Lecture Notes from Dr. E. Mark Mahoney – Neuropsychologist at Kennedy Krieger

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**ADHD Brain Function and the Effect on Reading Fluency and Comprehension**

Since 1998 ADHD had been acknowledged as a developmental disorder, genetically linked.

Because it is a developmental disorder, it is crucial to diagnose early so strategies/medication can be started.

**Statistics**

~25% of children in the classrooms have a learning disorder or attention deficit.

~Following cases for the last 10 years, studies have shown LD and ADHD performances parallel very closely.

~The DSM IV will be out soon and it will look like an increase in occurrence, but only because the behavioral criteria will be more specific.

Helpful changes in the DSM IV:

-Symptoms can be documented by age 7.

-It will show how the disorder looks different at different ages due to the course of

development in a growing child.

-It will more clearly demonstrate that higher demands in a lifestyle increase symptoms;

lower demands in a lifestyle lower symptoms.

~Occasional visits to the pediatrician are usually inadequate…observations need to be in depth and over a period of time to demonstrate truer statistics.

**TYPES**

1. Combined
2. Hyperactive/Impulsive
3. Inattentive (also now is included one called Restrictive Inattentive…sluggish, spacy).

In fact, uncomplicated ADHD is the exception, not the rule.

There will usually be coexisting characteristics: depression, anxiety, conduct disorder, specific learning disorders. If you are not treating the coexisting characteristics, you will not have a good treatment outcome.

**Medications: Stimulant and Non-Stimulant**

-they work on the neurotransmitters, allowing the necessary connections to work.

1. Stimulants: Work on blocking the re-uptake of dopamine.

2. Non-stimulants: Work on blocking the re-uptake of norepinephrine.

These medications are not a gateway drug to future drug abuse; in fact, treatment usually prevents future substance abuse. (Inappropriate ways of self-medication.) There is often a dual diagnosis for people with attention deficit disorders; the other diagnosis is substance abuse.

Studies of children’s brains on and off medications show that brain size is the same; medications do not cause a lack of growth in the brain.

**Diagnostic methods**

1. Neuroimaging and brain mapping
2. Cognitive assessment

How does ADHD impede learning?

Working memory is crucial to learning. Working memory is disrupted in ADHD. It affects new learning as well as retention. (This is usually determined using the California word learning test.)

Children can learn, but they cannot retain. The problem is taking it from short term memory to long term memory.

Time is important in performing a task. Many symptoms of ADHD are time referenced symptoms; it takes ADHD brains more time to process, more time to be able to retain new information, etc. Given extra time, they can perform as well as the brains without ADHD.

Some functional academic differences can be observed immediately; however, other symptoms only show up as you develop.

Many students seem fine until 4th grade when there is a huge shift. This is the point where there is a need for speed. Learning material comes from the teacher at a much higher rate of speed.

1st grade: You are learning to be a good citizen and starting to learn to read.

4th grade: You are now reading to learn.

Middle School: You are learning to ORGANIZE your learning.

Executive Functioning; frontal lobe of the brain.

This part of the brain affects *intention* rather *attention*.

It comes into play *after the perception* and *before the action.*

Young children act impulsively because their executive functioning has not developed. It is what a person needs to pause and formulate the most appropriate response.

This area of the brain involves affect, cognition and motor skills. That is why when you see one area disrupted; you usually see all 3 affected.

**Developmental studies**

ADHD brains get their mean thickness and volume 3 to 4 years later than they should. The size will catch up to brains without ADHD, but not the skills that should develop concurrent with the growing brain. On the flip side, rapid growth in the brain is not good either, as is evidenced in autism.

ADHD brains achieve motor development earlier.

ADHD BRIANS have smaller basal ganglia, but only in boys.   
Girls’ brains develop 2-3 years earlier anyway, so boys with ADHD have a double whammy.

Also directed by the frontal lobe are words, eyes, and motor skills. This particular area is consistently smaller in all ADHD children. Expectedly, this smaller area of the brain lends itself to problems with inhibition.

Studies of white matter diffusion are consistently abnormal in the ADHD brain and this is very important in reading.

The volume of white matter is also smaller in ADHD children in both males and females. This has a major effect on slow time performance.

Recent studies are being done on the 4 year old brain. The basal ganglion clearly begins to show abnormalities even earlier in other parts of the brain.

Brain scans on ADHD people show much more activity than the normal group. Whether the tasks are easy or difficult, their brain has to work much harder than the normal group. This was clearly evidenced in reading comprehension tasks in which the child had the basic reading skills, but could not perform well.

**How Reading is affected**

You must be able to read quickly as you get older.

ANY task that is timed will show a lower performance for ADHD students (even simple functions such as following a dot on a screen with their eyes.) There is a direct impact on academics.

Too much information coming in too fast bottlenecks the brains and the child cannot perform the task well. If the information is coming in quickly, the lag period is jumbled and the performance is poor. This is critical in school.

Reading is affected because, even though the child has the basic skills, they cannot process the information as quickly as other children.

Testing children on working memory helps identify ability in dual tasking; planning and retention skills can predict reading comprehension.

It is important to be aware of the impact of increased demand in learning tasks. If you increase the demand on anyone, the performance will worsen. So, even if we do this to children without ADHD, we can bring them down to where AHDH children are all of the time.

**How to teach children with ADHD**

~Allow info to come in a predictable manner overall. On occasion, they need a little unpredictability in the way you present the material.

~If it is boring, you will lose them.

~Studies have shown if you “jitter” the information and show it in different ways, the ADHD performance improves. Multi-sensory learning is very helpful.

**Suggested strategies**

~Use organizational tools.

~Repeat instructions.

~Use highlighters and underline anything important, even if it is not necessary for the average child.

~Allow movement in the classroom.

~Moderate speed and multi-tasking.

~Use moderate unpredictability to avoid boredom, keep engaged.

~Structure lessons. (Less work for the brain.)

~Be aware writing notes can slow the processing of the ADHD brain.

~ADHD children need more *direct* teaching.

~ADHD students will need social guidance, especially with impulsivity.

~Repeat skills at different intervals.