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ATTENTION DEFICIT-HYPERACTIVITY DISORDER -- *A REVIEW FOR THE OPTOMETRIST*

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Biographical Page

Steven J. Lusch, class of 1996 grew up in South Dakota and attended South Dakota State University where he completed three years of courses toward optometry pre-requisites. He then attended the University of Oregon through the national student exchange program where he finished his pre-requisite requirements. He received a bachelor of science degree from Pacific University. Following graduation, Steve plans to join a family optometric practice and would like some day to work in the specialty area of pediatric optometry.

Abstract

Attention Deficit-Hyperactivity Disorder is a syndrome involving attentional impairments, impulsivity, and motor overactivity. This disorder has a long history of misunderstanding concerning its origins and areas of involvement. Early researchers believed the condition to be a result of brain damage. More current research points to environmental factors which may contribute to its development. There are various treatment options available, including pharmacotherapy, behavioral therapy, biofeedback, and vision therapy. Optometrists should be aware of the options available for parents as to treatment for their children. They should also be prepared as to what to expect when testing a child with ADHD and what training techniques may be of benefit for these children. A team treatment plan including parents, teachers, and doctors is the most effective way to give the ADHD child his or her best chance at success.

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Attention Deficit Hyperactivity Disorder -- a review for the optometrist.

Little Jimmy has his first eye appointment today. He reaches the clinic door a good five steps before his mother, who is struggling to keep up. Mom checks in at the desk, and finally gets Jimmy to sit beside her in the reception area. She plans to read him a book to occupy him while waiting to see the doctor, but not far into it Jimmy is squirming in his seat and off he goes to explore. He doesn't respond to his mother's calling, nor to the office staff saying, "don't play with that!". Jimmy has been diagnosed with Attention Deficit Disorder , and is now making the rounds with the local professionals in search of help. Mother has brought him to you in hopes that you can help him with his school problems, because her neighbor told her you did a great job with her daughter's glasses.

This could be any one of us on any given day in clinic. It's important that we are prepared, have good information for the parents, and are able to do all we can to help these children to succeed.

In recent years, a population of Attention Deficit Disorder (ADD) or Attention Deficit-Hyperactivity Disorder (ADHD) diagnosed children has grown immensely. Children that in the past may have been treated with punishment are now thought to have a disorder or deficit and are being recommended for various different types of treatment. Many of these kids will be walking, or possibly running through your clinic doors, and this article is intended to provide a little vital information that will help you deal with these special cases.

Historically, this condition has been known under several different titles, including defects in moral control, minimal brain damage, minimal cerebral disfunction, hyperactive child syndrome, and hyperkinetic behavior disorder. In 1902 an English pediatrician, Still, related these hyperactive symptoms to brain damage or lesions. He also was the first to note the higher prevalence of this condition in boys as compared to girls. An encephalitis epidemic in 1918 gave further support for this theory as child survivors of the illness showed many of these behavior problems following recovery. Though many children were found to have the symptoms with no demonstrable signs of brain damage, it was considered to be related then to birth trauma, genetics, child rearing, or resistance to punishment. The existence of this damage was thought to only manifest itself when the child was placed in the additional stress of the classroom environment. The treatment of choice was medication administered through either a hospital or psychiatric ward. In 1937, Dr. Charles Bradley in a resident treatment center, treated children with headaches using benzedrine to increase blood pressure. He secondarily found a dramatic and marked change in the children's behavior following this treatment. The children were much less disruptive in class and referred to the medication as their "arithmetic pills" because they felt it allowed them to maintain attention and work through problems more quickly and accurately. This first era of study lasted up to World War II. Through this period not much was done in terms of exploring the effects of drugs on child behavior. This was due to the fact that during the depression years there was no access to special programs for children who acted out in the regular classroom.

A second period in the condition's history spanned from W.W.II into the 60's, when many studies of the concommitance of brain disorders and hyperactive behaviors were conducted. These studies further supported the theory of hyperactivity as a result of brain injury, and these behaviors alone became enough for doctors to make a diagnosis of brain damage. Various treatments were recommended by the experts such as Strauss and Lehtinen who did extensive studies on the subject. They recommended creating low stimulus environments to eliminate all possible distractions for the children. However, many of these programs put into practice met with limited success. In the 50's a resurgence of pharmacotherapy took place as the use of tranquilizers in adult psychiatric patients and stimulants for hyperactive children was further explored. Though few studies of the long term effects of pharmacotherapy were done, and those that were had poor prognoses, the treatment of choice in this era was drug treatment combined with minimal stimulation classrooms and the prognosis through adolescence was considered good.

A third period, from the mid 60's to the present, has seen a shift away from the belief that the hyperactive behaviors are a result of brain damage. As a result, the World Health Organization developed

the term Hyperkinetic syndrome(1969), and the American Psychiatric Association listed the category Hyperkinetic reaction of childhood(1968) to better describe the condition. The APA has since renamed the problem as Attention Deficit Disorder, with or without hyperactivity (ADD or ADHD). Currently, one source defines ADHD as a "syndrome involving symptoms such as attentional impairments, impulsivity, and motor overactivity." (D.P. Cantwell)

The DSM IV has ADHD Divided into three distinct categories. (Table 1, DSM IV) A diagnosis is made based on the presence of three possible characteristics of the disorder: inattention (e.g., carelessness, messiness), hyperactivity (e.g., fidgeting, restlessness), and impulsivity (e.g., impatience, thoughtlessness). The subtypes of ADHD are 'Predominantly inattentive', 'Predominantly hyperactive/impulsive', and 'Combined'. Six or more behaviors in one category are necessary for the diagnosis of the first two subtypes, and six of both to be considered 'Combined'. These actions must occur in more than one environment (e.g., in school and at home). (DSM IV)

In recent years, research has greatly intensified on this subject. A variety of new factors have surfaced which are thought to also contribute to the development of ADD/ADHD. Various studies have shown possible genetic predispositions to the condition, similar to that of alcoholism. The child would then require certain forces to be present in order to manifest the condition. Other studies flag environmental factors such as allergens, toxins, food additives and dyes as contributing to hyperactive behaviors. These studies suggest that changing environments, removing possible allergens, and special dieting can bring about changes in behavior. Though the changes in behavior have been seen, they are not proof of the causative action of these items. If a parent Tranyglyphs believes that their child's behaviors are a result of environmental influence, they should be referred to an Allergist, nutritionist, or pediatrician for consultation.

Another line of study suggests that the child's behaviors are related to circumstances surrounding the child, not problems within the child. Influences such as parental discipline and social pressure are considered to be possible forces in these behaviors. Small inappropriate behaviors may result in over-reactions by parents or peers, which precipitates an escalation in problem. This theory fuels the controversy in pharmaceutical therapy for these kids, as the problem is considered to be from without, rather than from within. The drugs are being used in this scenario to be used to control the child, not addressing the cause of the behavior.

The long term effects of stimulant drugs are also an area of current study. A major concern was the apparent suppression of weight and height gain during development. This effect, however, has been shown to be transient and no appreciable effects on adult height and weight have been shown. New studies are currently looking into possible effects on the cardiovascular system due to the increase in both heart rate and blood pressure caused by the drug. Currently, drug treatment hasn't been used long enough to get this information.

There are still those who believe that this disorder is just an entity concocted by parents and teachers unwilling to put forth adequate effort in controlling problem children. Many young children exhibit some of these behaviors at times, and this makes it difficult to distinguish normal, active children from those with a true problem. These facts contribute to the controversy in diagnosis and treatment of ADD/ADHD.

With such a wide diversity of characteristics possible in a child having ADHD, it's difficult to know what to expect. Some commonalities have been shown through a number of different sources. Several studies have illuminated an association between ADHD and various academic problems. "Lambert and Sandoval (1980) examined underachievement (defined as a discrepancy between actual and IQ/age-appropriate achievement) in boys with hyperactivity. They found that 53% of the boys with hyperactivity (versus only 11% of the controls) were underachieving in either reading or math. in another follow-up study, Charles and Schain (1981) reported that the majority of preschoolers with hyperactivity functioned below grade-level expectations in reading and math, once they were in school." (D.P. Cantwell) Testing done concerning the math performance of children with hyperactivity reveals slowed response times, more

typographical errors, and more secondary motor activity as compared to expected norms. (S.S. Zentall) Another source suggests that children with ADHD are more likely to have comorbid affective and/or anxiety disorders than those kids without ADHD diagnoses. (P.S. Jensen) On various levels, these children seem to act in a manner that is below age-appropriate expecteds. Various studies have also shown a possible link between attention deficit and learning, conduct, anxiety, affective, and depressive disorders.

In contrast, the self-perceptions of ADHD diagnosed children are quite different. One study used questionnaires to acquire information about how some of these kids viewed themselves. The study found "ADHD boys did not rate themselves significantly worse than controls on global self-worth of most other self-perception subscales. They tended to make internal attributions for positive social outcomes, but they were less likely than controls to accept responsibility for negative social outcomes. ...ADHD children reported a positive self-image despite clear-cut academic failure and social rejection..." (B. Hoza)

The treatment options for ADHD are under controversy and have been in the media a great deal recently. Possibly the best known treatment is pharmacological through the use of psychostimulants, and more specifically Methylphenidate (Ritalin). As before mentioned, stimulant treatment for this condition was first explored by Dr. Bradley in 1937. Following this accidental discovery, there was little further study of its potential until the late 50's and early 60's. Many positive reports concerning the use of these drugs at this time combined with a lack of reports concerning any deleterious long term effects, led to a rapid escalation of use to 1970. At this point a Congressional investigation took place concerning possible short and long-term effects of stimulant medications. While this information exists, there are also many sources of information concerning the efficacy and effectiveness of Ritalin. One such study reports 88% of their test subjects with ADHD alone had significant improvements from methylphenidate therapy. (S.D. Mayes) Another study tested ADHD children using continuous performance tests (CPT's) such as the Test of Variables of Attention (T.O.V.A.). It was found that errors of omission and commission, response time, and response variability improved where psychostimulants were administered. (L.M. Greenberg) Today, stimulant treatment of hyperactivity remains to be one of the treatments of choice, and according to some sources is being used for as long as 7 to 10 years in some cases.

In two study reviews conducted by Russell A. Barkley and Charles Cunningham, they looked at the effects of stimulant drugs found on both cognition and behavior. They found that academic performance appeared unaffected in either the short or long term by the medications. They did find, however, that behavior problems such as aggression, impulsive behavior, noisiness, noncompliance, and disruptiveness were all positively affected by the use of stimulant drugs. This, consequently, effected the reactions of teachers, parents, and other children toward these hyperactive kids. They received more praise for compliant behaviors, and this further perpetuated the positive effects of the drugs on their behavior. The most likely explanation for this discrepancy between behavior improvement and lack of academic improvement seems to be the associated learning disabilities often found among hyperactive kids. This also explains the improvement in academic achievements in these kids, as found by Barkley and others, through the use of behavioral therapy directed toward improving classroom skills.

Alternative pharmacological treatments include antidepressants, neuroleptics, tranquilizers, impulsive/tantrums (Inderal), and mood stabilizers (Prozac). These treatments, however, have not been extensively studied for use with children. (R. Barkley)

Part of the controversy with pharmacological treatment of the deficit stems from the reported side effects. The most frequently reported side effects from Ritalin use include irritability, decreased appetite, and lethargy. Others included insomnia, abdominal symptoms, hand-wringing, teeth-grinding, foot-tapping, as well as headaches. Although these side effects do not occur in every case, the question remains as to whether the cure is as bad as the disease. For those who have experienced the benefits of the treatment, clearly it is worth the risk. For those who have seen the less desirable effects, the decision is less clear.

Treatments other than through chemical means are also of potential benefit. Training parents as to how to best interact with their child with ADHD and the best ways to respond to and alter behavior patterns will be of great benefit. These kinds of tips are also useful for the clinician trying to get useful information

from an uncooperative child. Child counseling and the development of self-help tools will also put some means of control into the child's hands. Special education services can also be of great benefit for academic assistance with these children. Other more controversial and less studied treatments include diet/vitamin and mineral supplementation, anti-motion sickness medications, and biofeedback to control brain wave activity and heighten attention. The benefit of these treatments, however, has yet to be shown through research. Vision therapy has also been suggested as a possible treatment technique, and this is where we come in to the picture.

Although vision therapy is a controversial treatment with no proven benefit for ADHD, it has been known for years that many learning difficulties and academic problems have visual components. We have also had success in treating these visual deficits, thereby giving some children a better chance for success in the classroom. The key is to evaluate the child for possible vision deficits and work on improving those skills. This is what we have to offer in order to give the child a better chance at success in the classroom. In treatment of ADHD the problem is complicated by the fact that these kids can often be quite difficult to work with. As mentioned before, they may also see themselves as no different from others. This makes motivation a difficult factor. In order to be successful, it is important to keep in mind how these children work. You may need to alter your approach to better work with them. An article originally written for teachers and the classroom situation has some valuable tips which we as optometrists can apply to have better success. (N. Hallowell, e.t.a.l.)

The first vital step is to be organized in both testing and training situations. ADHD kids need structure, so it's important to have a predictable schedule. It may be useful to have the child make their own schedule for home training "to avoid one of the hallmarks of ADD: procrastination". (N. Hallowell, e.t.a.l.) It is also important to have lots of activities planned. This will help maintain attention and make your life easier. Within this structure and plan, it is good to be flexible and understand that the child will not always want to do what you have planned. Flexibility and thinking on your feet will make all the difference. It is important to allow for an escape valve outlet like letting the child leave the room for a moment when things are not going well.

The second major point involves being an encourager. Frequent eye contact and the building of a relationship with the child will go a long way toward cooperation in training. These children need lots of praise, encouragement, and approval. Try to seek out their successes and use feedback to help the child understand what they are striving for. It's important as well to be flexible. You may need to abandon your normal manner with these children and become a little more "unconventional and flamboyant".(Hallowell) When possible, you may want to make a game out of the training as an additional motivator. This may improve their performance.

The third point is a more practical one. Repeat instructions often. "Repeat, repeat, repeat."(Hallowell) Large goals and tasks will often need to be broken down into smaller ones for better understanding and success. Explicitly explain procedures and activities, and monitor the child's progress often to ensure they understand fully. Giving responsibility back to the child whenever possible is a great tool for motivating and keeps the kids plugged in to their own therapy. It is also important to check in with parents as often as possible. Their participation is critical to the child's success. Many things can be used to get the child and parent working together for the child's benefit, such as having the child reading aloud at home. Implementing a point system with the parent as the scorekeeper is a great motivator for the child and gets the parents involved in the therapy as they see the improvements made in performance. In terms of homework, the goal should be quality work, not quantity. One characteristic of many ADHD kids is carelessness or messiness, and if concentration and careful work are not encouraged, no improvements will be achieved.

One thing to consider is that the symptoms of this disorder not only affect the child's behaviors in the classroom and at home, but also in your clinic. This fact calls into question the validity of any testing you are trying to do. Are the results of your testing actually the performance abilities of the child or simply a result of the disorder? With poor attention you may find abnormally high accommodative lags, inaccuracies in phoria measurement, poor eye movements, decreased accommodative and convergence

amplitudes and facilities, and a variety of results below age expected norms. These children are often developmentally delayed in a variety of aspects, so it follows that these kids may well be visually delayed as well.

The behaviors of these children may also complicate testing. Difficulty sitting still, maintaining attention, and distractibility, make testing in a busy clinic a challenge. Many doctors have reported a markedly different result with children on medication. These children many times seem, although calm, to be dissociated and difficult to reach to get the attention required for good exam results. Be prepared to get right to work with the child as soon as they get there, and try not to keep the child and parent waiting in the reception area too long. The sooner you can get started, the more useful information you will get before the child looses interest. It may be necessary to use more than one exam time to get all the information you need to totally evaluate the child.

It will be vitally important to remember all the tools at your disposal. Don't be afraid to change tasks in mid stream when things aren't working or when the child is getting bored. You can't depend on the phoropter to get needed information with a child who doesn't want to sit behind it long enough to get what you need. Free space testing is often the best option. Try bead skills or the Marsden ball to evaluate eye movement abilities. Use dynamic retinoscopy techniques such as Book or MEM out of phoropter. It is important to have a good device for maintaining the child's attention, such as a movie or game the child is interested in. Use loose lenses and prisms to test facilities, amplitudes, and phorias, as well as red/green or Polaroid cards., vectograms, and stereoscopes can give you lots of good information concerning binocularity and visual abilities and are often fun for the children. This aids in maintaining their attention and gives you more accurate findings. Have a variety of eye charts available so that you can best match the child's abilities and also so that you can continue to mix things up and keep it more exciting. Some good options would be the Tumbling E's, Landolt C's or broken wheel. Lighthouse cards, or behaviors Allen cards. Don't be afraid to cycloplege to ensure a good distance refraction. Overall, the more dynamic you can be with your exam, the better your results will be.

Training, like the exam, should be modified to optimize those things the child can do. It is important in training to emphasize the quality of work done, not the quantity. Otherwise, these kids will want to fly through it and won't receive any benefit and the time and money will be wasted. You may need to change in-clinic and homework activities more often to keep the child interested. These children can often be easily discouraged, so it is important to start with a skill that they already have and work from there to build other skills which are lacking. Frequent praise and reward are needed for these children to be successful in vision therapy or in any kind of treatment. Our goal as optometrists is to give them visual skills optimal for their success in school for reading and sustaining clear single vision while doing school work.

Training skills such as eye movements, accommodative and convergence control, and stereopsis and binocularity will help to make the child a more efficient learner. This can be done through a variety of means. As mentioned earlier, start with what they can do, and stretch them from there. It is best to build monocular abilities to equality, then continue into binocular skills. These monocular skills can be trained using accommodative tasks with loose lenses and alternate patching, and training eye movement skills in the same way. This can be followed by monocular work in a binocular field through the use of dissociating filters or lenses such as red/green anaglyphs, Polaroid filters, or training techniques such as a split-pupil accommodative rocks. From here, we proceed into binocular training, both free space and in instruments such as the stereoscope. Vergence and stereo ranges can be expanded using vectograms or tranyglyphs, and binocular eye movement skills can be built up using Marsden ball training, Wayne saccadic fixator, or other training techniques. The more different ways you can find to train the same skills, the more the child will stay interested and the better the results you will achieve. Again, a major key is to stay patient in training. Continue to encourage the child for small achievements to maintain a positive attitude in the child and continued motivation. this is not a quick fix.

The prognosis through adolescence and adulthood is also an area in which the experts have varying opinions. It is a common belief that with the proper support, these symptoms will subside as the child

enters into adolescence and learns to curb these tendencies. More current research would tend to show that if these behaviors aren't corrected early on, the child will be maladjusted and show difficulties in social situations even into adulthood.

Attention Deficit-Hyperactivity Disorder is a syndrome involving attentional impairments, impulsivity, and motor overactivity. This disorder has a long history of misunderstanding concerning its origins and areas of involvement. Its symptoms are many and its diagnosis is elusive. Its treatment is often challenging and difficult. We as optometrists have unique skills and services to offer as a potential treatment for many of the difficulties associated with this disorder. A doctor who is willing to put forth the effort to organize a vision therapy plan, be an encourager to a child, and follow a case closely has an opportunity to make tremendous improvements in that child's life. It is important to understand that no one therapy will alleviate all of the problems for any one child. We as health care providers need to work closely with one another to create a custom program addressing the specifics of each child's needs. Doctors as well as teachers and parents need to work together if we are to provide the child with his or her best chance of success.

Diagnostic criteria for Attention-Deficit/Hyperactivity Disorder (DSM IV)

A. Either (1) or (2):

(1) six (or more) of the following symptoms of **inattention** have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

Inattention

(a) often fails to give close attention to details or makes careless mistakes in schoolwork, work, 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 schoolwork, chores, or duties in the workplace (not due to oppositional behavior or failure to understand instructions)
(e) often has difficulty organizing tasks or 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) six (or more) of the following symptoms of **hyperactivity-impulsivity** have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

Hyperactivity

(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 in which 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 waiting turn
(i) often interrupts or intrudes on others (e.g., butts into conversations or games)

B. Some hyperactive-impulsive or inattentive symptoms that caused impairment were present before age 7 years.

C. Some impairment from the symptoms is present in two or more settings (e.g., at school [or work] and at home).

D. There must be clear evidence of clinically significant impairment in social, academic, or occupational functioning.

E. The symptoms do not occur exclusively during the course of a Pervasive Developmental Disorder, Schizophrenia, or other Psychotic Disorder and are not better accounted for by another mental disorder (e.g., Mood Disorder, Anxiety Disorder, Dissociative Disorder, or a Personality Disorder).

Code based on type:

314.01 Attention-Deficit/Hyperactivity Disorder, Combined Type: if both Criteria A1 and A2 are met for the past 6 months

314.00 Attention-Deficit/Hyperactivity Disorder, Predominantly Inattentive Type: if criterion A1 is met but criterion A2 is not met for the past 6 months

314.01 Attention-Deficit/Hyperactivity Disorder, Predominantly Hyperactive-Impulsive Type: if criterion A2 is met but criterion A1 is not met for the past 6 months

Coding note: For individuals (especially adolescents and adults) who currently have symptoms that no longer meet full criteria, "In Partial Remission" should be specified.

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