathologists and audiologists have not had major roles in the assessment of students with ADHD. Increasing evidence, however, indicates that many students with ADHD exhibit language deficits that must be addressed, and many students who are initially diagnosed with communication disorders are later also diagnosed with ADHD. Current research suggests that higher order language deficits involved in metacognitive or executive functioning may be a primary component of ADHD. Metacognition has been defined as "an executive function that selects, controls, and monitors the use of cognitive strategies" (Kuhn, 1992, p. 248) or "any knowledge or cognitive activity that... regulates any aspect of any cognitive enterprise (Flavell, Miller, & Miller, 1993, p. 150).

Assessment of children and adolescents with ADHD is multidimensional. The child's performance should be assessed across multiple domains (cognitive, metacognitive, linguistic, social/emotional, and sensori-integrative), in multiple settings (home, school, community, work), and with multiple persons (parents, siblings, peers, teachers). Such an assessment requires the involvement of professionals from a variety of disciplines. Each professional should note not only what types of tasks the student can and cannot do, but also should note the child's attention and activity level while performing the tasks. A complex interaction exists

between ADHD and cognitive, metacognitive, linguistic, social/behavioral, and sensori-integrative abilities. Three relationships between ADHD and learning problems have been proposed:

1. For some students, apparent attention deficits and hyperactivity are secondary to underlying learning problems. These students do not attend or they become restless on activities that they find difficult. If the students can handle the task, they do not exhibit attentional problems. These students should not be diagnosed as ADHD.
2. For a large percentage of students, learning disabilities and ADHD appear to coexist (Shaywitz, Fletcher, & Shaywitz, 1994). Their attentional deficits and activity levels increase on activities that are difficult for them, but the attentional and activity problems are not limited to tasks that are difficult for them. With these students, attention problems are at the root of their difficulties with learning, either in terms of poor academic achievement on standardized tests or in classroom performance. For this reason, some professionals view learning disabilities and ADHD as aspects of the same phenomenon, that is, they view attention as a fundamental learning process, which when disordered, constitutes a type of learning disability. In fact, some would argue that ADHD should not be viewed as a separate disorder but as one of the heterogeneous disorders in the cluster known as “learning disabilities.”
3. Some students appear to manifest deficits or problems only with attention and/or activity levels. They perform within the average or even above average range on traditional cognitive tests and language assessments that measure discrete behaviors such as rote memory, vocabulary knowledge, syntactic skills, etc. Current research suggests, however, that many of these students may exhibit metacognitive deficits or deficits in mastering rule-governed behavior. Such students are likely to exhibit deficits on higher order language tasks that require complex social interactions or planning and organization of extended discourse.

Assessment of students with ADHD should include authentic and curriculum-based assessments. Authentic assessment involves evaluating students' performance on tasks or activities that are typically required of them. Curriculum-based assessment involves considering the academic content and social interaction demands of the curriculum, what skills the student brings to the curriculum, what types of knowledge and skills the student needs assistance to develop, and what accommodations might be necessary for the student to experience success with the curriculum. Such assessments include descriptions of the student's behavior and the impact of this behavior; the student's academic achievement and the student's classroom performance; and the student's social interactions and the situational impact of these interactions. Assessment should include both an “inside-out” approach—that is, an evaluation of the student's strengths and deficits in a variety of domains (motor, cognitive, metacognitive, social/emotional, language, etc.); and an “outside-in” approach—an evaluation of the effects of varied environmental demands (behavioral and academic expectations; Nelson, 1992). A comprehensive assessment of students with ADHD should include the following components:

- Medical evaluation
- Questionnaires or rating scales completed by teachers, parents, and peers
- Interviews of parents, teachers, and students
- Student self evaluation
- Observation of the student in naturalistic settings

- Clinical assessment of attention and activity
- Formal and informal assessment of cognitive, metacognitive, sensori-integrative, and language abilities

It is critical to recognize that attentional behaviors and activity levels differ across ages, genders, and cultural background (Barkley, 1990; Bauermeister, 1995; Mann, Ikeda, Mueller, Tao, Humis, Li, & Chin, 1992). Younger children and boys demonstrate higher activity levels and less attention than older students and girls. Girls are more likely than boys to demonstrate attentional deficits without hyperactivity. Cultural groups differ in terms of what is considered the norm with respect to activity levels. For example, Bauermeister (1995) reported that teachers in Puerto Rico reported higher levels of inattentiveness, impulsivity, and activity in their classrooms than did their U.S. counterparts. For this reason, single arbitrary cutoff scores on rating scales and questionnaires should not be used across ages, genders, and cultural groups to diagnosis ADHD. Single arbitrary scores could result in underidentification of girls and older students and under- or overidentifications of students from differing cultural backgrounds.

Questionnaires and Interviews

Teachers and parents are often asked to complete questionnaires with descriptors of the child's behavior. Speech-language pathologists who work within classrooms may also be involved in completing questionnaires on students or working with teachers to complete questionnaires. If they are to participate effectively on education teams and assist in planning assessments and intervention programs for students with ADHD, it is important that they be familiar with the types of behaviors that are associated with the diagnosis of ADHD. Questionnaires completed by teachers and parents can give speech-language pathologists insight into areas that should be considered for assessment and intervention. A variety of teacher report questionnaires are available. Among those most widely used are: Conners' Teacher's Rating Scale (1989); the Comprehensive Teacher Rating Scale (ACTeRS; Ullman, Sleater, & Sprague, 1985); and the Child Behavior Checklist-Teacher's Report (Achenbach, 1991). The Conners scale is frequently used for screening, and longer scales such as the Child Behavior Checklist are used for in-depth diagnostic purposes.

There have been several versions of the Conners scale. The current version has 28 items that teachers rate on a 4-point scale according to severity of manifestations: not at all, just a little, pretty much, and very much. The scale yields three factors titled conduct problem, hyperactivity, and inattentive-passive. The resulting hyperkinesis index is sensitive to attention-disorder behavior in the classroom and to the effects of medication. The Conners scale tends to focus on activity levels and is less effective in identifying students who have attentional problems without hyperactivity. In addition, ratings on the Conners scale can be influenced by conduct disorders unrelated to inattention or hyperactivity.

The ACTeRS was developed in response to statistical and definitional criticisms of the Conners scale. It consists of 20 items, divided into four categories (attention, hyperactivity, social skills, and oppositional) rated on a 5-point scale. The attention and social skills categories are worded positively and higher scores reflect more

appropriate behavior; the remaining categories are worded negatively and higher scores indicate less desirable behavior. Boys and girls differ considerably in all but social skills competence ratings.

The Child Behavior Checklist (Achenbach, 1991), which has both a teacher and parent form, is one of the most comprehensive questionnaires. There are 113 items divided into eight or nine behavioral scales depending on the child's age and sex and dealing with specific diagnostic categories (anxiety, social withdrawal, depression, immaturity, self-destruction, inattention, unpopular, delinquent, aggressive, obsessive/compulsive, and nervous/overactive). The questions are rated on a 3-point scale (not true, somewhat/sometimes true, very true/often true).

It is important not only to determine if the child exhibits attentional/behavioral problems, but also the context within which these problems occur. The Elementary School Situations Questionnaire (Barkley, 1991) and a version adapted for adolescents (Goldstein & Goldstein, 1990) enable the practitioner to understand the relationship between the child's attentional difficulties and the specific situations in which those difficulties cause problems. These scales also enable the practitioner to develop an understanding of the child's compensatory skills and the teacher behaviors that in specific situations may minimize the negative impact of the child's attentional problems. These questionnaires ask the teacher to indicate if a student presents problems in specific situations, and if so, the severity of the problem. Situations include arrival at school, individual task work, free play, lessons, recess, lunch time, etc.

To develop a thorough understanding of the characteristics and needs of a student with ADHD, Goldstein & Goldstein (1990) recommended that teachers complete a questionnaire such as the Conners or ACTeRS, a measure of social skills, and a measure of situational problems. Optimally, it is recommended that teachers also complete the more comprehensive Child Behavior Checklist and the Teacher Observation Checklist.

In addition to information gained from formal questionnaires, the speech-language pathologist may find it useful to interview parents, teachers, and the students themselves regarding types and variations in behaviors associated with ADHD, learning strengths and difficulties, coping/management strategies, social relationships, etc. Information gained from interviews can provide the speech-language pathologist with ideas regarding what other assessments might be done or what the focus of intervention should be. The interviews may be structured or ethnographic. In structured interviews, the interviewer develops a series of specific questions (preferably open-ended questions, unlike the close-ended questions on the questionnaires) and asks each person interviewed the same questions. In ethnographic interviews, the person being interviewed determines the topics discussed. Speech-language pathologists can gain useful information by asking students to describe their typical day, or by asking parents and/or teachers to describe a typical day or activity with the student. The interviewer pursues the topics raised by the parents or students, seeking examples and detailed descriptions. The information gained in this way can be used to develop individualized intervention programs.

Observation in Naturalistic Settings

School psychologists/diagnosticians or speech-language pathologists can obtain observational data on the behavior of the student with ADHD in the school environment to be used to verify teacher observations on the questionnaires and provide insight into the role the teacher and curriculum might play in the child's behavior. The speech-language pathologist should observe the classroom interaction in the following areas (Creaghead, 1992):

- The classroom scripts (what children have to know to act appropriately in this classroom)
- The teacher's cues for defining and activating these scripts (how children know how to act in this classroom)
- The child's knowledge of the script and awareness of the teacher's cues (What does this child know about the script for this classroom? Which cues does the child notice and which ones does he or she miss? What does he or she know about the significance of these cues?)

The frequency of a particular behavior during a rating period, the duration of that behavior, or if the behavior occurs at least once in a given interval of time should be determined. Many classroom observation systems do not have normative data available. Consequently, it is usually recommended that the observer obtain data on another child in the classroom for comparison. One observational system given, termed the TOAD, observes instances in which the child is talking out (T), is out of seat (O), exhibits attentional problems (A), or is disruptive (D) (Goldstein & Goldstein, 1990).

Clinical Assessment of Attention

Traditional psychometric tests may have a twofold function for students with ADHD—one purpose is the traditional use of the test, e.g., to evaluate the level of cognitive, language, or motor performance; the other purpose is to evaluate qualitative aspects of the child's attentional and motoric activity behavior during the assessment. Professionals involved in assessments of students with ADHD should consider both purposes. The most common psychometric tests used for the student with ADHD include tasks measuring reflection, vigilance, and sustained attention. There are also a number of tasks that measure selected, divided, and focused attentional skills. Because all psychometric tests require visual and cognitive processing, none of them is a pure measure of attentional ability.

Some tests that are usually administered by psychologists and diagnosticians are used primarily to assess inattention and impulsivity. Computerized continuous performance tests (CPTs) such as the Test of Variables of Attention (TOVA) and Conners' Continuous Performance Test (Conners, 1992), are becoming increasingly popular in diagnosing ADHD. These tests generally require a child to observe a screen while individual letters or numbers are projected onto it at a rapid pace. The child is asked to push a button or key when a certain stimulus or pair of stimuli in sequence appears. Scores derived from the CPT are number of correct responses, number of target stimuli missed (omission errors), and number of responses following nontarget or incorrect stimuli (commission errors). The first two measures tap sustained attention; the third measure taps both sustained attention and impulse control. Poor performance does discriminate students with ADHD from normal children, but good performance does not rule out ADHD.

CPTs result in few false positives (identifying students as ADHD when they are not), but a high rate of false negatives (not identifying students who have ADHD; Matier-Sharma, Perachio, Newcorn, Sharma, & Halperin, 1995).

Focused attention is the ability to focus on essential versus irrelevant input. This is usually inferred by the evaluator through observation of the child in a natural setting, feedback from parents or teachers, and behavioral observation of the child during assessment. Formal focused attention tasks may include the Stroop Neuropsychological Screening Test (Color Distraction Test; Stroop, 1935; Trenerry, Crosson, DeBoe, & Leber, 1989) which requires the child to read color name words printed in different colored inks (e.g., the word green printed in red ink), or the Trail-Making Test (Reitan, 1958) which requires the child to sequentially connect dots alternating numbers and alphabet letters.

The child's impulsivity and reflection should also be observed. Impulsivity results in increased errors caused by a lack of effective time spent before responding. Reflection is the opposite and involves increased preresponse time and cognition resulting in a greater likelihood of correct responses and reduced errors. Matching familiar figures (finding two identical pictures from a set of four to eight pictures) and completing mazes (such as those on the WISC-III) provide an opportunity to observe a child's impulsivity or reflection.

Three subtests from the WISC-III (arithmetic, digit span, and coding) are often believed to measure freedom from distractibility. Although they do have a weak correlation with other tests of attention, they do not correctly distinguish children with ADHD from children with learning disabilities or normally achieving children to any useful degree (Greenblatt, Mattis, & Trad, 1991; Wielkiewicz, 1990).

Although speech-language pathologists and audiologists are not likely to administer CPTs or neuropsychological tests specifically designed to measure aspects of attention and impulsivity, they should observe the child's behaviors during whatever testing they do that is reflective of attentional and impulsivity problems. This information is essential for interpreting children's performance—has the child performed poorly because of lack of knowledge and skill or because of lack of attention and persistence to the task? Speech-language pathologists and audiologists should qualitatively evaluate a child's behavior throughout the assessment process. They should note the child's level of alertness and how long the child is able to attend to each task. It is often misleading to judge levels of attention in a test situation. One must also evaluate the child's capability to attend in a classroom, or with others. Many assessment activities are short and do not require sustained attention from a child. Is the child cooperative or defiant? The majority of children with ADHD are cooperative during testing but lack persistence and are easily distracted. They may require praise and encouragement to continue. During formal assessments, the evaluator should note the child's vigilance, sustained attention, and focused attention. Many visual and auditory memory tasks that require a child to attend to increasingly longer sequences of stimuli with breaks between stimulus presentations require vigilance. Sustained attention requires the child to persist at a task until it is successfully completed. Many children with ADHD, either because of a low frustration threshold or impulsivity in responding, lack persistence. If a child lacks persistence, the evaluator may underestimate a child's ability. Many tests used with children with ADHD are better measures of

persistence and reflection than of the skills the tests are intended to measure. A measure of sustained attention with children is direct observation of students' visual attention to assigned tasks, which may involve watching television, playing with toys, performing class assignments, cancellation of letters or shapes in arrays, or sorting poker chips by color. Many children with ADHD, however, will attend to television and entertaining toys because of the novelty, so judgements of ADHD must be based on more than one observation in one setting.

Assessment of Language Abilities

Several studies have reported that a greater percentage of children with ADHD are somewhat delayed in the onset of talking (6% to 35%) than children without ADHD (2% to 5.5%; Hartough & Lambert, 1985; Szatmari, Offord, & Boyle, 1989). In addition, students with ADHD are more likely than children without ADHD to have a diagnosis of language disorder (Cantwell, Baker, & Mattison, 1979, 1981; Love & Thompson, 1988; Trautman, Giddan, & Jurs, 1990). The speech-language pathologist should evaluate traditional aspects of language: the child's fluency of speech, phonological, syntactic, semantic, and pragmatic skills. In addition, the speech-language pathologist should evaluate the child's higher level extended discourse, executive function, and metacognitive skills. For children with reading difficulties, the speech-language pathologist should also evaluate the student's phonemic awareness abilities (including sound/symbol knowledge, phonemic blending, phonemic segmentation, and phonemic manipulation). Children with deficits in these areas of language are highly likely to exhibit learning problems in the classroom, particularly with literacy. If students have language deficits in these areas, they are likely to have language deficits on higher order language tasks that involve extended discourse and use of language for planning, problem solving and monitoring behavior. However, adequate performance on syntactic, semantic, and phonemic awareness tasks, which are traditional measures of language, does not preclude a student having language learning problems at discourse and metacognitive levels. In fact, many students with ADHD do not exhibit language disorders on traditional measures of vocabulary and syntax, though they may exhibit difficulties in word finding by self-report or report of parents or others.

The speech-language pathologist must evaluate the student's ability to comprehend and produce extended narrative and expository discourse, and progress in developing these skills. Extended discourse in mainstream (school) culture requires that students be able both to "center" and "chain," that is, when given a topic to discuss or write on, they must be able to make each of their comments refer to the topic (center) and at the same time place each of the utterances in a logical sequence (chain; Applebee, 1978; Westby, 1984). Students with ADHD are likely to have difficulty producing coherent texts and simultaneously centering and chaining in discourse (Tannock, Purvis, & Schachar, 1993). They are particularly likely to begin discussing the topic, but then to chain a series of associated ideas, forgetting the original topic. Because not all cultures emphasize this centering/chaining organization, care must be taken when evaluating the discourse of students from nondominant cultures (Kaplan, 1966; Michaels, 1985; Scollon & Scollon, 1981).

Many of the DSM-IV criteria for ADHD reveal a set of communication issues characteristic of pragmatic dysfunction (e.g., difficulty awaiting turns, talking excessively, interrupting others, not listening to what is being said, and blurring

out answers to questions before they are completed). Children with ADHD have also been shown to have less knowledge about social skills and appropriate behavior with others (Grenell, Glass, & Katz, 1987). As stated earlier, many of the pragmatic and social skill deficits are associated with executive dysfunction or metacognitive deficits. Students with ADHD seem to lack self-talk critical to the control and organization of interpersonal behavior. As a consequence, they do not correctly interpret essential verbal, nonverbal, and situational cues, or make decisions based on that evidence in accordance with social expectations (Whalen & Henker, 1985). Language assessment should consider the student's knowledge of and ability to use appropriate scriptal language in situations, that is, their awareness of and ability to use appropriate language patterns in expected interactions. The speech-language pathologist should observe the student's use of language in social and academic situations. Social pragmatic skills can also be assessed by asking students to role play situations such as (Paul, 1995):

- requesting ice cream from a brother who took the cone for a taste and won't give it back
- persuading a friend to lend a favorite sweater
- greeting a friend, principal, grandparent
- requesting information from a teacher about a homework assignment

Pragmatic language assessment should also include documentation of the language functions that are used (Tough, 1981). Is language used primarily for self-maintaining purposes (meeting needs and desires)? Does the student also use language for reflection, planning, and problem solving (i.e., language for reporting, predicting, reasoning, projecting in thoughts and feelings of others)?

Developing social cognition is critical for the development of pragmatic language abilities. The speech language pathologist should consider the student's ability to:

- recognize emotions of others
- explain the possible causes of the emotions
- explain the effects of the emotions or what the person might do as a result of the emotion

Assessing students' social cognition can be done by discussing the feelings of characters in stories, either in wordless pictures books or by reading a story, stopping when the character experiences an emotion, and asking for the reason for the emotion and what the character might do in response to the emotion.

Students with ADHD exhibit metacognitive deficits in a variety of domains (Barkley, 1996). Metacognitive functioning depends on two factors (1) a cognitive orientation or belief system about planning, and (2) cognitive abilities (Kreitler & Kreitler, 1987a, 1987b). By age eight, children know that planning is thinking ahead about what to do in the future (Pea, 1982). Cognitive orientation toward planning can be assessed by interviewing students about their ideas about planning.

Imagine someone who does not know what planning is. Try to explain to him or her what it means. What things are planned? When will you carry out the things that you plan? Who plans? How often is planning done? What is the purpose of planning (what is it good for)? What are the results

of planning? How is planning done? What does one feel when one plans? Is planning difficult or not? What are the difficulties in planning? Is planning important or not? (Kreitler & Kreitler, 1987b).

Although Kreitler and Kreitler report doing this interview with children as young as 5 or 6 years, it is probably best used for children in later elementary school or beyond. Children's cognitive orientation toward planning predicts how well they perform on a variety of planning situations, such as adding the middle to a story (Shure, 1992, p. 381):

There is going to be a school play six months from now and Devin wants the part of the television newscaster. Another boy, Julius, also wants the part. The story ends with Devin having the part and Julius not being mad. Fill in the middle of the story. How did Devin get the part and not make Julius mad?

or making a plan such as in the following example (Kreitler & Kreitler, 1987a, pp. 122–123): Orientation to planning and ability to plan should be assessed in students in mid elementary school and beyond.

Audiological Assessment of Persons with ADHD

Many children with ADHD may be referred to an audiologist during preschool or early primary school years to assess their peripheral auditory status. The referral may come from a physician, teacher, parent, other professionals or friend, due to the child's inconsistent auditory behaviors at school or in the home environment that may negatively affect academic and social interactions. In many cases the audiologist is the first professional to whom a referral is made. Although the audiologist is not responsible for assessment or diagnosis outside the realm of the child's auditory status, awareness of other disorders such as ADHD, learning disabilities (LD), and speech and language disorders that may present similar inconsistencies in auditory behaviors is critical. The manifestation of abnormal auditory behaviors may not necessarily reflect a peripheral hearing loss or a central auditory processing disorder (CAPD).

Central auditory processes are defined as the auditory system mechanisms and processes responsible for the following behavioral phenomena:

- Sound localization and lateralization
- Auditory discrimination
- Auditory pattern recognition
- Temporal aspects of audition, including,
 - temporal resolution
 - temporal masking
 - temporal integration
 - temporal ordering
- Auditory performance decrements with competing acoustic signals
- Auditory performance decrements with degraded acoustic signals

CAPD is an observed deficiency in one or more of the above-listed behaviors. For some persons, CAPD is presumed to result from the dysfunction of processes and mechanisms dedicated to audition; for others, CAPD may stem from some more

general dysfunction, such as a neural timing deficit, that affects performance across modalities. It is also possible for CAPD to reflect coexisting dysfunctions of both sorts (ASHA, 1994).

Assessment of the peripheral auditory system. The audiologist should rule out hearing loss in a child as a contributing factor to behaviors described as inconsistent, inattentive and, at times, inappropriate. A clinical history obtained for these children should include medical history, psychosocial behaviors, fine and gross motor development, speech and language development, and a complete family history of developmental, mental health, and genetic disorders. A description of the auditory behaviors of concern, including who has observed them, under what circumstances or environments they occur, since what age or when the described behaviors were first noted, is helpful in determining the pervasiveness of the behaviors. If the behaviors have been observed only recently or encompass a broader array of behavioral disorders, and peripheral auditory sensitivity is within normal limits, then an emotional or neurological disorder (which may include sensory integrative, learning disability, or language disorder) might be explored. If the auditory inconsistencies have been observed by both parents, teachers and others, and examples of these behaviors over a period of time or years are given, then an auditory deficit might be suspected. On completion of a comprehensive audiological assessment, if peripheral auditory status is found to be within normal limits, a central auditory processing (CAP) assessment and/or referral to other professionals may be recommended.

Selected audiological tests should be sensitive to the abilities and limitations of the child. It is important to consider the child's functional ability in the test setting. Instructions should be simple and clarified with the child to ensure comprehension. The task should be demonstrated and a practice or trial test item should be given to the child whenever possible. Physical restrictions for a hyperactive child, as well as necessary environmental limits for an impulsive child, should be considered. Motivating the child to respond during a routine audiological protocol can be facilitated by frequently changing the mode of response—for example, by incorporating a large motor and/or verbal response (such as throwing a foam ball through a nerf basketball hoop in response to pure tone testing for an older child). Fatigue can affect test reliability and validity and can be avoided by administering a test battery over a series of short sessions and providing frequent breaks. Most tests will not be invalidated if they are completed in segments administered over short time intervals. Although the team approach to pediatric testing is generally not employed with children more than 5 years of age, the use of team testing along with age-appropriate activities may improve test reliability, sustain attention, and delay test fatigue with students with ADHD.

Assessment of the central auditory system. Many professionals have inferred that children with ADHD experience auditory perceptual difficulties (Keller, 1992; Willeford & Burleigh, 1985; Burd & Fisher, 1986). Manifestations of poor listening skills, auditory distractibility or inability to maintain focus, difficulty following directions, daydreaming or inattentiveness are commonly shared behaviors. Yet whether there is comorbidity of CAPD and ADHD or whether they represent similar clinical pictures of varying underlying difficulties remains controversial. In a recent study of 30 children with CAPD, more than 50% of them were also identified as ADHD (Riccio, Hynd, Cohen, Hall & Molt, 1994). Geffner,

Davis and Koch (1996) found at least 94% of 240 children diagnosed with ADHD to have co-occurring CAPD. Although this suggests that CAPD may be associated with ADHD, the authors cautioned that it could also reflect the considerable overlap of definitions for both disorders, given that both emphasize attentional problems. Audiologists and speech-language pathologists should be cautious in attributing CAPD to attentional difficulties experienced by ADHD children because the relationship is not completely understood (Musiek & Chermak, 1995). The diagnosis of CAPD requires comprehensive audiological assessment and cannot be made solely on the basis of ADHD.

There exists a growing interest by audiologists, speech-language pathologists, educators, parents, and psychologists in measuring CAPD in ADHD children. Although distinguishing CAPD behaviors from the larger constellation of ADHD behaviors may be difficult, the diagnosis of CAPD has direct implications for the involvement of speech-language pathologists in intervention and management. Even though similar auditory behaviors may be demonstrated for CAPD and ADHD, the assessment and intervention for each disorder may be unique (Tillery & Smoski, 1994).

Students with ADHD are considered a population at risk for CAPD and may be considered as appropriate candidates for audiological assessment of peripheral and central function in the course of management. Yet students with ADHD who do not demonstrate auditory distractibility or inattention might not be expected to demonstrate significant findings on a CAP test battery. Ruling out CAPD should be considered in light of the implications for intervention. When an ADHD child is diagnosed with CAPD, the typical multimodal ADHD intervention plan should be developed. Such a plan consists of medication, behavioral management, counseling and educational assistance, including compensatory strategies, coping skills, language treatment, and activities to strengthen localization and figure-ground discrimination (Willeford & Burleigh, 1985). Often, reducing levels of noise in their environment may be helpful, because children with ADHD show poorer speech discrimination abilities in noise (Geffner, Lucker, & Koch, 1996).

Evaluating the auditory peripheral and central system in the large number of children referred for testing who present with ADHD is a challenge. Although a peripheral hearing loss is not anticipated, it is paramount to rule it out, because undetected hearing loss could itself account for many described ADHD behaviors. Routine audiologic tests (pure tone and PB word tests) are not subtle enough to detect CAPD (Jerger, Martin, & Jerger, 1987) and a more comprehensive central auditory battery of tests might be considered appropriate for ADHD children for whom auditory complaints or auditory inconsistencies are reported. Behaviors observed across school age children that may be considered typical of either ADHD or CAPD are:

- Inappropriate verbal responses or seeming not to hear correctly when spoken to directly
- Distraction in the presence of background noise or other extraneous stimuli
- Difficulty sustaining attention for verbal instruction over a period of time
- Difficulty completing all steps of multiple directions or assignments
- Denial of knowledge of assignments or tasks
- Daydreaming
- Inattention and distractibility

Children with ADHD may also have different levels of perception of and tolerance to loudness (Lucker, Geffner, & Koch, 1996). When behaviors like these are reported by the parent, the audiologist should obtain a complete history of the child in order to determine the appropriateness of CAP testing and/or referral to other professionals.

It is conceivable that neurologically based dysfunctions such as ADHD, LD, and sensory integrative disorders may affect central auditory pathways both within the brainstem and the auditory cortex. The auditory area of the corpus callosum, the planum temporale, and insula were reportedly smaller on the left side or both sides of the brain in children with ADHD using magnetic imaging techniques. It has also been proposed that the morphology of Heschl's gyrus may also differ in ADHD versus normal children (Musiek & Chermak, 1995).

Selection of a CAP test battery for children with ADHD should consider the reason for the child's evaluation, anticipated outcomes, and functional implications for that child. The audiologist should decide the utility of evaluating the child with ADHD both with and without medication. A test battery that proves to have good sensitivity and specificity to suspected anatomic differences is desirable. At a minimum, the test battery should include tests of dichotic listening, temporal processing, auditory closure and auditory figure-ground differentiation (Musiek & Chermak, 1995).

An audiologist performing a CAP battery should be aware of its weaknesses and limitations. The behaviors critical to the diagnosis of CAPD may reflect the influence of higher order cognitive functions involving language representations. One cannot conclude that poor auditory signal processing or perception is the primary explanation for difficulty with spoken language. These considerations are not exhaustive but rather exemplars. Audiologists and speech-language pathologists should continually seek and review new information regarding the conceptualization and empirical research to broaden their scope and understanding of individuals with ADHD.

Intervention

General Considerations

Speech-language pathologists working with children and adolescents are likely to encounter children with characteristics associated with ADHD regardless of their practice setting. They may be treating youngsters for speech and/or language disorders that coexist with ADHD after an ADHD diagnosis is made, or they may be working with students yet to be diagnosed. In either case, most speech-language pathologists working with school-age students will be presented with the challenge of appropriate intervention with this population. Intervention may include direct service to children and adolescents, ideally in collaboration with others, as well as consultation with professionals and families. Speech-language pathologist should be prepared for both of these roles.

Students with behaviors typical of ADHD constitute a widely diverse group likely to differ from each other in clinical manifestations, cognitive profiles, etiologies, responses to treatment, and prognosis. Because of the multidimensional nature of attention disorders, no one intervention approach will be sufficient. It is recommended that the professionals employ multiple methods from several sources across different settings and informants. Intervention techniques for

students with ADHD have traditionally included medication and behavioral management techniques. Increasingly, therapeutic interventions are also being provided in the areas of education, communication, social-emotional interactions, and physical difficulties.

Intervention with children with ADHD must be individualized. Some children may require language treatment, occupational therapy, or mental health intervention. Children with ADHD need to experience success with tasks as part of their treatment. These children also need advocates who will help others understand the nature of the children's difficulties. Their developmental and academic performance needs to be followed, with their progress monitored.

The planning and implementation of intervention programs involves several considerations: educational placement/services, collaboration, environmental factors, controversial approaches, pharmacological approaches, behavior management approaches, and developmental/instructional approaches. The speech-language pathologist, however, should be aware of the problems in this arena. First, the empirical data on nonpharmacological intervention with this population are sparse and derived mostly from laboratory or clinical settings. Very little has been done in classrooms and schools where the practical problems are encountered. Many of the approaches in use have either been validated with other populations or appear to have face validity, that is, clinicians, teachers and families have reported they are beneficial. Second, the heterogeneity of the population poses a problem for researchers and practitioners. What works for one student, may not be effective for another whose constellation of strengths and weaknesses may differ.

Educational placement and services. Speech-language pathologists and audiologists are frequently asked to assist in determining if students qualify for special services. The diagnosis of ADHD may not in itself qualify students for special education services. There is no separate category of disability called "Attention Deficit Hyperactivity Disorder" under the Individuals with Disabilities Education Act (IDEA, formerly PL 94-142). Students who need special education and related services may meet eligibility requirements in other categories, when these problems coexist. For example, some students who need special education services may be eligible under IDEA as having "Specific Learning Disabilities" if they meet those criteria. Other children may qualify under "Other Health Impaired" (OHI). Many, if not most, of these students will be served in regular classrooms with supplementary aids and services driven by the goals and objectives on their individualized education plan. Children and youth with ADHD who do not meet eligibility criteria under IDEA may be considered disabled under Section 504 of the Vocational Rehabilitation Act of 1973 if the condition constitutes an impairment that significantly limits the student's ability to obtain an education. In this case they are likely to have reasonable accommodations identified as part of a 504 plan, most often implemented in regular education.

Collaboration. The complexity of this disorder dictates the need for multimodal intervention. In fact, evidence suggests that some treatments may have additive or interactive effects (Barkley, 1990; Hall & Kataria, 1992). Such an effort requires collaboration on the part of all concerned. Regular classroom teachers, special education teachers, school administrators, physicians, speech-language

pathologists, audiologists, occupational therapists, and psychologists must work collaboratively in designing and implementing intervention plans in close consultation with families. Collaboration is crucial to monitor the effectiveness of treatment regimens and to assist in generalization of acquired skills and strategies across settings and situations. Collaboration between home and school is critical in the education of children and youth with ADHD.

Environmental factors. For children and youth with ADHD, attention to environmental factors in designing and implementing intervention plans is essential. Several factors are involved. Intervention in a variety of settings may need to be addressed: at home, at school (including classroom, playground, extracurricular activities) and in the community (including work and recreation). The structure and demands of the various environments or settings in which individuals have to function must be considered. Although some children may have similar problems across settings, the nature and extent of the difficulty may be affected by attributes of specific settings, or setting demands. For example, it is common for individuals with ADHD to have more difficulty with unstructured versus structured tasks and group versus individual activities. For this reason children may have fewer problems at home (where routines exist) than in their neighborhood (where they are confronted with new experiences). They may be more successful in a classroom with a consistent organization than in one that does not have a predictable structure. A young child may be more successful in playing a game with a friend at home than playing with a group of children on a playground.

Among other important environmental factors to be manipulated as part of intervention are: the nature and use of physical space, the organization and flow of activities, and transitions from one environment to another, or from one activity to another within the same environment. In another context, some settings may involve more complex demands, requiring greater sustained attention and self-regulation. Such is the case as students move through grades in school; therefore, as students grow older, intervention may change.

Controversial Intervention Approaches

There are many unanswered questions about developmental outcomes and intervention with children with ADHD. In their efforts to obtain effective services for their children, parents may become desperate. In their desperation, they may turn to highly publicized treatments that claim to be useful but have not been shown to be truly effective in accord with standards held by the scientific community (Goldstein & Ingersoll, 1992). Dietary management has been one of the most widely publicized interventions. Recommendations have been made to exclude additives and sugar from children's diets and to use high doses of vitamins and minerals (Conners, 1980; Feingold, 1975). Dozens of well-controlled studies have failed to find support for the dietary approaches. Although a few studies have reported some limited success with this approach, the results suggest, at best, that there may be a very small group of children who may be somewhat responsive to additive-free diets.

Proponents of a recent variant of this dietary approach believe candida yeast, which lives in the human body, overgrows and produces toxins that weaken the immune system and make the body susceptible to ADHD and other psychiatric disorders (Crook, 1986). Treatment involves use of an antifungal medication and a low-sugar

diet (because sugar is believed to stimulate the growth of yeast) and use of vitamin and mineral supplements. There is no evidence from controlled studies to support this model.

Biofeedback proponents claim that children with ADHD can be trained to increase the type of brainwave activity associated with sustained attention and to decrease the type of activity associated with day-dreaming and distraction with resulting improvement in attention and reduction in hyperactivity and impulsivity. Studies of biofeedback intervention have been seriously flawed by use of small numbers of children and ambiguous diagnosis. In general, biofeedback has not proved to be an effective treatment for a wide range of problems.

Chiropractic treatment recently has received attention from the media. It is based on the belief that learning problems are caused by misalignment of the sphenoid and temporal bones in the skull and problems in pelvic reflexes that, if not synchronized, impair the chemical and mechanical functioning of the body. This theory is not consistent with what is known about learning and behavioral functioning. No research has been done to support the effectiveness of this treatment.

Pharmacologic Intervention

Stimulant medication has been used in the treatment of children with ADHD since 1937 (Abikoff, 1991). Methylphenidate (brand name Ritalin), the medication of choice by most physicians, has been in use for such an extended period of time that it is likely that all of the positive as well as negative effects are likely known. There are, however, other medications that may be more effective for some individuals. It is important for speech-language pathologists to be knowledgeable about the use of medication for ADHD because they are often in a good position to monitor the effectiveness and some of the side effects of the medication. A list of medications that are currently being used for individuals with ADHD is provided in Appendix B. Between 70% and 80% of children with ADHD exhibit a positive response to central nervous system stimulants (DuPaul & Barkley, 1990). Primary effects are the improvement of attention span and the reduction of disruptive, inappropriate, and impulsive behavior, and if the medication is carefully monitored, there are also positive changes in academic performance (Rapport, Denney, DuPaul, & Gardner, 1994; Swanson, Cantwell, Lerner, McBurnett, & Hanna, 1992). There is minimal information available, however, on long-term outcomes of stimulant management.

The decision to give medication to children or adolescents with ADHD is often difficult and rests with the parents in consultation with a physician. This intervention may be a critical component of many treatment programs. Medication can increase behavioral control, thereby helping reduce many of the consequences of ADHD. Combined with behavioral management, psychological intervention, parental education in behavioral management techniques, and modifications in the academic learning environment, medication can lead to significant positive changes in daily functioning (Ullman & Slesator, 1985).

Before beginning a medication treatment program, a protocol to evaluate the effectiveness of the proposed drug treatment must be developed. The speech-language pathologist should be informed of the treatment plan so that she or he

can help monitor the child's behaviors that may affect language and auditory functioning. It has been suggested that the following steps be included in the program:

1. A complete medical and behavioral history should be obtained. The information gathered will help to decide which of the medications should be used. Provisions for medical monitoring should be included to help establish the most effective dosage and identify possible negative side effects.
2. Both pre- and postmedication behaviors should be evaluated by those who interact with the child on a daily basis.

Recently, it has been stated that individuals on a pharmacological treatment protocol for ADHD should receive their medication 7 days a week, 365 days a year (Silver, 1992). This is contrary to the more common theory that assumes that the symptoms associated with ADHD escalate when children are expected to cope with academic stress. Thus, medication is not given during evening hours and school vacations. Also, there have been concerns about delayed growth patterns in children who receive some types of medication and it has been hypothesized that the temporary relief from medication would limit the long-term effects on growth.

It is now commonly accepted that ADHD is a pervasive disorder affecting all aspects of individuals' interactions with their environment (Silver, 1992). Therefore, it is important for the children to have the benefits derived from the medication available to them as they attempt to cope in their family structure as well as social situations apart from the academic environment. In addition, many children are expected to complete homework or have other responsibilities after school hours; consequently, additional medication may be necessary for them to maintain the control needed to manage their behaviors for these activities. One should be aware that the effects of stimulant drug treatment appear between 30 and 45 minutes after ingestion and last between 6 and 12 hours. In most children, benefits from such medication peaks between 2 and 3 hours after ingestion. In contrast, the effects of antidepressant drug treatment may not fully appear for several weeks.

The effective use of medication in the treatment of ADHD requires careful monitoring. It is necessary to have in place a plan for the evaluation of the effectiveness of the pharmacological treatment. The plan should address the child's behaviors pre- and post-medication by all individuals who interact with him or her. Data should be collected frequently throughout the day in an attempt to discern when the medication reaches maximum benefits and when it begins to diminish its effectiveness. This may influence both dosage and when the medication is given. Without such a plan it is often difficult to know if the maximum possible benefits are being derived.

Behavior Management Approaches

Research supports the use of medication as an appropriate approach in the treatment of ADHD. It is important, however, to remember that the use of medication is just one component in a multimodal intervention plan for children diagnosed with ADHD.

Whether or not pharmacological approaches are used, behavioral interventions are an important component in most intervention programs. Two types of behavioral approaches are used with children with ADHD. Traditional behavioral approaches focus on training or shaping desirable behaviors and reducing the frequency of undesirable behaviors using contingency management procedures. Typical goals include increasing on-task behavior, task completion, compliance, and impulse control. Although both positive and negative consequences are utilized, best practice focuses on the use of positive reinforcers. A more recent focus in behavior management has been on controlling antecedent events, such as with the use of cuing (internal or external) or prompting.

Cognitive-behavior therapy is another approach that has been used with some success with this population, although its effectiveness as a stand-alone approach is questionable (Hall & Kataria, 1992; Abikoff, 1991). It is essentially a metacognitive approach that involves the use of verbal statements as an internal control device for self-regulation of sustained attention, impulse control, and hyperactivity. Most practical applications of this approach call for modeling of the verbal statements by others as the acquisition technique (Braswell & Bloomquist, 1991; Kendall & Braswell, 1985; Meichenbaum, 1977). Other metacognitive approaches also address self regulation by focusing on self responsibility for planning, recording and monitoring behavior. The goal of metacognitive approaches is to help children and youth move from an external locus of control (in which they depend on others to control their behavior) to an internal locus of control (in which they control their behavior themselves). These metacognitive intervention approaches must take place in the natural setting, prompt the type of performance desired, provide consequences as immediately and quickly as possible, and be extended over time (Ingersoll & Goldstein, 1993).

Many professionals would argue that behavior management as an area of intervention needs to be coupled with other areas of intervention/management for a number of reasons. First, the definition of what constitutes appropriate behavior may change with the setting; therefore, environmental factors must be considered. Second, behavior is either appropriate or inappropriate for a reason. It may provide a disruption to the individual or other individuals in an environment and thwart desired outcomes, or it may be socially unacceptable. The impact of the behavior, thus, will direct an appropriate course of intervention. Third, some behaviors have roots in other deficit areas. For example, what may on the surface be viewed as an acting-out behavior may be the crude attempt of a child with a language disorder to interact with peers. For this reason, it is important to consider other developmental or instructional approaches, as well.

Developmental/Instructional Approaches

There are a number of developmental or instructional areas that may be part of intervention depending on the age of the child. Among them are sensory integration and language/metacognitive strategies (for both academic tasks and social interaction). Increasing evidence attests to pragmatic and metacognitive language disorder as a salient feature for many youngsters with ADHD. The relationship between pragmatic language intervention and social skills is an important one.

Sensori-integrative approaches. A number of professionals consider this approach to be controversial and unproven. Occupational therapists suggest that children with ADHD are likely to have sensori-integrative deficits. In explaining the concept of sensory integration, Ayres (1972) stated:

The brain locates, sorts, and orders sensations—somewhat as a traffic policeman directs moving cars. When sensations flow in a well organized or an integrative manner, the brain can use those sensations to form perceptions, behaviors, and learning. When the flow of sensations is disorganized, life can be like a rush-hour traffic jam (p. 5).

Many of the behaviors associated with ADHD are viewed as reflecting sensori-integrative deficits. As defined by Ayres, attention is based on orienting, registration, and arousal, and forms the basis for the development of all other perceptual, motor, and cognitive processes. Research support for sensori-integrative theory and treatment is lacking; consequently, evidence in support of effectiveness of treatment is mainly anecdotal. Although the relationship between ADHD and sensori-integrative dysfunction has not been well-researched, many children with ADHD are receiving sensori-integrative treatment. To collaborate effectively with occupational therapists who are providing sensori-integrative treatment for students with ADHD, speech-language pathologists need to understand the characteristics and treatment principles that are hypothesized to underlie sensori-integrative dysfunction.

Children with ADHD are reported to have disorders in their reticular activating systems (RAS; Sensory Integration Newsletter, 1988). These symptoms include increased sensory sensitivity, poor or disordered sensory registration patterns, delay in the development of antigravity responses, and unusual patterns of responses (asleep, awake, alert, attending), and so forth. ADHD children often demonstrate many of these patterns within the first few months of their life. Over the past several years there has been an increasing awareness of the effects of these patterns on children's general development and learning. These children are now being referred for occupational therapy treatment much earlier for a variety of intervention strategies. The occupational therapist's goals are to decrease sensory hypersensitivities, facilitate more appropriate registration and processing of sensory input, facilitate development of antigravity responses to help organize and modulate interaction with the environment, facilitate self-regulation and organization skills, and affect RAS functions.

There are a number of types of sensory integration (SI) dysfunction that relate to ADHD. Developmental dyspraxia is characterized by problems in motor planning that have been found to relate to poor tactile perception skills. Holborrow and Berry (1986) found a correlation between hyperactivity and motor incoordination. Impulsivity may be overlaid on the child's motor planning difficulties.

Another type of SI disorder, tactile defensiveness (TD), consists of a constellation of symptoms associated with adverse reactions to non-noxious tactile stimuli. The response consists of feelings of discomfort and a desire to escape the situation when certain types of tactile stimuli are experienced. Tactile defensiveness has been linked with attention-aroused dysfunction, hyperactivity, and motor problems in children with learning disabilities (Ayres, 1972; de Quiros & Schragar, 1978).

Several types of vestibular-related disorders have also been associated with ADHD. These children tend to have poor balance, difficulty maintaining body position against gravity, and low muscle tone. The children may also experience gravitational insecurity. They are fearful of changes in body position and losing head/body alignment (Ayres, 1979).

Occupational therapists recommend that speech-language pathologists consult with them to understand the basic theoretical principles of which types of touch, pressure, and movement are excitatory or inhibitory for the child because these can affect the quality of interactions. They also recommend that speech-language pathologists consult them when a child displays or is reported to display irregular, unpredictable biological functions (difficulty with feeding, sleeping and bowel movements), low sensory thresholds (easily overstimulated), initial withdrawal (difficulty adjusting to changes in routine or schedule), and negative moods (crankiness, fussiness) and when seating and postural stability issues need to be addressed.

Language/metacognitive approaches. Because metacognitive approaches to behavior control may require more explicit teaching for some students, self-regulation should be viewed as an instructional issue. Language mediates cognition and is both a prerequisite and corequisite to self-regulation; therefore, language deficits need to be addressed as they relate to self-regulation. In addition to the self-regulation aspect, a cognitive strategy intervention approach may include a strategic approach to learning; for example, use of memory strategies for remembering important information. The teaching of higher order cognitive processes and their application to independent problem solving and generalization of learning should also be addressed. These processes are often called “executive functions” and involve the planning, organizing, and evaluation of activities (Borkowski & Burke, 1996; Camp & Bash, 1981; Diaz, Neal, Amaya-Williams, 1990; Pressley & McCormick, 1995).

In school environments, modifications may be necessary to curriculum and/or instruction. In general this population is likely to require more explicit teaching of concepts, skills, and strategies than typical peers who may learn things more incidentally from the environment or from indirect teaching approaches. They will likely benefit from “optimally stimulating learning tasks” (Zentall, 1993) rather than a general reduction of stimulation, as was once thought. High activity level and poor academic performance may be independent problems (Shroyer & Zentall, 1986).

General Intervention Principles

The following general intervention principles are recommended for individuals with ADHD across the life span:

- A variety of approaches may be needed in treating an individual. There is no one appropriate intervention plan for all students with ADHD. Heterogeneity of the population requires that intervention options be viewed with a “menu” mentality and that practitioners select approaches based on the specific problems encountered.

- Intervention should be planned on the basis of individual student characteristics and setting demands. It is not enough to know the strengths and weaknesses of individuals. Students must also understand what is required of them in various environments.
- The nature of intervention will necessarily change across the age span of an individual as different needs emerge in response to biological changes, effects of prior treatment, and changes in setting demands.
- A positive view of intervention should be maintained, building on the strengths of each individual. The potential energy, creativity, leadership, and spontaneity of children and youth with ADHD should be appreciated and used to their advantage.
- A study of behavior and performance over time in a variety of settings is instructive; therefore, the process of ongoing diagnostic intervention and teaching is an important frame of reference for intervention.
- Intervention targets and approaches should match the problem. For example, if a third grade student is having difficulty contributing as a member of a group, then intervention tactics should focus on that specific issue. Although it is possible that some required skills are absent that can be targeted during individual work, it is essential that intervention directly involve group work.
- Specific efforts should address areas likely to be problematic, for example, unstructured large group instruction or complex tasks.
- Rules and instructions must be clear, concise and delivered through more external modes of presentation, using visual rather than, or in addition to, verbal reminders. Complex explanations or irrelevant details should be avoided. Routines, boundaries and goals should be developed with children and youth.
- Behavior management should be planned in anticipation of difficulties, using prompts and cues. Appropriate behavior should be rewarded before using punishment. Consequences must be delivered more swiftly, immediately, systematically, and frequently than with typical peers. They should be a higher magnitude. Rewards should be changed more frequently. Feedback should be provided for ongoing task performance to shape and regulate behavior (Barkley, 1990).
- A hands-on approach to learning should be employed, when possible. Use multisensory input in teaching concepts, skills, and strategies (visual aids, variety of stimuli).
- There is a greater need for active responding during instruction with external cues and scaffolding as support (Zentall & Meyer, 1987).
- Attention to generalization of learning should be part of every intervention program.
- Professionals need to refer children and youth with ADHD for treatment when it is not in their role or scope to provide services.

Some intervention principles vary according to the age of the individual.

Intervention principles—preschool. The diagnosis of ADHD in preschool children is particularly complicated. Most physicians, psychologists, and other professionals are hesitant to diagnose children less than 5 years of age as having ADHD because as many as 50% of these preschoolers who exhibit characteristics that seem to indicate ADHD will outgrow these symptoms by 5 years of age. Because of the multidimensional nature of attention itself, as well as the way in

which ADHD may be manifested, the diagnosis, assessment, and treatment of the preschooler may be a difficult task. Assessment and educational intervention strategies for preschool children with ADHD must involve consideration of their developmental levels with respect to attention and self-regulation. The following general principles are recommended:

- Conduct a developmental assessment that includes speech/language, audiological, vision, sensori-integrative evaluations
- If the child has a diagnosed sensori-integrative disorder along with a speech-language disorder, consider conducting joint treatment with an occupational therapist
- Base intervention strategies on child's developmental level

Educational intervention principles—school age. Educational intervention for school-age students focuses on strategies used by teachers and related service personnel to teach students with ADHD and the specific content that is to be taught. Speech-language pathologists should determine if students with ADHD have language deficits in addition to ADHD, and if they do, develop appropriate therapeutic and educational support strategies. Speech-language pathologists have a major role as collaborative consultants working with teachers to assist students in managing classroom behavioral demands and academic expectations.

- Changes in the structure of the environment may be helpful, e.g., preferential seating in front of the class or some other location such as near the teacher's desk, away from windows, etc.
- Metacognitive approaches to self-regulation and learning should be taught directly and practiced to achieve automaticity (Westby & Cutler, 1994). Self-responsibility for monitoring behavior, including self-recording and self-evaluation, should be fostered.
- Metacognitive approaches should be coupled with contingency management procedures. Positive reinforcement procedures (using secondary reinforcers) can be effective in reducing activity level, increasing time on task, and improving academic performance. A variety of reinforcers and contingencies should be used, with an emphasis on using positive reinforcers first. Short versus long reprimands (Abramowitz, O'Leary, & Fattersak, 1988) and immediate versus delayed feedback for interactive off-task behavior (Abramowitz & O'Leary, 1990) can be effective. Response cost techniques have also been effective in improving attention, on-task behavior, and completion of academic tasks (Sullivan & O'Leary, 1990).
- Highly stimulating and novel instruction and materials should be used (Zentall, 1993).
- Complex concepts and processes should be broken down into smaller components. Information might be chunked. A response might be obtained after each element using rehearsal, paraphrasing, and other techniques. Individual pieces should be practiced first, before introducing competing messages, mixed processes, or increased complexity.
- Pacing of activities is important. Balance should be maintained between easier and harder tasks, tasks requiring more attention with those requiring less, in-seat tasks with out-of-seat tasks, preferred tasks with nonpreferred tasks.
- Students should be prepared for each day's events with an advance organizer. For example, a visual/graphic representation of the day's events may be used to assist with understanding and to provide an external cue.

Interpretation

- Cues such as color should be provided for important information and may be added to increase important task features (Zentall & Kruczek, 1988; Zentall, 1989).
- For some students, having them read aloud may assist in reducing errors and increasing reading comprehension.
- If cooperative learning is used in a classroom setting, the social skills necessary for use of this instructional approach must be taught as prerequisites or corequisites.

Many questions remain regarding the nature, diagnosis, and effective intervention strategies for individuals with ADHD. Changes in federal guidelines and increased advocacy activities by parents of children with ADHD have resulted in schools needing to make appropriate accommodations for students with ADHD. Because of the high comorbidity of ADHD with speech-language disabilities and central auditory processing disorders, and because a primary basis of ADHD is executive/metacognitive dysfunction, speech-language pathologists and audiologists are increasingly involved in the assessment and intervention of students with ADHD. The purpose of this report is to familiarize speech-language pathologists and audiologists with current information and philosophies regarding the nature, diagnosis, and treatment of ADHD. This knowledge is essential if speech-language pathologists and audiologists are to provide appropriate and effective services for students with ADHD and if they are to function effectively on interdisciplinary teams serving students with ADHD. Speech-language pathologists and audiologists working in the public schools have the following roles in working with students with ADHD who qualify for services under IDEA (because they have documented language and learning disabilities):

- providing assessment and intervention services to students with ADHD whose primary diagnosis is speech and language disorder
- serving on interdisciplinary teams responsible for the diagnosis, assessment, and intervention with students with ADHD
- conducting speech-language and auditory assessments on students with a primary diagnosis of ADHD
- providing teachers and parents with information on the language and auditory difficulties frequently exhibited by students with ADHD
- providing direct language intervention with students with ADHD with an emphasis on developing executive function and metacognitive language skills
- collaborating with classroom teachers in adapting and modifying classroom environment and curriculum content, and developing social interactions for students with ADHD

Speech-language pathologists must be aware that many language-learning disabilities cannot be identified with currently available standardized tests. Consequently, many students may not qualify for services under IDEA because of the assessment tools used in the evaluation. These students, however, may exhibit executive function/metacognitive deficits, and they would be good candidates for intervention. State guidelines that require specific scores on particular standardized assessment instruments to qualify students for services may deny services to such students. Parents of students with ADHD who fail to qualify for services under IDEA may seek educational accommodations under Section 504, the Vocational Rehabilitation Act. Such accommodations may or may not permit speech-language pathologists to work with students with ADHD in the school context. Speech-

Knowledge Competencies

language pathologists must make the distinction between qualifying for services based on arbitrary guidelines and having a need for services. Although some students with ADHD may not qualify for services in the school context, they may be appropriate candidates for intervention provided by speech-language pathologists in clinical and private practice settings. Speech-language pathologists and audiologists working with individuals with ADHD should have the following knowledge and skills:

Background Knowledge

1. Knowledge of characteristics of students with attentional deficits with/without hyperactivity, including the heterogeneity of:
 - behavior
 - communication skills
 - cognitive/metacognitive skills
 - social/emotional skills
 - academic skills
2. Knowledge of various factors affecting attention and activity level:
 - medical conditions
 - anxiety/stress/depression
 - central auditory processing abilities
 - motivation (boredom, disinterest)
 - learning disabilities/cognitive deficits
 - sensory integrative dysfunction
 - cultural expectations
 - environmental factors
3. Knowledge of types of attention
 - sustained attention
 - vigilance
 - focused attention
 - associative control
 - divided attention
 - shifting attention
 - span of attention
 - distractibility
4. Awareness of changing criteria for diagnosing ADHD
5. Awareness of changing characteristics across the age span
 - infancy
 - preschool
 - school-age
 - adolescence
6. Awareness of gender differences in ADHD characteristics
7. Awareness of other psychopathologies related to ADHD
 - oppositional disorder
 - conduct disorder
 - obsessive-compulsive disorder
 - anxiety disorders
 - mood disorders
 - Tourette's syndrome and other tic disorders

Assessment

1. Knowledge of various rating scales for use by:
 - family/parents
 - teacher/classroom
 - other important people in child's life
2. Knowledge of and skills in using interviewing strategies with students with ADHD and their parents
 - structured interviews
 - ethnographic interviews
3. Knowledge of the use of standardized tests for quantitative and qualitative descriptive purposes
 - error analysis
 - response analysis
 - arousal level
 - types of attention required and types of attention displayed
4. Knowledge of and skills in conducting alternative assessment procedures to evaluate the student
 - authentic assessment
 - curriculum-based assessment
 - observational assessment systems
 - discourse analysis
 - metacognitive/executive function assessment
5. Knowledge of and skills in conducting alternative assessment procedures to evaluate environmental demands
 - text levels
 - student/teacher scripts
 - classroom structure and routines
 - physical environment (physical objects and organization), including noise level
6. Knowledge of the range of language skills to evaluate and skills in conducting the evaluations:
 - rate and fluency
 - phonology/phonological awareness
 - syntax
 - pragmatics/social
 - semantics and word retrieval
 - discourse (dialogue and monologue)
 - metacognitive strategies/executive function
7. Knowledge of issues in audiologic assessment of students with ADHD (for audiologists)
 - ways to modify testing procedures for students with deficits in attention with or without hyperactivity
 - knowledge of specific CAPD assessment procedures
 - relationships between ADHD and CAPD

Intervention

1. Pharmacological: Knowledge of drugs used to manage attention disorders and hyperactivity so as to be able to assist in monitoring effects
 - type of drugs
 - side effects
 - interaction with other drugs

- management
 - dosage
 - schedules
 - evaluation
2. Knowledge of environmental demands
 - classroom
 - home
 - recreational
 3. Knowledge of educational target areas
 - language
 - behavior
 - sensori-integrative disabilities
 - social skills
 - academic strategies
 - self-regulation/metacognitive skills
 - auditory processing skills
 4. Knowledge of development related to attentional issues
 - developmental stages of attention
 - developmental stages of self-regulation
 - development of planning strategies
 - development of social cognition
 - cultural/environmental influences on attention/self-regulation
 5. Knowledge of and skills in implementing behavior management strategies
 - traditional operant approaches
 - cognitive behavior therapy
 - biofeedback therapy
 6. Knowledge of issues in working with parents of children with ADHD
 - cultural variations in child socialization
 - levels of parent involvement
 - strategies for educating parents in working with their child with ADHD
 7. Ability to function on interdisciplinary teams
 - advocate for involvement of multiple persons who are familiar with the student
 - take responsibility for data collection
 - share information from their field with parents and other professionals on the team
 - educate others regarding the roles of speech-language pathologists and audiologists in working with students with deficits in attention with or without hyperactivity.
 - awareness of the roles of speech-language pathologists/audiologists and other professionals on interdisciplinary teams

References

- Abikoff, H. (1991). Cognitive training in ADHD children: Less to it than meets the eyes. *Journal of Learning Disabilities, 24*, 205–209.
- Abramowitz, A. J., & O'Leary, S. G. (1990). Effectiveness of delayed punishment in an applied setting. *Behavior Therapy, 21*, 231–239.
- Abramowitz, A. J., O'Leary, S. G., & Futttersak, M. W. (1988). The relative impact of long and short reprimands on children's off-task behavior in the classroom. *Behavior Therapy, 19*, 243–247.
- Achenbach, T. M. (1991). *Manual for the revised child behavior checklist*. Burlington, VT: Author.

- American Psychiatric Association. (1968). *Diagnostic and statistical manual of mental disorders* (2nd ed.). Washington, DC: Author.
- American Psychiatric Association. (1980). *Diagnostic and statistical manual of mental disorders* (3rd ed.). Washington, DC: Author.
- American Psychiatric Association. (1987). *Diagnostic and statistical manual of mental disorders* (Rev 3rd ed.). Washington, DC: Author.
- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.
- American Speech-Language-Hearing Association. *Central auditory processing: Consensus development conference*. 1994. Program and abstracts. Rockville, MD: Author.
- American Speech-Language-Hearing Association. (1994). *Consensus statement on central auditory processing*. Rockville, MD: Author.
- Applebee, A. (1978). *The child's concept of story*. Chicago: University of Chicago Press.
- August, G. J., & Garfinkel, B. D. (1990). Comorbidity of ADHD and reading disability among clinic-referred children. *Journal of Abnormal Child Psychology*, 18, 137–165.
- Ayres, J. (1972). *Sensory integration and learning disorders*. Los Angeles: Western Psychological Services.
- Barkley, R. A. (1981). *Hyperactive children*. New York: Guilford Press.
- Barkley, R. A. (1990). *Attention deficit and hyperactivity disorder: A handbook for diagnosis and treatment*. New York: Guilford Press.
- Barkley, R. A. (1991). *Attention-deficit disorder: A clinical handbook*. New York: Guilford Press.
- Barkley, R. A. (1996). Linkages between attention and executive function. In G. R. Lyon & N. A. Krasnegor (Eds.), *Attention, memory, and executive function*. Baltimore: Brookes.
- Bauermeister, J. J. (1995). Teacher rating scales for the assessment of ADD and ADHD in Hispanic (Puerto Rican) children. *ADHD Report*, 3, 9–10.
- Bleichman, J. H., Hood, J., & Inglis, A. (1990). Psychiatric risk in children with speech and language disorders. *Journal of Abnormal Child Psychology*, 18, 283–296.
- Braswell, L., & Bloomquist, M. L. (1991). *Cognitive-behavioral therapy with ADHD children*. New York: Guilford.
- Borkowski, J. G., & Burke, J. E. (1996). Theories, models, and measurements of executive functioning: An information processing perspective. In G. R. Lyon & N. A. Krasnegor (Eds.), *Attention, memory, and executive function*. Baltimore: Brookes.
- Bronowski, J. (1977). Human and animal languages. In J. Bronowski (Ed.), *A sense of the future* (pp. 104–131). Cambridge, MA: MIT Press.
- Burcham, B. G., & DeMers, S. T. (1995). Comprehensive assessment of children and youth with ADHD. *Intervention in School and Clinic*, 30, 211–220.
- Burd, L., & Fisher, W. (1986). Central auditory processing disorder or attention deficit disorder? *Journal of Developmental and Behavioral Pediatrics*, 7, 215–216.
- Camp, B. W., & Bash, M. S. (1981). *Think aloud-increasing social and cognitive skills: A problem-solving program for children*. Champaign, IL: Research Press.
- Cantwell, D. P., & Baker, L. (1985). Psychiatric and learning disorders in children with speech and language disorders: A descriptive analysis. In K. D. Gadow (Ed.), *Advances in learning and behavioral disabilities* (Vol. 4). Greenwich, CT: JAL.
- Cantwell, D. P., Baker, L., & Mattison, R. E. (1979). The prevalence of psychiatric disorder in children with speech and language disorder: An epidemiological study. *Journal of the American Academy of Child Psychiatry*, 18, 450–459.
- Cantwell, D. P., Baker, L., & Mattison, R. (1981). Prevalence, type and correlates of psychiatric diagnosis in 200 children with communication disorder. *Developmental and Behavioral Pediatrics*, 2, 131–136.
- Conners, C. K. (1980). *Food additives and hyperactive children*. New York: Plenum.
- Conners, C. K. (1989). *Conners' Teacher Rating Scale*. Toronto: Multi-Health Systems.
- Conners, C. K. (1992). *CPT: Conners' continuous performance test*. North Tonawanda, NY: Multi-Health Systems.

- Creaghead, N. A. (1992). Classroom interactional analysis/script analysis. In W. A. Secord & J. S. Damico (Eds.), *Best practices in school speech-language pathology: Descriptive/nonstandardized language assessment*. San Antonio: Psychological Corporation.
- Crook, W. G. (1986). *The yeast connection: A medical break-through*. Jackson, TN: Professional Books.
- Damico, J. S., & Augustine, L. E. (1995). Social considerations in the labeling of students as attention deficit hyperactivity disorder. *Seminars in Speech and Language, 16*, 259–274.
- Denckla, M. B. (1996). A theory and model of executive function: A neuropsychological perspective. In G. R. Lyon & N. A. Krasnegor (Eds.), *Attention, memory, and executive function*. Baltimore: Brookes.
- Denckla, M. B., & Reader, M. (1993). Education and psychological interventions: Executive dysfunction and its consequences. In R. Kurlan (Ed.), *Handbook of Tourette's syndrome and related tic and behavioral disorders* (pp. 431–451). New York: Marcel Dekker.
- de Quiros, J. B., & Schragger, O. L. (1978). *Neuropsychological fundamentals in learning disabilities*. San Rafael, CA: Academic Publications.
- Diaz, R. M., Neal, C. J., & Amaya-Williams, M. (1990). The social origins of self-regulation. In *Vygotsky and education: Instructional implications and applications of sociohistorical psychology*. New York: Cambridge University Press.
- DuPaul, G. J., & Barkley, R. A. (1990). Medication therapy. In R. A. Barkley (Ed.), *Attention deficit hyperactivity disorder*. New York: Guilford.
- Feingold, B. (1975). *Why your child is hyperactive*. New York: Random House.
- Flavell, J. H., Miller, P. H., & Miller, S. A. (1993). *Cognitive development*. Englewood Cliffs, NJ: Prentice-Hall.
- Frick, P. J., & Lahey, B. B. (1991). The nature and characteristics of attention-deficit hyperactivity disorder. *School Psychology Review, 31*, 288–296.
- Geffner, D., Davis, R., & Koch, W. The relationship among children with ADD, auditory processing disorders and early otitis media. 1996. Poster session, ASHA Convention, Seattle
- Geffner, D., Lucker, J. R., & Koch, W. (1996). Evaluation of auditory discrimination in children with ADD and children without ADD. *Child Psychiatry and Development, 26* (3), 169–179.
- Goldstein, S., & Goldstein, M. (1990). *Managing attention disorder in children*. New York: Wiley.
- Goldstein, S., & Ingersoll, B. (1992, Fall/Winter). Controversial treatments for children with attention deficit hyperactivity disorder. *Chadder*.
- Greenblatt, E., Mattis, S., & Trad, P. V. (1991). The ACID pattern and the freedom from distractibility factor in a child psychiatric population. *Developmental Neuropsychology, 7*, 121–130.
- Grenell, M. M., Glass, C. R., & Katz, K. S. (1987). Hyperactive children and peer interaction: Knowledge and performance of social skills. *Journal of Abnormal Child Psychology, 15*, 1–13.
- Hall, C. W., & Kataria, S. (1992). Effects of two treatment techniques on delay and vigilance tasks with attention deficit hyperactive disorder (ADHD) children. *Journal of Psychology, 126*, 17–25.
- Hartsough, C. S., & Lambert, N. M. (1985). Medical factors in hyperactive and normal children: Prenatal, developmental, and health history findings. *American Journal of Orthopsychiatry, 55*, 190–210.
- Holborrow, P. L., & Berry, P. S. (1986). Hyperactivity and learning difficulties. *Journal of Learning Disabilities, 19*, 426–431.
- Hynd, G. W., Hern, K. L., Voeller, K. K., & Marshall, R. M. (1991). Neurobiological basis of attention deficit hyperactivity disorder (ADHD). *School Psychology Review, 20*(2), 174–186.

- Ingersoll, B. D., & Goldstein, S. (1993). *Attention deficit disorder and learning disabilities: Realities, myths and controversial treatments*. New York: Doubleday.
- Jerger, S., Martin, R. C., & Jerger, J. (1987). Specific auditory perceptual dysfunction in a learning disabled child. *Ear and Hearing, 8*(2), 78–85.
- Keller, W. D. (1992). Auditory processing disorder or attention deficit disorder? In J. Katz, N. A. Stecker, & D. Henderson (Eds.), *Central auditory processing: A transdisciplinary view* (pp. 107–114). St. Louis: Mosby.
- Kaplan, R. (1966). Cultural thought patterns in intercultural education. *Language Learning, 16*, 1–20.
- Kendall, P. C., & Braswell, L. (1985). *Cognitive-behavioral therapy for impulsive children*. New York: Guilford.
- Kreitler, S., & Kreitler, H. (1987a). Plans and planning: Their motivational and cognitive antecedents. In S. L. Friedman, E. K. Scholnick, & R. R. Cocking (Eds.), *Blueprints for thinking*. Cambridge: Cambridge University Press.
- Kreitler, S., & Kreitler, H. (1987b). Conceptions and processes of planning: The developmental perspective. In S. L. Friedman, E. K. Scholnick, & R. R. Cocking (Eds.), *Blueprints for thinking*. Cambridge: Cambridge University Press.
- Kuhn, D. (1992). Cognitive development. In M. H. Bornstein & M. E. Lamb (Eds.), *Developmental psychology: An advanced textbook* (3rd ed., pp. 211–272). Hillsdale, NJ: Erlbaum.
- Landau, S., & Milich, R. (1988). Social communication patterns in attention deficit-disordered boys. *Journal of Abnormal Child Psychology, 16*, 69–81.
- Love, A. J., & Thompson, M. G. G. (1988). Language disorders and attention deficit disorder in young children referred for psychiatric services. *American Journal of Orthopsychiatry, 24*, 52–63.
- Lucker, J. R., Geffner, D., & Koch, W. (1996). Perception of loudness in children with ADD and without ADD. *Child Psychiatry and Human Development, 26*(3), 181–190.
- Mann, E. M., Ikeda, Y., Mueller, C. W., Takahashi, A., Tao, K. T., Humis, E., Li, B. L., & Chin, D. (1992). Cross-cultural differences in rating hyperactive-disruptive behaviors in children. *American Journal of Psychiatry, 149*, 1539–1542.
- Matier-Sharma, K., Perachio, N., Newcorn, J. H., Sharma, V., & Halperin, J. M. (1995). Differential diagnosis of ADHD: Are objective measures of attention, impulsivity, and activity level helpful? *Child Neuropsychology, 1*, 118–127.
- Meichenbaum, D. (1977). *Cognitive-behavior modification*. New York: Plenum.
- Michaels, S. (1985). Hearing the connections in children's oral and written discourse. *Journal of Education, 167*, 36–56.
- Musiek, F. E., & Chermak, G. D. (1995). Three commonly asked questions about central auditory processing disorders: Assessment. *American Journal of Audiology, 3*(3), 23–26.
- Musiek, F. E., & Chermak, G. D. (1995). Three commonly asked questions about central auditory processing disorders: Management. *American Journal of Audiology, 4*(1), 15–19.
- Nelson, N. W. (1992). Targets of curriculum based language assessment. In W. Secord & J. S. Damico (Eds.), *Best practices in school speech-language pathology*. San Antonio: Psychological Corporation.
- Office of Civil Rights. *Memorandum*. 1993. 19 IDELR 876.
- Paul, R. (1995). *Language disorders from infancy through adolescence*. St. Louis: Mosby.
- Pea, R. D. (1982). What is planning development the development of? *Children's planning strategies; New directions for child development, 18*, 5–27. <person-group person-group-type="editor">Forbes, D. L.Greenburg, M. T.</person-group>
- Pennington, B. F. (1991). *Diagnosing learning disorders: A neuropsychological framework*. New York: Guilford.

- Pinheiro, M. L., & Musiek, F. E. (1985). Special considerations in central auditory evaluation. In M. L. Pinheiro & F. E. Musiek (Eds.), *Assessment of central auditory dysfunction: Foundations and clinical correlates* (pp. 257–265). Baltimore: Williams & Wilkins.
- Pressley, M., & McCormick, C. (1995). *Cognition, teaching, and assessment*. New York: HarperCollins.
- Rapport, M. D., Denney, C., DuPaul, G. J., & Gardner, M. J. (1994). Attention deficit disorder and methylphenidate normalization rates, clinical effectiveness, and response prediction in 76 children. *Journal of the American Academy of Child and Adolescent Psychiatry*, 33, 882–893.
- Reid, R., & Katsiyannis, A. (1995). Attention deficit/hyperactivity disorder and section 504. *Remedial and Special Education*, 16, 198–214.
- Reitan, R. M. (1958). Validity of the Trail-Making Test as an indication of organic brain damage. *Perceptual Motor Skills*, 8, 271–276.
- Riccio, C. A., Hynd, G. W., Cohen, M. J., Hall, J., & Molt, L. (1994). Comorbidity of central auditory processing disorder and attention-deficit hyperactivity disorder. *Journal of the American Academy of Child and Adolescent Psychiatry*, 33, 849–857.
- Scollon, R., & Scollon, S. (1981). *Narrative, literacy and face in interethnic communication*. Norwood, NJ: Ablex.
- Sensory Integration Newsletter. (1988, June).
- Shaywitz, S. E., Fletcher, J. M., & Shaywitz, B. A. (1994). Issues in the definition and classification of attention deficit disorder. *Topics in Language Disorder*, 14, 1–25.
- Shroyer, C., & Zentall, S. S. (1986). Effects of rate, nonrelevant information and repetition on the listening comprehension of hyperactive children. *Journal of Special Education*, 20, 231–239.
- Shure, M. B. (1992). *I can problem solve*. Champaign, IL: Research Press.
- Silver, L. B. (1992). *Attention-deficit hyperactivity disorder: A clinical guide to diagnosis and treatment*. Washington, DC: American Psychiatric Press.
- Stroop, J. R. (1935). Studies of interference in serial verbal reactions. *Journal of Experimental Psychology*, 18, 643–662.
- Sullivan, M. A., & O'Leary, S. G. (1990). Maintenance following reward and cost token programs. *Behavior Therapy*, 21, 139–149.
- Swanson, J. M., Cantwell, D. P., Lerner, M., McBurnett, K., & Hanna, G. (1992). Effects of stimulant medication on learning in children with ADHD. In S. E. Shaywitz & B. A. Shaywitz (Eds.), *Attention deficit disorder comes of age*. Austin, TX: Pro-Ed.
- Szatmari, P., Offord, D. R., & Boyle, M. H. (1989). Correlates, associated impairments, and patterns of service utilization of children with attention deficit disorders: Findings from the Ontario child health study. *Journal of Child Psychology*, 30, 205–217.
- Tannock, R., Purvis, K. L., & Schachar, R. J. (1993). Narrative abilities in children with attention deficit hyperactivity disorder and normal peers. *Journal of Abnormal Child Psychology*, 21, 103–117.
- Tillery, K. L., & Smosky, W. J. (1994). Clinical implications of the auditory processing abilities of children with attention deficit hyperactivity disorder. In *American Speech-Language-Hearing Association central auditory processing: Consensus development conference*. Rockville, MD.
- Tough, J. (1981). *Talk for teaching and learning*. Portsmouth, NH: Heinemann.
- Trenerry, M. R., Crosson, B., Deboe, J., & Leber, W. R. (1989). *Stroop Neuropsychological Screening Test*. Odessa, FL: Psychological Assessment Resources.
- Trautman, R. C., Giddan, J. J., & Jurs, S. G. (1990). Language risk factor in emotionally disturbed children within a school and day treatment program. *Journal of Childhood Communication Disorders*, 13, 123–133.
- Ullman, R. K., & Sleator, E. (1985). Attention deficit disorder children with and without hyperactivity: Which behaviors are helped by stimulants? *Clinical Pediatrics*, 24, 547–551.

- Westby, C. E. (1984). The development of narrative language abilities. In G. P. Wallach & K. G. Butler (Eds.), *Language learning disabilities in school-age children*. Baltimore: Williams & Wilkins.
- Westby, C. E., & Cutler, S. K. (1994). Language and ADHD: Understanding the bases and treatment of self-regulatory deficits. *Topics of Language Disorders, 14*, 58–76.
- Whalen, C. K., & Henker, B. (1985). The social worlds of hyperactive children. *Clinical Psychology Review, 5*, 1–32.
- Wielkiewicz, R. M. (1990). Interpreting low scores on the WISC-R third factor: It's more than distractibility. *Psychological Assessment, 2*, 91–97.
- Willeford, J. A., & Burleigh, J. M. (1985). *Handbook of central auditory processing disorders in children*. Orlando, FL: Grune & Stratton.
- Zentall, S. S. (1988). Production deficiencies in elicited language but not in the spontaneous verbalizations of hyperactive children. *Journal of Abnormal Child Psychology, 16*, 657–673.
- Zentall, S. S. (1989). Attentional cueing in spelling tasks for hyperactive and comparison regular classroom children. *Journal of Special Education, 23*, 83–93.
- Zentall, S. S. (1993). Research on the educational implications of attention deficit hyperactivity disorder. *Exceptional Children, 60*, 143–153.
- Zentall, S. S., & Kruczek, T. (1988). The attraction of color for active attention-problem children. *Exceptional Children, 54*, 519–536.
- Zentall, S. S., & Meyer, M. J. (1987). Self-regulation of stimulation for ADD-H children during reading and vigilance task performance. *Journal of Abnormal Child Psychology, 15*, 519–536.

Appendix A. DSM-IV Criteria for Attention-Deficit Hyperactivity Disorder

Either (1) or (2):

1. Inattention: At least six of the following symptoms of inattention have persisted for at least six months to a degree that is maladaptive and inconsistent with developmental level:
 - (a) Often fails to give close attention to details or makes careless mistakes in schoolwork, or other activities.
 - (b) Often has difficulty sustaining attention in tasks or play activities.
 - (c) Often does not seem to listen when spoken to directly.
 - (d) Often does not follow through on instructions and fails to finish school work, chores, or duties in the workplace (not due to oppositional behavior or failure to understand instructions).
 - (e) Often has difficulties organizing tasks and activities.
 - (f) Often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (such as schoolwork, or homework).
 - (g) Often loses things necessary for tasks or activities (e.g., toys, school assignments, pencils, books or tools).
 - (h) Is often easily distracted by extraneous stimuli.
 - (i) Is often forgetful in daily activities.
2. Hyperactivity-Impulsivity: At least six of the following symptoms of hyperactivity-impulsivity have persisted for at least six months to a degree that is maladaptive and inconsistent with developmental level:
 - (a) Often fidgets with hands or feet or squirms in seat.
 - (b) Often leaves seat in classroom or in other situations in which remaining seated is expected.
 - (c) Often runs about or climbs excessively in situations where it is inappropriate (in adolescents or adults, may be limited to subjective feelings of restlessness).
 - (d) Often has difficulty playing or engaging in leisure activities quietly.
 - (e) Is often "on the go" or often acts as if "driven by a motor."
 - (f) Often talks excessively.

Impulsivity

 - (g) Often blurts out answers before questions have been completed.
 - (h) Often has difficulty awaiting turn.
 - (i) Often interrupts or intrudes on others (e.g., butts into conversations or games).

Attention-Deficit/Hyperactivity Disorder, Combined Type: Both (1) and (2).

Attention-Deficit/Hyperactivity Disorder, Predominantly Inattentive Type: Criteria (1) is met but not criterion (2).

Attention-Deficit/Hyperactivity disorder, Predominantly Hyperactive Impulsive Type: Criterion (2) is met but not criterion (1).

Appendix B. Medications Used for ADHD

A. Psychostimulants

I. Methylphenidate (Ritalin)

II. Pemoline (Cylert)

III. Dextroamphetamine (Dexedrine)

1. Short-Term Effects of Stimulants

- a. Improved gross motor skills
- b. Decreased vocalization
- c. Improved handwriting

2. Interpersonal Effects

- a. Decreased classroom disruptions
- b. Increased compliance with directions
- c. Teacher becomes less controlling, more guiding

3. Cognitive Effects

- a. Increased attention span
- b. Less distractibility, impulsivity
- c. Enhanced cognitive encoding, processing
- d. No effect on memory

4. Response to Stimulants

- a. 70%–80% improve on Ritalin (best taken after meals)

5. Common Side Effects

- a. Insomnia
- b. Anorexia, weight loss
- c. Irritability
- d. Gastrointestinal complaints

6. Less Common Side Effects

- a. Dizziness
- b. Nausea
- c. Euphoria
- d. Constipation
- e. Lethargy
- f. Anxiety
- g. Dry mouth

7. Usual Dosage

- a. Ritalin: 5–20 mg (0.3–0.7mg per kg), maximum 60–75 mg daily
- b. Dexedrine: 2.5–10 mg, bid-tid; max. 30–40 mg daily
- c. Cylert: 18.75 mg to start; typical dose 0.5–3 mg per kg one time daily
- d. Adjust dosage upward every 1–2 weeks until therapeutic response
- e. Obtain parent and teacher behavior rating scales and ratings of side effects 1 week after each dose adjustment

B. Tricyclic Antidepressants

I. Desipramine (Norpramin)

II. Imipramine (Tofranil)

III. Nortriptyline (Pamelor)

1. Indications for Tricyclics in ADD

- a. Resistance to, or inability to tolerate stimulants
- b. Co-existing depression or anxiety
- c. Augment beneficial effects of Ritalin
- d. Adolescents susceptible to substance abuse

2. Response to Tricyclic Antidepressants
 - a. 50%–70% improve
 - b. More effect on behavior than cognition
 - c. Improvement may be short-lived
 - d. Rapid response, often within one week
3. Behavioral Effects
 - a. Mild improvements in attention
 - b. Decreased impulsivity
 - c. Mild decreases in activity level
 - d. Improved mood; decreased irritability
 - e. Decreased aggressiveness and temper outbursts
4. Common Side Effects
 - a. Drowsiness
 - b. Dry mouth
 - c. Blurred vision
 - d. Constipation
 - e. Rash
 - f. Changes in pulse, blood pressure
5. Rare Side Effects
 - a. Cardiotoxicity
 - b. Induction of aggression
6. Usual Dosage
 - a. Starting dose is 10–25mg AM and PM
 - b. Therapeutic range is 5–5mg/kg/day
 - c. Adjust dose upward every 2–3 weeks until clinical response observed
 - d. Use behavior rating scales from parents and teachers to evaluate therapeutic effect
 - e. Get EKG prior to administration and at each dose change
 - f. Parents need to control medication; overdose can be lethal

C. Clonidine

1. Indication for Clonidine
 - a. Aggression associated with highly aroused ADD
 - b. ADD with conduct disorder
 - c. Augments beneficial effects of Ritalin
 - d. Resistance to, inability to tolerate stimulants
 - e. ADD with motor tics
2. Response to Clonidine
 - a. 70% of patients
 - b. Acts on ADD by decreasing arousal rather than increasing attention
 - c. Helpful when ADD symptoms are severe in evenings
 - d. Available in skin patch form
 - e. Greatest effects are on impulsiveness and explosiveness
 - f. Can take 2–3 months to evaluate results
 - g. May take 4–6 months to titrate drug
 - h. Does not have much effect on attention
3. Side Effects of Clonidine
 - a. Sedation
 - b. Hypotension
 - c. Weight gain
 - d. Depression
4. Usual Dosage
 - a. 8–12-year-old children: 0.25–0.3mg; per day

b. Adolescents: 0.3–0.4mg; per day

Silver, L.B. (1992). *Attention-deficit hyperactivity disorder: A clinical guide to diagnosis and treatment*. Washington: American Psychiatric Press.