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Attention Deficit Hyperactivity Disorder

DISCLAIMER: the following is not meant to treat anyone with advice or tell you what you should do, such as relative to use of medication, exercise, or changing your diet. The information in this handout is merely offering what has been published in the research literature, as well as based on my professional experience. Talk to a doctor or other appropriate professionals as to what is best for your own specific needs.

It should also be appreciated that everyone has their own perspective on how to improve health. Nutritionists do it through food. Physicians do it through medicine. Psychologists do it through changing thoughts, feelings, and behaviors. Consequently, what is offered here is a reflection of my own bias and perspective.

Lots of controversy exists on ADHD. The condition may be over diagnosed, under diagnosed and misdiagnosed. But the disorder is real. There is evidence of it in the professional literature dating back to when George Washington was president in the late 1700's. The name has changed many times over those years. But the underlying problem has remained pretty consistent through out all that time.

ADHD does take a toll on a person's ability to function at their potential. Academic, social, occupational and financial prices can all be paid because of it. It can be treated fairly effectively, although there is no cure for it at this time.

<u>The basics: Diagnosis</u>
When I am asked about the possibility of ADHD being a diagnosis for a child or adult, I look to 'the duck test' to figure out what is happening.

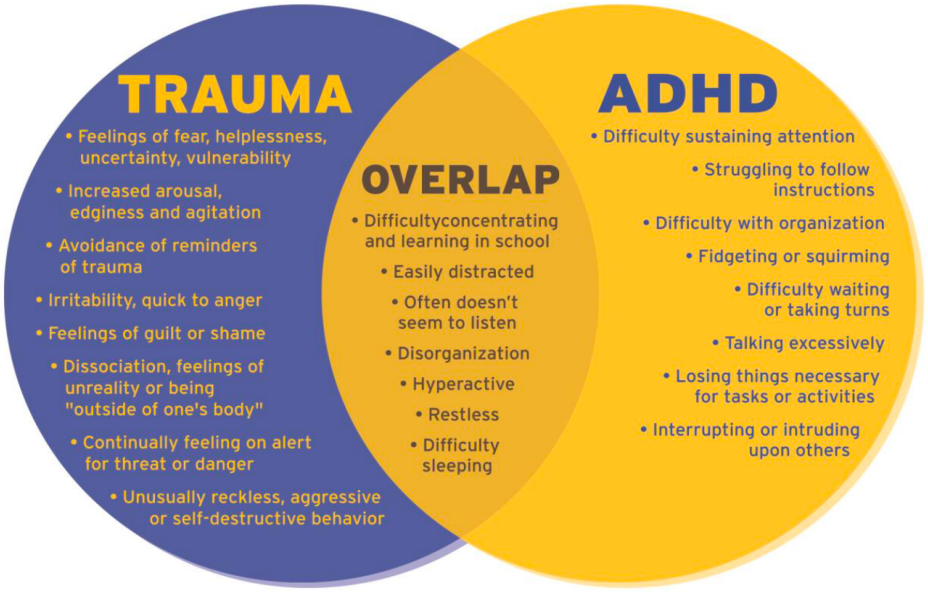
> *If it looks like a duck, walks like a duck, and quacks like a duck, chances are it's a duck.*

What does this mean relative to ADHD?

First is the history of what has been happening over the years. Technically speaking, ADHD has to have been an issue since the early grade school years of life. If a person had no problem with attention back then, and all of a sudden in later years, such as in their teens, twenties or beyond the problem has surfaced, that is not ADHD. Attention can be impaired by any number of factors beyond ADHD. These may include:

- depression
- anxiety

- stress
- medication side effects
- traumatic brain injuries (TBI's) such as from being in a car accident or from sports related blows to the head like concussive episodes or 'getting dinged.' Troops coming back from the wars in Iraq and Afghanistan are also now showing signs of 'ADHD' but in fact it is from TBI's they have suffered from the war, which some now call 'secondary ADHD.'
- strokes
- the effects of alcohol or drug abuse



This illustrates that traumatic events for a child (e.g. neglect, abandonment, physical or sexual abuse, life threatening disasters, death of a loved one, etc.) can create symptoms that may look like ADHD and is another issue that needs to be considered. Trauma and ADHD also make each other worse. Some adverse childhood experiences (ACEs) increase the likelihood of having an ADHD diagnosis. They include:

- socioeconomic hardship
- divorce
- familial mental illness
- neighborhood violence
- incarceration

When the person in question is currently a young child, such as in grade school, it is fairly easy to get a history as to how they have been, such as from kindergarten or 1st grade up till their present. Parents are usually available to offer such information.

I have encountered many parents who asked to be worked up for a possible diagnosis of ADHD after their own children have been found to have the disorder. ADHD has a major genetic

component to it. ‘Apples don’t fall too far from the tree’ and so if the child has it, the chances are that at least one of the parents does too. Few adults of the current generation were diagnosed back when they were in school, because the times were different. But an undiagnosed problem can still cause problems.

With older individuals, such as someone in their 30’s or beyond, getting that early history is at best very difficult and in my experience, usually impossible. Memory is quite fallible, and when someone has to remember what they were like 20-40 years ago, accuracy is highly unlikely. Plus, asking an adult to reflect on what they were like as a child creates its own problem of distortion. Kids have no reference to understand what is ‘normal’ or not. The adult’s parents are seldom available to me to question. And even if they are, they too are subject to the same problems, of trying to remember specific details from decades ago. So, strictly speaking, making the diagnosis is not as certain when dealing with adults using current diagnostic criteria. In simple terms the situation might be likened to having two of the three facets of the ‘duck test’ present, and the third being unknown. Not as certain, but even so it can offer fairly convincing evidence.

What follows below is written in the nomenclature for children. It applies to adults as well, but again, it may not be as clear cut. So, to keep it simple, it will be written as addressing kids, and issues more specific to adults will be addressed later in this paper.

What kind of history am I looking for? Some common complaints include:

- being highly distractible so that extraneous stimuli captures a child’s attention and hijacks them away from what they are supposed to be paying attention to.
- the inability to inhibit themselves as needed. Talking too much in class is one example. Being a ‘class clown’ or saying stuff to others that is rude & insensitive and may cost them such as in lost friendships, are examples of effects of ineffective control.
- a short attention span. Parents almost inevitably report that their child can pay attention to some stuff that they enjoy a lot, such as watching video games or television. Tasks that are not so pleasurable, like listening in school, doing homework, or reading a book, inevitably hear that the child has little to no focus. How long a child can attend to such matters varies. But I most commonly hear it is perhaps 5-10 minutes, with the wider range being from about 1-20 minutes.
- a variation on attention span is what’s called ‘working memory’ which involves what you can remember over a short period of time. Parents say something to kids, and literally seconds later the child has forgotten what it was they were told to do. Another facet of this is time management, such as starting semester long term papers the day before they’re due, or otherwise not being able to plan and prepare for upcoming events.
- homework is a particular problem that parents report to me since it is a daily struggle witnessed in the home. Most parents I meet tell me that they sit with their child to try and help maintain a focus. And even with such effort, kids typically take two hours or more to do perhaps 15-30 minutes worth of work. A smaller percentage of parents will tell me of the opposite experience – where kids rush through it far too fast, spending maybe five minutes on what really needs a half hour to do well.

- bopping around from one task to another without finishing much if anything in the process. Kids will do a few minutes of this, and then a few of that, but they can not see anything through to completion all at once. A common complaint is that a child may read a paragraph or two, or at most a page or so of a book before losing their focus. The ability to read chapters at a time, be it something like Harry Potter or textbooks for school, is seldom heard. There are exceptions, but they are a distinct minority.
- disorganization. There is a nearly universal complaint I hear, especially from mothers, about their child being very messy such as in how their bedroom is kept. Let's face it: kids are sloppier than adults. So, this complaint by itself is not that valuable to me, since I have no way to know if the child is 'average messy' or 'worse than average messy' or 'better than average messy.' But, disorganization is still a common problem and it may be more effectively communicated by noting if the kid is constantly losing personal items. The one I hear of most often is homework, where the assignment is done but not turned in. Many parents tell me that their child is doing the homework, knows the material, but is being marked down for not getting it turned in to the teacher because it has been forgotten, or stuffed in to a book bag or locker. Lower grades including F's result, even though the child may be bright. Other lost items may include textbooks, house keys, wallet, watch, jewelry etc. If such items are being lost, are they found in a few seconds or minutes, a week or a month, or gone for good? Are multiple versions of the same item (e.g. five watches in five months) being lost?
- fidgety and squirmy behavior, or 'always on the go' is another common feature, especially for boys. Kids who get up and walk around the classroom while the teacher is talking is a common complaint I hear from parents and school. Not being able to sit for more than a few minutes of homework without moving around is another. A fair portion of kids can not even sit still to watch a favorite television show, such as a half hour sitcom. Some mothers have told me that during pregnancy they thought their child was hyperactive. "It felt like they were climbing on a jungle gym!" A warning to heed: the absence of such hyperactivity and fidgety qualities in a girl is not necessarily indicative of ADHD being absent. Hormones make a difference. Plus, girls are taught from day one to be 'little ladies.' 'Boys will be boys' is a very different way of being raised, and their behavior is far less controlled by parental demand. i.e. Girls tend to have the inattentive elements of ADHD, and often are not showing the hyperactive/impulsive ones. Even so, ADHD is still present, and can take a toll on them just as it can on boys.
- difficulties with regulating emotions, arousal, and motivation. ADHD kids can be more hot headed, or emotionally reactive, than others. Lack of arousal may be seen the most around starting homework, where an ADHD kid needs constant prodding, 'Sit down and do it!' But it can come out in other ways, such as being easily bored in class, or not remaining alert at a job especially where they have to be sedentary (sitting at a desk, standing in one spot). And motivation is based more on 'What's fun at this moment?' vs. being able to work toward longer term, or delayed rewards such as 'Earn good grades for all of high school and you can get in to a good college.' The immediate payoff ('This is fun!' 'This is exciting!') grabs ADHD kids far more than others, even if it is harmful for them in the longer run. Motivation to have good performance at school or at a job is based more on external forces (a parent, teacher, or boss) than intrinsic ones of 'I take pride in what I do, and want to do well for my own reasons.'

- Giving up too quickly when they run in to problems. Part of life involves being able to think flexibly, figure out alternative ways to solve problems if one approach is not working. ADHD individuals tend to 'throw in the towel' way too quickly. 'This is impossible! I give up!' and so hurdles that are in the way of goals like educational and vocational success become more of an impenetrable obstacle. Higher drop out rates from school, lower rate of being promoted, or being fired more often from a job are all consequences of not being able to problem solve and overcome what should just be routine difficulties.
- greater variability in the quality or quantity of work performance, or the speed at which it is completed. People with ADHD can sometimes do quite well at a task and other times very poorly, and there is not much consistency over time, and this is especially true for individuals with the more impulsive elements of ADHD.
- social abilities are often affected. Part of growing up and maturing is learning how to get along with other kids. Listening quietly, taking turns, sharing, and being patient are all involved. Such skills are typically not the forte of ADHD kids. Consequently many have problems with making and/or keeping friends. Many parents will tell me that their child gets along with other kids. But, usually what parents are thinking about is playing a board or team sports game with other kids and getting along okay. When I rephrase the question to 'Does your child invite others over to your home?' Or, 'does your child get invited over to other kids for birthday parties and the like?' Or 'Does your child seek out other kids on the weekends?' what I typically hear is 'no.' Research suggests that 70% of kids have no friends by the time they reach 2nd grade.
- situational variability. In some settings, especially more 1:1, or those with close supervision, or something that is truly enjoyed by the individual, or there is an immediate payoff, ADHD people can do well. In other settings (if something is boring, or if they are working independently), work suffers.

Another common complaint I hear from parents is that the problem has persisted for years, and everything that has been tried to date has failed. Tutors, special ed in school, punishment, reward systems for doing well, extra supervision at home such as while the child is doing homework have all been tried. Nothing works.

One issue that is not recognized officially as to a diagnostic criteria and not well understood is the time perspective that people with ADHD have, which is more 'Right now' and not geared to 'the future' such as delaying gratification so that something bigger and better is achieved. The graphic below captures this change in perspective.

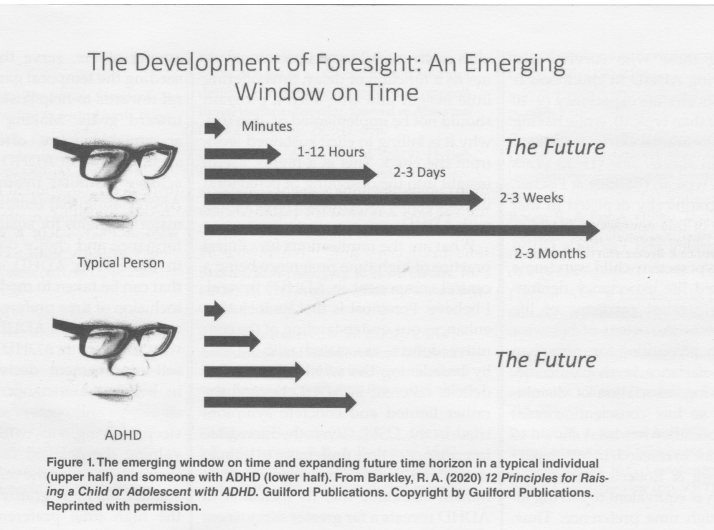


Figure 1. The emerging window on time and expanding future time horizon in a typical individual (upper half) and someone with ADHD (lower half). From Barkley, R. A. (2020) *12 Principles for Raising a Child or Adolescent with ADHD.* Guilford Publications. Copyright by Guilford Publications. Reprinted with permission.

The consequence of this shorter time perspective? One is that giving a reward for something, like 'earn an A in your class this semester and we'll give you…' is meaningless to someone with ADHD. The reward needs to be more immediate.

This shorter time perspective also leaves such a person more impulsive, and unable to appreciate benefits of longer-term choices such as 'Eat well and in nutritionally sound ways' or 'Sleep well' or 'Get a good education to get a good job.' It also has implications for engaging in higher risk activities as to 'This is fun in the short term, I won't think about the longer term consequences if something goes wrong' - which could be unprotected sex, or speeding on the highway, or shoplifting something big that could lead to criminal charges.

I also hear that teachers typically are raising a concern about possible ADHD, often from an early age such as first grade. At the least, they are concerned about a child 'not being able to focus' or 'always being on the go' in the classroom. Teachers are smart when it comes to kids' behavior. They see scores if not hundreds of children in a year's time, and over their career. They have a lot of experience in knowing what is normal behavior for a child and what is unusual. So, I listen closely to what teachers say, and give them a lot of respect for their insights and thoughts about how a child is behaving in school.

Another element of history that I look for are one or more factors that are correlated with ADHD and may be causes of it. These include:

- a family history of ADHD especially among the first-degree relatives
- being born prematurely and significantly low birth weight
- even low levels of lead in the blood. It is known to interrupt dopamine which is a major neurotransmitter involved with ADHD. There is some research that is finding that 'heavy metals' like lead are a primary factor in the development of ADHD (and other childhood disorders such as autism and disruptive behaviors). One study found that the 'typical' level of lead in kids, 1.1 – 1.3 mcg/dl, doubled the risk of ADHD vs. a blood lead level below 0.8 mcg/dl. Having a lead level of 2.0 mcg/dl or greater quadrupled the risk. Research also has found that high exposure to lead in childhood was linked to a permanent loss of brain tissue, especially in boys. It occurred in the area of the brain known as the prefrontal cortex, which is right behind the forehead. This part of the brain controls executive functions such as emotional regulation, impulse control, attention, verbal reasoning, and mental flexibility. Lead is prevalent in the environment due to decades of pollution such as through leaded gasoline and paint. It is also found in food colors, with "allowable" levels per the FDA of up to 10 ppm. Vegetable oils being refined with phosphoric acid introduces up to 10 ppm of lead, and citric acid usage may introduce up to 1 ppm of lead during this

process. Research has been done which has found an inverse relationship between dietary zinc and calcium and lead levels in kids' blood and this relationship holds in both directions as to ways to lower blood lead levels through more of these minerals being taken in by kids. Zinc also helps protect the body against accumulating heavy metals like lead. The food dye Yellow #5 (often found in soft drinks, tortilla chips, popcorn, Sunny D orange juice, Starburst candy, Gatorade, and cereals) lowers zinc as an example of a hidden factor that can lead to higher lead indirectly. Sub-optimal zinc levels make it harder for the liver to clear out heavy metals like mercury, lead, cadmium and arsenic which can then accumulate in the body, disrupt the brain's functioning, and lead to ADHD symptoms

- Another hidden factor that can contribute to calcium loss in a person is consumption of a high fructose diet (e.g. from high fructose corn syrup, HFCS, which is prevalent in highly processed foods). As of 2019 the average American was consuming over 21 lbs. of HFCS. (World Journal of Clinical Pediatrics, "Higher rates of autism and ADHD in American children: are food quality issues impacting epigenetic inheritance?" Renee Dufault et al, March 2023).
- lack of oxygen at birth (e.g. the cord around the neck, and the infant being blue)
- prolonged labor
- jaundice in the first few days of life
- fetal alcohol syndrome (or, maternal alcohol consumption during pregnancy)
- exposure to cocaine in utero
- preeclampsia
- number of maternal infections during pregnancy
- maternal smoking during pregnancy
- low thyroid function in the mother during pregnancy
- exposure to secondhand smoke (and lead + secondhand smoke have an additive effect on each other)
- mothers who use narcotics during pregnancy more than double the risk for ADHD compared to those who do not use such drugs. The same study found that risk for ADHD increases with exposure to multiple substances including tobacco and marijuana. (JAMA Open Network, "Individual and combined association between prenatal polysubstance exposure and childhood risk of ADHD" H.M. Garrison-Desany et al, 3/11/22).
- exposure to mercury or pesticides. Women who are pregnant have been warned for years to avoid or limit their fish consumption especially of those varieties that are known to have high levels of mercury. One issue to be aware of is that there is the typical level of mercury in one's body, and then there can be spikes on a short-term basis from eating a meal with a lot of mercury. Such spikes may or may not be safe during pregnancy depending on when it occurs such as during the first, second or third trimester and what is being developed in the fetus at the moment. Methyl mercury (from fish) can pass through the placenta to the fetus. Babies and those breastfeeding have rapidly developing brains and mercury can do a lot of damage to that process. One study (Environmental Research, "Cognitive performance of children prenatally exposed to 'safe' levels of methyl mercury"

May 1998, P. Grandjean et al) looked at 112 kids who had mothers with hair mercury concentrations of 10-20 mcg/g compared to those kids with exposure below 3 mcg/g. The kids with higher exposure "showed mild decrements, relative to controls, especially in the domains of motor function, language and memory. Subtle effects on brain function therefore seemed to be detectable at prenatal methyl mercury levels currently considered to be safe." Other research looked at umbilical cord blood and its mercury level and found that it was about 70% higher in mercury concentration than maternal blood. If a lower blood level of mercury (of 3.5 mcg/l vs. 5.8 mcg/l that is typically accepted as being "reasonably certain to be without appreciable risk" as the EPA puts it) is used to compensate for this issue, then the number of women of child-bearing age with that mercury level or higher in the U.S. would result in 600,000 newborns/year who receive "in utero mercury exposure that is associated with increased risk of neurodevelopmental effects." (Transactions of the American Clinical and Climatological Association, "Mercury exposure: medical and public health issues", Kathryn Mahaffey, 2005).

- chronic elevated parental stress during pregnancy
- adverse early environments (e.g. malnutrition, or placement in a substandard orphanage)
- maternal use of acetaminophen (Tylenol) during pregnancy
- micronutrient and mineral deficiencies in the mother during pregnancy
- higher exposure to the chemical BPA (bisphenol A) as shown through urinary levels, with the association stronger in boys than girls
- there is some Canadian research from 2019 done on 1,877 kids ages 6-17 that found an association between fluoridated water and ADHD being increased by almost 3-fold, with the biggest effect found in teenagers suggesting that there could be a cumulative effect over time
- use of antibiotics in the first two years of life, especially five or more times
- the mother being on some anti-seizure meds especially during the first trimester of pregnancy. Depakote was associated with a 74% increase in the likelihood of ADHD in the offspring in one Swedish study. Tegretol and Lamictal did not cause such problems.
- diabetes in the mother. Type 2 diabetes created a 43% greater risk of ADHD in the offspring. Gestational diabetes especially between weeks 27-30 also increased risk of ADHD (along with autism, and especially intellectual disability). Fathers having type 1 or type 2 diabetes also increased risk for offspring, but a weaker level than mothers.
- there is research that 'screen time' (tv, cell phones, laptops, iPads, etc.) is causing problems. One study involving about 2,500 kids ages 1 and 3 and followed for six years found that more tv watching at those early hours was associated with attention problems by age 7. (Pediatrics, "Early television exposure and subsequent attentional problems in children" Dimitri Christakis et al, 2004). A meta-analysis of nine studies involving over 81,000 kids found excessive screen exposure may significantly contribute to ADHD in kids. (Reviews on Environmental Health, "Screen time and childhood ADHD: a meta-analysis" Hezuo Liu et al, 5/11/2023). Another study involving pre-schoolers had stories offered to them on screen or read aloud. After 6 weeks brain scans (EEGs) with the screen exposed kids brain patterns similar to those with ADHD. (Trends in Neuroscience and

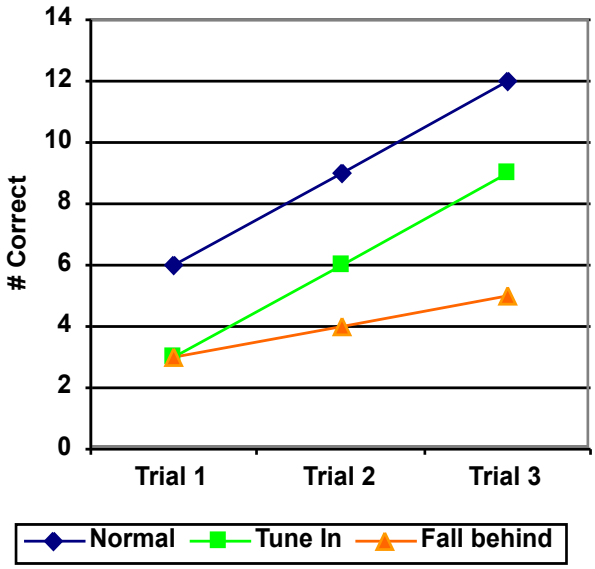
> Education, "Screen-exposure and altered brain activation relation to attention in preschool children: an EEG study" Michal Zivan et al, Dec. 2019).
>
> However, there is a 'chicken or egg' question that arises. Do kids with ADHD gravitate to screens, or do screens 'cause' ADHD? Or are parents simply allowing kids with ADHD more screen time such as to keep them occupied and quiet?

The 'second duck' I look for is behavior in front of me. I have seen kids in my office who were sliding down their chair, crawling under my desk, diving off the chair's arm, or literally walking into walls intentionally and playfully bouncing off them. That's hyperactivity. However, there are a fair portion of kids who will sit quietly and be very polite and well behaved in my office. The parents and teachers tell me the child is out of control. What's happening? Being in a doctor's office can change some kids. They may be more inhibited and restrained, anxious or intimidated. So, if poor attention and/or hyperactivity is witnessed by me, I take note of it. The absence of such behavior is not proof of anything. False negatives are always a possibility.

The third duck is formal test results. There is a myth going around that 'no test can assess for ADHD.' Not true. There are a number of psychological tests which can assess for problematic attention. No test can *diagnose* ADHD. But, no test can diagnose breast cancer or diabetes. Have you ever heard a drop of blood, or mammogram radiograph speak? Tests offer pieces of information. A doctor needs to think about and understand such information, based on training and experience, and to make the final diagnosis of what is occurring in the individual.

Tests can be employed to look for different facets of what may be ADHD. Short term memory is typically poor, as was just noted, because learning is not occurring as it should. Information can be presented several times in a row, and a 'learning curve' plotted out. How well does a child 'tune in' from the outset? How much progress do they make over several trials? How much information is retained over time, such as an hour or a day, so that it has a chance to get shunted over to long term memory?

Kids with ADHD typically do not 'tune in' well. Say something to them, and they come back with "What?" or "Huh?" Some make average progress – but having started from behind they never close the gap. Others start from behind and then make less than average progress. So they fall still further behind.



The graph to the left offers examples of both of these patterns. The graph illustrates how many items are correctly answered out of a hypothetical task involving fourteen problems. The particular graphs shown are meant to be descriptive. That is, someone with ADHD does not have to match these graphs precisely.

Still other tests that I employ assess for what are called 'frontal lobe' or 'executive skills.'

Executive skills include abilities such as:

- being able to conceptualize an idea
- being able to figure out how to organize and plan, to bring such an idea to fruition
- then being able to 'get in to gear' and go from the thinking to the doing stage. Kids being able to persist as needed on such a task, and 'staying in gear.' Kids who quit prematurely, such as from high frustration, probably have problems with this element. Another facet of what can be called weak self-motivation involves kids who get hijacked from 'boring work' be it homework or chores, to something more fun or interesting and then never seem to get back to doing what they're supposed to. Lack of self-motivation can be heard from many parents and teachers who talk about kids 'not living up to their potential' because they don't try hard enough.
- once something has been started and persistence has occurred, being able to look for, catch and correct mistakes in a timely manner. That is, 'getting back on track' when errors do occur.
- once a task has been completed, realizing this, and knowing that it is time to stop. 'Beating a dead horse' serves no purpose.
- being able to behave as needed and expected. Acting like 'a bull in a china shop' is not well tolerated. The more common analogy I use is 'the screaming child in the grocery store' such as little kids who want candy in the check out line. Little kids may get away with such behavior. Older children, such as adolescents and teens, and definitely adults, can not yell, scream, have tantrums, or otherwise behave inappropriately for long in any setting without paying some stiff consequences.
- time management is another skill, that becomes more apparent from the middle school grades on up, and especially in high school and college. The difficulty of completing homework in an appropriate amount of time is one example. Another is that of students

who are given a big project to complete over the course of a month or a semester, who begin it only in the last day or two before it is due, and then has to rush to get it in.

Kids with ADHD typically have very poor executive skills. I already have mentioned disorganization being a common complaint of parents. The impulsivity, hyperactivity, fidgeting and squirming, and 'bouncing off the walls' are also illustrations of the last bulleted point noted above, where behavior is outside of societal expectations. Kids who bop around and have inadequate attention span are probably having problems with the 'staying in gear.' Distractibility, and minimal attention span may involve the 'inability to get in to gear.' There are questionnaires that I employ that assess for such issues. And formal tests also can be administered which are designed to evaluate for these types of difficulties.

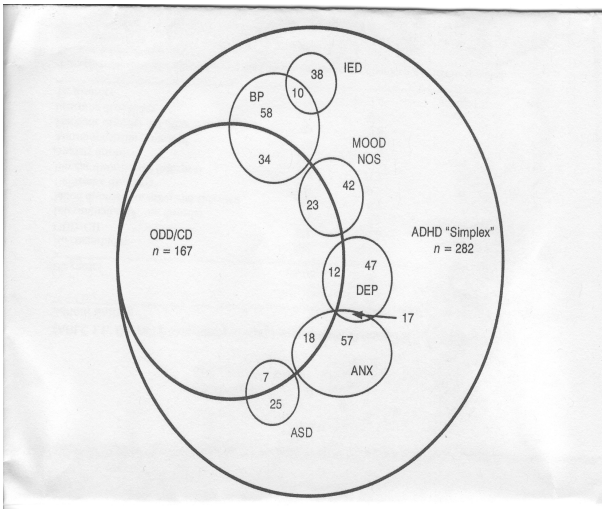
Something else to consider is that there is an increased risk that ADHD kids will have seizures, and that seizure patients will have ADHD. Research has found that the risk in both directions is about 2.5 times higher than normal, especially for kids with frontal lobe epilepsy. My own experience is that I have seen a lot of ADHD kids who have what I call symptoms suggestive of sub-clinical seizure activity. That is, full blown 'seizures, like a fish flopping around out of water' are not happening. But instead the child is having several odd sensory or perceptual experiences that are occurring on a periodic basis that may be indicative of 'little blips' of abnormal electrical activity. Such odd sensory experiences can include:

- hearing one's name called out when no one is talking to them
- seeing 'shadowy, ghost-like images' moving around typically in one's peripheral vision
- a feeling of bugs crawling on or under the skin most typically on the limbs
- odd smells when nothing is present that would be making them
- odd tastes for no good reason
- seeing items look much smaller than they really are (e.g. an experience like looking through a pair of binoculars from the wrong end)
- seeing items look much larger than they really are (e.g. something looking magnified)
- a feeling of floating out of one's body while the person is awake (i.e. not while dreaming)
- a feeling of one's body being distorted such as in shape or weight

My advice to parents when I hear of such symptoms being present is 'Talk to the pediatrician' and discuss whether a more thorough neurological evaluation is warranted.

I also look for a 'fourth duck' to make the diagnosis of ADHD. What else might explain the current problems a child is having?

- Depression?
- Anxiety?
- Autism spectrum problems?
- Brain injury such as from car accidents, or 'getting dinged' playing sports?
- Alcohol or illicit drug abuse?
- Traumatic experiences (incest, rape, death of a parent, etc.)?



The graphic below is an illustration of what was found in one study that involved 282 people who had ADHD.

What it is representing is that many other problems can occur with ADHD. Most prevalent are ODD/CD (oppositional defiant disorder, and conduct disorder, which 167 people in this group had). Others are BP (bipolar disorder), Mood Disorder NOS, depression, anxiety, IED (intermittent explosive disorder), and autism spectrum disorder (ASD). Some people in this sample had multiple diagnoses on top of the ADHD. One survey found that 67% of teens with ADHD are anxious and 46% are depressed.

Other research studies have suggested that learning disabilities occurring with ADHD may be present at the estimated rate of 20-60%, language difficulties occurring perhaps at the rate of 40-64%, along with tic disorder (10-15%), motor coordination difficulties, and epilepsy. Kids with Tourette's have a 35-80% chance of having ADHD, while ADHD kids have under a 2% chance of having Tourette's. Overall, 52-87% of kids with ADHD have at least one other psychological issue present, and about a quarter have two or more problems on top of ADHD.

Of course it is also possible that these types of diagnoses might exist without any ADHD being present.

One of the problems I sometimes come across especially with young adults such as those in college or a bit beyond is that they do not report a lot of ADHD symptoms and yet I make such a diagnosis based on my own behavioral observations and formal test findings. Why is this? There is research that has found that there is a vast difference between what parents will say vs. what these adult children claim about themselves. Some research found that only 4-5% of such children offered enough information about themselves to be diagnosed with ADHD by age 21 - while nearly 66% of them met diagnostic criteria offered by parents. Even at the age of 27 there was still considerable disagreement between the children and their parents, and they did not start to reach agreement until the early to mid 30s. Lack of self-awareness by the children are seen as being responsible for this effect. ADHD takes a toll on such self-awareness especially in social contexts.

As an example of how gross such lack of self-awareness can be: many years ago I saw two 20 year old males in a short period of time, each for an ADHD evaluation, and who were unrelated to each other. Both denied having any behavioral difficulties in their grade school years. Both of them had their mother present in the office with me at the time of the appointment. Both mothers exclaimed in disbelief, "What?!!" in response to their denying behavioral problems during their schooling. Both mothers told me the same story: each had been ***expelled*** in pre-k, then in kindergarten, and then in 1st grade because their behavior was so bad. Neither of the boys denied that being the case, they just did not appreciate it being out of the norm.

These ‘four ducks’ give me a lot of evidence and allow me to diagnose whether or not a child has problems with ADHD. Nothing is perfect in life, and this method is not fool proof. But, it does have a high accuracy, and errors are few in my experience.

Kids with ADHD are often called ‘accident prone.’ They run around wildly and out of control. Or, they are ‘thrill seekers’ and take large risks, such as jumping off roofs of houses or out of tree branches high above the ground. Such behavior basically is gambling, and sooner or later anyone who gambles enough will lose. Beyond broken bones and trips to the ER to set them resulting, some of these lost gambles may entail pediatric TBIs, which as mentioned earlier can be called ‘secondary ADHD.’ There is some research which suggests that up to 57% of ADHD kids are ‘accident prone’ which is well above the level for non-ADHD kids suffering such injuries. Plus, 15% of ADHD kids have had four or more serious accidental injuries, such as broken bones, accidental poisoning, lost teeth, etc. ADHD kids who are on stimulant medication such as Ritalin have a lower rate of trauma-related admissions to hospital ER’s.

Some research has found that kids without ADHD have a 5-7% rate of ‘secondary ADHD’ due to sustaining pediatric TBI. Kids with ADHD have a rate of 25% of secondary ADHD from such TBIs, and this figure is considered conservative and probably an under-estimate of the true number. Regardless, such a rate is reflective that with so much thrill-seeking gambling occurring, they ‘lose’ more often.

ADHD kids having a higher rate of concussions such as from sports is one matter. Another finding is that they have more concussive related symptoms compared to kids without ADHD. Plus, the recovery from a concussion is more complicated for ADHD kids with sports-related concussions. TBIs, whether sustained by kids or adults, come in varying degrees. The common labels are minimal, mild, moderate, and severe. ‘Minimal’ we can forget about, I call them ‘little dings’ and are like ‘goose eggs’ some people get from a minor blow to their head. Most TBIs are ‘mild.’ However, with moderate and severe TBIs the risk of secondary ADHD rises, and research suggests that with the severe forms of pediatric TBI the rate is 48%.

Secondary ADHD can disappear as the brain heals over time, especially with milder TBIs. However, if symptoms are persisting for more than two years, it might be considered a chronic and permanent problem at that point.

Another issue to mention is that there is an elevated rate of migraines found in kids with ADHD, and adults too. What the connection is between them is not clear but the presence of such headaches makes managing ADHD symptoms that more challenging. One survey found that 26% of ADHD kids between the ages of 6-18 had migraines vs. 10% of healthy controls (Brain & Development, “Migraine and associated comorbidities are three times more frequent in children with ADHD and their mothers” Meryem Kutuk et al, 6/16/2018).

Why does ADHD matter?

Here is a quick summary as to some of the differences that arise between someone with ADHD vs. those who do not have the disorder, and various aspects of life.

	ADHD	Non-ADHD
High school drop out	17.7%	6.0%
College degree	37.1%	67.5%
Married	26.7%	45.7%
Fired from a job	50.9%	21.2%
Pay	$20,000.	$30,000.

(from Barbaresi et al, poster session at Society for Developmental Behavior Pediatricians, 2011)

There are some who say that ADHD is actually a more functional state. It may allow a person to multi-task, and not just focus on a single issue at a time in more mundane and boring ways. Modern life is certainly fast paced, and few people, especially adults, can afford not to multi-task throughout the day. One father who had been diagnosed with ADHD, and had his son in to see me for such a possible diagnosis, said that his using medication for ADHD allowed him to better handle "the administrivia" of life. Needless to say, he did not think much of administrivia, and preferred to be more creative, and free-thinking. So, he no longer was taking the ADHD medication that had been prescribed to him.

What I more commonly hear from ADHD individuals, or their parents or spouses, is that they are not functioning well. With kids, grades are usually very poor. C's and D's, or D's and F's are being made. A modest percentage of kids with ADHD can still make A's and B's – but they do so at a tremendous price of energy and time. One college student with ADHD, who made such high grades, told me that she had to write ten drafts of a term paper to accomplish what her roommate did in just one or two. And, she needed weeks or months to create what the roommate accomplished in a few days.

When ADHD medication is employed and is effective in controlling at least some of the symptoms, I usually hear that a child's grades jump by at least two points, such as a D/F student becoming a B/C, or a C/D turning in to an A/B. A fair portion of kids I work with go from D/F grades to A's and B's. Moreover, IQ scores tend to jump by an average of 10-15 points, which is a lot.

The medication is not making the person any smarter. Rather, what is happening is that the child is 'no longer driving with the brake on.' You can drive with the brake on – but an awful lot of energy is wasted in the process. Research also has found that what is happening is that grades in ADHD kids suffer more from the inattentive side of the disorder rather than from a child being too hyperactive or impulsive. Improve their ability to stay focused, and grades go up.

Parents also need to remember that the best time in life to get an education is as a child. It is very hard to go back to school, be it for a high school diploma, or a college degree, later in life when marriage, kids, a mortgage, and work responsibilities demand almost all one's time.

Moreover, the human brain is most adept at learning skills for a relatively short length of time, and virtually all of this neurological window of opportunity is during childhood. Consider what the spoken language skills are of a 2 year old child, who can barely utter single words or just short phrases. Then look at a 6 year old child, in 1st grade. Vocabulary has exploded to thousands of words in those four years. Grammar and syntax have developed fairly well and far surpass a toddler's "Me go potty." Now consider the average high school student who tries to learn a foreign

language starting in 9th grade. How much progress can such a student make between 9th and 12th, compared to the child between ages two and six? Far less. Why? The region of the brain that controls language is only neurologically open for a few years, from roughly the ages of two to perhaps ten or so. Past that point, it becomes far harder to pick up language once that region of the brain seals shut.

What is the message here? There is a need to fill the brain with knowledge and understanding when it is amenable to learning. Wait too long, and the ability to learn is greatly reduced. I most commonly see this in adults who are dyslexic. They never learned to read as a child and were shoved through school. They repeatedly try to learn how to read as adults, and few ever succeed to any extent in my experience.

Most parents value education for their children. Anything that interferes with a child becoming educated during the formative years will exact a very high price for the rest of that person's life. What that says to me is that the unique opportunity, of becoming educated during childhood, should not be wasted. If ADHD interferes with education, take the necessary steps to treat it so that learning can occur. Arguing about creativity, multi-tasking, or administrivia misses the point. What matters is education. Make sure your child gets it while they can.

Another problem that ADHD can cause is having difficulty getting along with others, such as peers. Difficult social relationships can lead to delinquency, truancy, under achieving in school, dropping out altogether, and other forms of maladjustment.

Why do relationships take a hit with ADHD? Remember those executive skills, they are involved here. Being able to control one's emotions and not be impulsive has a big impact on social relationships, such as blurting out something that is rude or insensitive. Such impulsivity can involve low frustration tolerance or being less empathic to others, which has obvious implications for causing troubled relations.

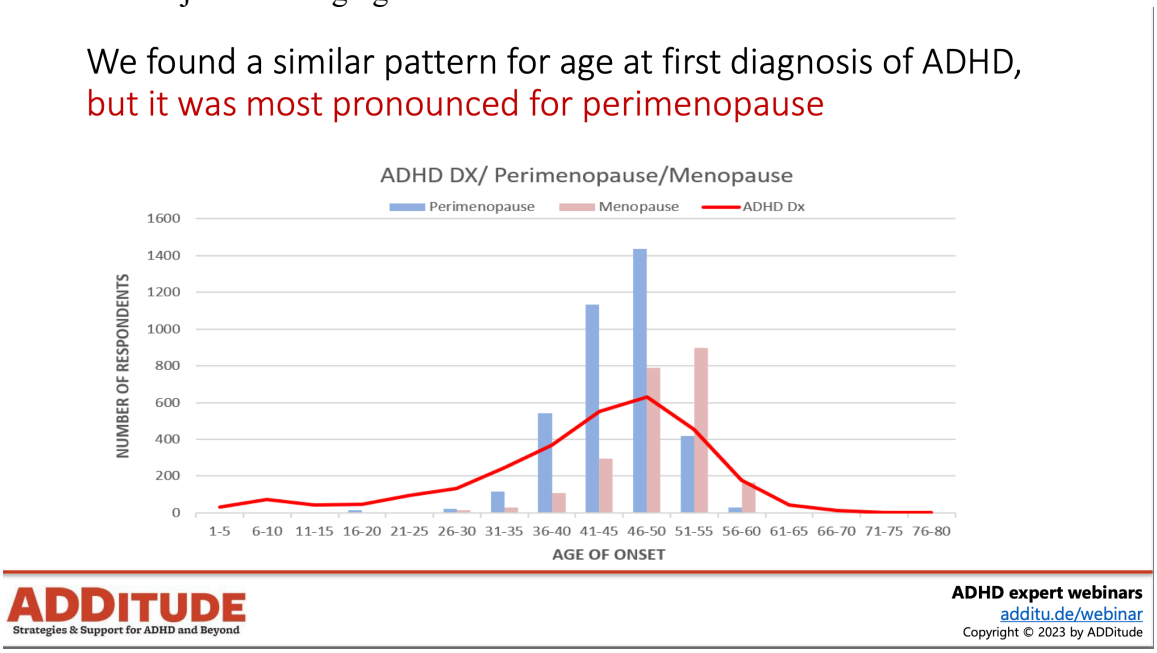
Another executive function that impacts relationships involves organization, planning, and self-monitoring. ADHD kids may not be able to monitor and be aware of how they are coming across to someone else, such as being rude or insensitive. Problems with a skill like planning can impact kids, such as if they do not think about what might impress a friend such as by sharing something vs. what may hurt another's feelings by not sharing and being selfish. Or, poor planning might come out by an ADHD kid grabbing for some other child's toy vs. figuring out a way to ask to politely ask to play with it.

Another executive skill that can impact friendships is cognitive flexibility and problem-solving abilities. Can a child be flexible and figure out a way to 'go with the flow' and change their expectations when something arises and requires them to bend in what they expect? Little kids who get into screaming fits at the grocery when they want to buy some candy and they keep on no matter what is an example of rigid behavior that is dysfunctional quite quickly. Grade school kids cannot get away with that so easily. If they insist 'This is what I want! And I'm going to get it no matter what!' they are viewed by others as bullying, controlling, demanding, insensitive to the needs of others, or otherwise out of touch with the needs of others.

The ability to regulate one's emotions is another important executive function. Crying in class, boisterously laughing during religious services, or yelling in doctor's offices are all inappropriate. There are times that such emotions are more appropriate but there is a need to be aware and capable of controlling oneself to not offend others or make them feel that you are out of control emotionally. Obviously there is greater tolerance for little kids to have some difficulty here vs. older ones. But even so, there are expectations for any age child to behave within some limits.

Something else to appreciate is that 'girls are different.' They have different hormones than boys especially after hitting puberty as to the amounts involved. It is believed that dopamine levels in various areas of the brain are reduced in ADHD individuals which causes the symptoms of the disorder but can also impact mood. Females' (who have gone through puberty) changing hormonal levels over the course of a month are thought to play a role in ADHD symptom severity with estrogen and progesterone involved. There was one study done in the Netherlands that looked at this issue somewhat. (They used mostly self-report questionnaires which creates some questions about accuracy.) But findings included that premenstrual dysphoric disorder (PMDD) was found in about 46%. of the ADHD women vs. about 29% of the general population. Post-partum depression after birth of a first child was almost 58% in ADHD vs. about 15-20% (depending on low, middle, or high income countries being used). (Journal of Psychiatric Research, "Prevalence of hormone-related mood disorder symptoms in women with ADHD" Farangis Dorani et al, Dec. 2020). ADHD symptoms

Researchers also theorize that during the follicular phase higher estrogen levels lead to better mood and executive function. But with that comes spikes in impulsivity and hyperactivity. In the luteal phase lower estrogen and greater progesterone might result in problems with emotional control such as PMS and working memory, and ADHD meds may be less effective then. In pregnancy when progesterone and estrogen are very high ADHD symptoms decrease. One survey of more than 4,000 perimenopausal women greater difficulties arising then due to a suspected change in the dopamine-estrogen relationship. However, as of 2024 no definitive, long-term studies exist on this entire subject of changing hormones in women and ADHD.



https://www.additudemag.com/wp-content/uploads/2023/11/12_19_23-wasserstein-hormones-adhd.pdf

The above graph was taken from a survey done by ADDitude magazine on 3,549 women who were perimenopausal or menopausal, with 81% who had been diagnosed with ADHD. The #1 symptom that first appeared during menopause or perimenopause was brain fog & memory issues with 60% noting it. Other symptoms like inattentiveness, distractibility, time management problems, disorganization, etc. were down in the 5-25% range. As to the impact of symptoms executive dysfunction, emotional dysregulation and social struggles worsened the most. As to why ADHD is surfacing so prominently in the perimenopausal years one possible explanation is they were borderline ADHD in years past and the hormonal changes pushed them over the line. Or they were ADHD in the past but they were coping with it and now it is getting worse. For those who received hormone replacement therapy roughly the approximate numbers as to what that did for ADHD were

	% reporting
ADHD improved	25
ADHD worsened	5
Made no difference	35
'Other'	35

Then there is pregnancy in girls with or without ADHD. A Swedish study (JAMA Open Network, "Association of ADHD disorder with teenage birth among women and girls in Sweden" Charlotte Skoglund et al, Oct. 2019). It looked at females in Sweden who gave birth for the first time between 2007-2014 involving 384,103 people including 6,410 with ADHD. The rate of pregnancy with vs. without ADHD was 15.2% vs. 2.8%. Substance abuse was the most common comorbid mental health disorder among those with ADHD. Contraception is said to be widely available in the country. Research out of Taipei found that long-term use of meds for ADHD decreases the likelihood of early pregnancy by 31%. (Journal of Attention Disorders, "Early pregnancy risk among adolescents with ADHD" M. Hua et al, Jan. 2020).

Then there is depression in ADHD girls. It is three times more likely ADHD females vs. those not with the disorder. For those with ADHD on oral hormonal birth control the risk of depression was five times higher vs. those not on such hormones. For those with ADHD using a hormonal pill the risk of depression was 6 times higher vs. those without ADHD on a hormone. Over the course of the study 42% of the women with ADHD were prescribed antidepressants vs. 11% for those without ADHD. (Journal of the American Academy of Child & Adolescent Psychiatry, "Hormonal contraceptive use and risk of depression among young women with ADHD" Cecilia Lundin et al, Oct. 2022).

There are other serious down sides to ADHD. Research has shown that various problems occur far more often when ADHD is present and is not effectively treated. Generally the increased risk is a factor of 2-4 times greater incidence. These increased problems include:

- increased depression and/or anxiety, and decreased self-esteem and –confidence. It is tough to hear from teachers, peers, and parents 'Why don't you do better?' Or 'Why aren't you as smart as your brother?' Or, 'Why are you so dumb?' Egos take a beating when D's and F's are earned for years on end. Or, from being a child who can't learn to read. Or, from having few if any friends and feeling like an outcast, rejected by others. One third of

ADHD kids in high school have thoughts about suicide, especially among those who are depressed. And about 16% of ADHD kids in high school make an attempt to kill themselves which is more than five times the rate of non-ADHD high schoolers.

- one study (Journal of Attention Disorders, "The mediating role of mental health and substance use on suicidal behavior among undergraduate students with ADHD" N. Brown et al, Feb. 2022) on college students found that there was more double the rate of suicidal ideation for ADHD individuals vs. those without it (about 45% vs. 22%), increased rate of making suicidal plans (about 27% vs. 10%), and about double the rate of attempts (13.4% vs. 5.5%).
- risk of suicide for ADHD individuals also continues into adulthood. This includes there being a higher risk for completed suicides ('successful') as well as ideation and attempts of suicide, for those individuals who have a hyperactive component. Impulsive-aggressive behavior also puts adults at greater risk for making suicide attempts. Suicide attempts are roughly 5 times more likely with ADHD being present. If there is also major depression or an eating disorder on top of the ADHD in the adult, the risk for actual suicide attempts also increases significantly. Females who are hyperactive are especially at risk for actual attempts being made as adults, with a rate almost four times higher than young women who do not have ADHD. And elevated self-destructive behaviors occurs in ADHD hyperactive females who have a history of physical or sexual abuse, or have experienced neglect.
- postpartum depression. A Swedish study ran between 2005-2013 with 3,515 women who had been diagnosed with ADHD before their pregnancy. One finding was that the ADHD women gave birth to their first child at a younger age (15-24 years) vs. non-ADHD mothers (ages 25-34 years). Other research such as out of Taiwan and Holland also found earlier ages of giving birth for ADHD moms. The ADHD women also were likely to have a lower education level and were less likely to live with the father of the child, which might also be contributing factors to postpartum depression.
- dropping out of school. Kids with ADHD often fail a grade, and that by itself substantially increases the risk of dropping out before finishing high school. One third of ADHD kids end up dropping out of high school. And high school dropouts suffer vocationally and financially in the years that follow.
- substance abuse. Nicotine, alcohol and illicit drugs (in declining order of risk) are the three classes that have been researched the most heavily with ADHD and are found to occur more often with ADHD. A good percentage of kids in my experience try to self-medicate through such substances. They either try to calm themselves down (using sedating drugs, which includes nicotine). Tobacco smoking rates in ADHD individuals are approximately double that of non-ADHD people, starting around the age of 15. Or, they try to boost their attention up such as through drugs like amphetamine and cocaine. Such attempts always fail. The toll on health from smoking is well known. Alcohol can lead to arrests (e.g. DUI's), which gives a person a criminal record. It can also cause car accidents leading to possible injury or death. Health hazards (e.g. cirrhosis, gastritis, pancreatitis, and damage to one's brain such as for memory) also occur. Illegal drugs can have comparable effects – but at a greater price legally and toward one's health.
- car accidents. Parents are inevitably concerned about a teen getting a license to drive. The rate of accidents for 16-17 years olds is alarming. Add ADHD to the mix of inexperience and the impulsive, risk-taking nature of a teen, and the result is a greatly increased potential

for being in a crash. Research suggests that having ADHD behind the wheel is comparable to driving drunk. In the process your child and/or someone else's may be injured, maimed or killed. Even without medical risk, serious legal repercussions can occur. Research that came out in 2020 took over 3,000 people from different regions across the U.S. and followed them continuously for 1-2 years including recording them while they were driving. What they found is that factors that are predictive of crashes and near-crashes included

- the degree of self-reported ADHD symptoms was predictive of future driving risk, including more ADHD symptoms being linked to reduced inhibition (e.g. being impulsive)
- distractibility was a major factor
- decrements in alertness while driving predicted near crashes

- other dangerous driving behaviors are increased in frequency, such as: driving a vehicle before they are licensed, or without a valid license. And being more impulsive and risk-taking leading to more crashes. And having greater levels of anger, hostility, and aggression (i.e. road rage). And they are more likely to have had suspended or revoked licenses.
- irresponsible sexuality, in terms of not taking adequate precautions. The net effect: 32% of ADHD boys have fathered a child by the time they are 19 years old. For girls 68% have become mothers by 19. Early parenting has serious consequences educationally, vocationally and financially, as well as creating difficulties in simply being a good parent at such an early age as to the effect on the child. Then there is the emotional toll of an abortion, or putting a baby up for adoption. The toll put on others, such as the new grand-parents who may be forced to raise and pay for the grand-child. Or, financial responsibilities for the teen parent without the ability to meet them, and what that does to them as well as the baby in terms of probably living in poverty.
- The risk of contracting sexually transmitted diseases (STD's) be it HIV, AIDS, or others like gonorrhea or hepatitis, is four times higher for ADHD individuals.
- increased risk of divorce in early adulthood, coupled with more difficulty in obtaining and holding a job, with implications as to decreased family stability and quality of life.
- the longer ADHD goes untreated in an adult the greater the likelihood of an anxiety disorder coexisting with it.
- learning disabilities occur in 35-50% of ADHD adults.
- ADHD adults are 5 times more likely to die by age 46 due to issues like risky behaviors.

There is also a study that lasted for 33 years, a rarity for it to be so long running, looking at 135 kids who were 6-12 years old initially, and then evaluating them in mid-life. The findings included:

- presence of conduct disorder in childhood was negatively predictive of in mid-life: overall functioning, eventual educational attainment, and adult occupational functioning.
- antisocial behavior predicted poorer educational attainment
- educational goals predicted better overall functioning
- early job functioning positively predicted later social functioning
- early social functioning positively predicted later occupational functioning

Auditory Processing Disorder (APD)

APD is something I see in roughly half the kids I evaluate for ADHD, and research suggests that it is occurring at about that level. ADHD and APD overlap in symptoms and look a lot alike.

Consider the following:

Overlapping symptoms	APD symptoms	ADHD symptoms
Distractibility	Distracted by noise	Distracted by various stimuli
Inattention	Deficit in focused attention and filtering background noise	Deficit in focused attention and/or sustained attention
Poor listening skills	Auditory attention deficits	Attention deficits across a broad array
Restlessness	Less impulsive	Highly impulsive (more so for people who have the 'H' side of ADHD, meaning those who are hyperactive
Frequently asks to have directions repeated; difficulty following directions	Poor sound localization	No problems with sound localization
Academic difficulties	Poor phonological decoding and listening comprehension	Error prone in math, poor reading comprehension and writing

There is some controversy about APD, and not everyone believes it really exists. One of the problems is that the tests that are used to diagnose it are not as good as might be desired in certain technical aspects of their design. Another problem is that an exact definition of what APD is, and how to diagnose it does not exist; the standard diagnostic manual (DSM5) in psychology does not recognize APD's existence.

Some of the factors that argue that ADHD and APD are different include the fact that only about 50% of people who have the former have the latter. Another is that the geographical areas of the brain that are involved with each disorder (the frontal lobe in particular for ADHD which is heavily involved with the aforementioned executive skills, and the temporal lobe for APD which is where language and verbal comprehension resides to a large extent), are different.

I am not an audiologist and can only delve a little way into APD issues. I use a quick screening test to assess for it when I suspect it is present; audiologists have far more sophistication in evaluating for it. As to treating it if APD is found, I can offer nothing whatsoever. From experience, I've found that audiologists will offer one of several approaches, depending on what the underlying cause is. Such treatments can include:

- for a small percentage, simply sitting closer to the teacher helps. As noted above, APD students are distracted by noise, and when the teacher's voice is louder, and they are farther away from other students who are making distracting noises, they can do better.
- for a small percentage, there is an actual hearing loss and a hearing aid is needed.
- On very rare occasion, I have heard of students who have had a lot of impacted ear wax, and they simply needed their ears cleaned out. Or, others have had an undiagnosed ear infection and it was serious, and needed to be treated.

- another approach is for the teacher to wear a microphone and have their voice broadcast over a low power FM channel in the classroom, with the student wearing some headphones tuned to that frequency. The net effect is that the teacher's voice becomes louder, and all the extraneous noises (e.g. other students shuffling around in their seats) are not amplified, so the APD child can better pay attention to what the teacher is saying. However, kids tend not to like it because they can be ostracized by classmates.
- computerized training programs, like Earobics, and Fast ForWord can be used by some, when so determined by the audiologist. How they work is basically one of 'practice, practice, practice.'

It should also be appreciated that ADHD and APD influence each other. e.g. A student who is inattentive due to ADHD will not listen closely, and so verbal comprehension suffers. Conversely, if what is spoken to an APD student does not sink in quickly enough and/or fully enough, then the student is likely to become frustrated, give up, tune out and be inattentive. So, treating ADHD with medication can help with APD by at least making the child more attentive to what others are saying.

ADHD & College

There are a fair percentage of students I see who manage to get through the earlier years of school without ADHD being diagnosed, but when they hit high school and particularly college, they suddenly seem to hit a brick wall. My take as to why this happens is that they are quite bright and were smart enough to get through elementary and junior high school years based on their intelligence. But the lower grades, especially in elementary school, involve a lot of what I call 'hand holding' by parents and teachers. I routinely hear of mothers who spend 1-3 hours a night sitting with a child so that they can focus and complete 20-30 minutes worth of homework. And teachers write out assignments on the blackboard, and give them a sheet of problems like math or spelling to take home, and tell them to bring it back completed the next day.

Higher grades, in high school and especially college, involve a very different system where structure and hand holding of the lower grades is basically entirely absent. There is no more staying in a single classroom the entire day. Instead, in college in particular daily schedules vary, and a student is responsible for getting to class on time. Attendance is no longer taken. Don't show up to class, suffer the consequences. There is no more mom saying, 'Sit down and do your homework' and reminding the child to put it in to a folder in the book bag to be taken to class tomorrow. Plus, in high school or college a teacher says, 'Pick a project, and turn it in three months from now.' That's it. If the student did not hear it the first time, or write it down, or remember, that's more tough luck. What is worse, older students invariably procrastinate to the last day, and one student I saw actually waited until the last hour before a semester long project was due before he started to work on it.

There is also increased responsibility put on older students. This includes having multiple textbooks and notebooks, with them being stored in the locker between classes. They tend to grab the wrong ones to take home at the end of the day, or forget them all together, and the consequence is that homework does not get done and they get a zero on it, so their grades suffer.

Another major change is law. For K-12 students, federal law dictates that kids get extra attention if they have ADHD. My experience is that this is more theoretical, and in reality school

bureaucracy prevents effective help being given all too often. Regardless, some sort of extra services, if only accommodations like 'more time to take a test,' are readily available, and parents are in charge and have legal authority to help their child. In college, the law basically becomes 'If a student needs help they have to ask for it, and make it happen.' Plus, parents no longer have legal authority to intervene once a child turns 18, without permission being obtained through legal channels such as a health care proxy being created. So, students now have to become advocates for themselves to a far greater degree.

What all this relates to is that raw intelligence is no longer enough to do well in school. Executive skills, like organization and planning, and the ability to initiate and persist, and to stay focused and on-track, become far more important and have a massive influence on the kind of grades earned. Such executive skills are hard hit by ADHD.

Research has been done with college student on this issue, and the findings bear out the weaknesses that such older students have which impair their ability to do well. Compared to normal (non-ADHD) students areas of weakness that have been found include:

- time management. This requires a student to prioritize, ration their time effectively, and recognize the many demands that exist in their day, and make sure that all the essential needs have adequate opportunity to be addressed. i.e. No more mommy who can force a student to sit down, focus, and crank out the homework. They have to do it for themselves, and they typically don't. Appointment books, wall calendars for tracking projects, other scheduling devices, and alarm clocks, tend not to be used or at least not well. The way to treat this problem is to teach such students how to use such aids and make better use of their time as a result.
- concentration. College students tune out, get distracted, lose their focus, and so do not hear what a professor is offering in class. Sitting in the front of the classroom, and taking notes may help. When on their own, such as doing homework, taking frequent breaks to avoid fatigue may also be a means to improve focus.
- selecting main ideas. ADHD students may study massive amounts of material, but it is all too often not the critical ideas that need to be learned. Consequently, they can become overwhelmed because they have not zeroed in on what is the meat of the topic. Moreover, by not having a good eye for picking out the critical concepts, they spend far too much time on the non-essential, which causes time management problems.
- test taking strategies. This is similar to the point noted above. How one studies for an essay test is very different than multiple choice. Poor choices can lead to wasting time, studying too much and becoming overwhelmed. Interventions can include better note taking, underlining of key concepts, creating outlines and summaries, identifying potential test questions, and use of Study Guides that exist for some textbooks.
- motivation. ADHD students will all too often say to themselves, 'I really don't want to study for this test, it's too boring. Talking on the cell phone, playing a video game, surfing the net… is a lot more fun, so I'll do that, and get to the studying later.' Work before pleasure is a concept and goal that needs to be learned, which can be accomplished in stages over time. 'If I study for an hour I'll do some fun stuff for fifteen minutes.' That can progress to 'If I get a B or better in this class for the term, I'll treat myself by buying a….'

> And ultimately, a far more internal motivation can be created, 'I'm going to learn this material simply because I want the pleasure of mastering it.'

These students do have the ability to learn and do well. But, far too often I've seen students in their late teens to late twenties who are failing semester after semester because of such problems as those described above. Such failure is very expensive in terms of money, wasted time, and their future and the more limited vocational opportunities that are likely to occur for being a college drop out. Plus, an individual's ego takes a beating as to 'Why can't I learn? I used to be a good student, and now I feel so stupid.' Research has been done and has found that a much smaller percentage of students with ADHD ever make it into college compared to non-ADHD kids. Plus, of those ADHD who do enter college, about 75% never graduate because of all these issues taking a toll. Once more, treatment can be very helpful, but too often older students are quite resistant to the idea – only to their own detriment.

There is at least one caveat when talking about treating ADHD through meds. And that is that meds can be misused and abused. There was a study that found that a quarter of middle and high school students reported abusing prescription stimulant ADHD meds. (JAMA Open Network, "Prescription stimulant medical and nonmedical use among US secondary school students, 2005-2020" S.E. McCabe et al, April 2023). Students who used marijuana in the past 30 days were 4 times more likely to abuse ADHD meds than those who did not use weed. Over half of adolescents who misuse prescription stimulants get it from friends or relatives. But illicit sources are another avenue and those may contain other dangerous drugs like fentanyl or methamphetamine that can result in overdoses. A lethal dose of fentanyl is about the size of a few grains of salt. It is hard for a student to know what is a genuine medication vs. what is counterfeit.

ADHD & Adults

Let me address the issue of adults now. Some adults I see with 20/20 hindsight recognize that they probably had ADHD symptoms as a kid but were never diagnosed. Others thought they did okay in their school years, but as adults have started to realize that they are having problems. Maybe their spouse has said something to them. Or seeing their own children diagnosed with the disorder has opened their eyes. Or, problems are coming out at work or other areas of their life, so that coworkers, bosses or friends are making comments that perhaps ADHD exists in them. Regardless which of the above scenarios may apply to you, the following thoughts are offered.

There have been two large studies on adult ADHD, and their findings were similar. In a nutshell: ADHD cuts a wide swath across the lives of adults, causing a lot of impairment. Moreover, there is zero benefit to the disorder according to this latest research. Talk of being better at multi-tasking or being more creative do not hold up.

What were the findings? One of the studies said that the biggest hit is taken relative to education and school when compared against adults who do not have ADHD. One adult man I saw who had ADHD had spent twenty-four years in college – and was just now completing a two year Associate's program. The educational problems that arose according to this research included:

- being retained in grade
- receiving special education classes
- being diagnosed with learning disabilities or behavior disorders while in school
- high class ranking and grade point averages were significantly lower

- of those who attended college, more had unsatisfactory grades and had withdrawn from more classes
- weaker test scores in arithmetic, spelling, reading, and listening comprehension

Another major problem area that both research projects found to be present was occupational difficulties among adults with ADHD. Issues here included:

- getting along with others
- being fired
- quitting out of boredom
- being disciplined by supervisors
- being more inattentive at work
- being more impaired in performing assigned work
- being less punctual
- being less able to demonstrate good time management
- problems with managing daily responsibilities

There are a few reasons why college students and adults have difficulty with doing well in school and the work performance. One is what can be called 'time management.' This can include procrastination, wasting time on less essential stuff and not focusing on priorities as needed, and 'waiting to the last minute' – seemingly needing fast approaching deadlines to get in to gear and start a task much less complete it. Simply put, there is no more safety net of mom saying, 'Sit down and do your work.'

A second reason is that ADHD individuals are more disorganized. They have a 'file by pile' quality quite often, where they have to rummage through stacks of papers or other stuff to find what they need, and time gets wasted. They lose or misplace personal items, such as keys, wallets, glasses, cell phone… and tend to be late getting to school or the office, which has an impact on their performance. Some tell me that they just 'toss papers into a filing cabinet' and do not file them away as needed. Or they are disorganized with electronic filing of documents on their computers. So again, more time is wasted, and they cannot do their work efficiently.

A third major factor can be called self-motivation, or lack thereof. This again goes back to no longer having the 'mom safety net' of being forced to do something. Cutting corners, taking short cuts, doing as little as is required to 'get away with' an assignment, are all common types of behaviors here, which again has consequences for grades in college, or performance on the job and the reputation earned. There is also a frequent tendency to 'play before work' which also further undermines performance.

A fourth factor is emotional impulsivity. Raw emotions and poor self-regulation of how they are expressed becomes an issue. People having "personality conflicts" with their boss gets them fired. Or, making impolite comments to friends as to "just speaking my mind and being honest" costs them their friendship. Or such comments cause friction within one's family.

Research done on over 14,000 participants found that those with ADHD have an annual income 33% lower than non-ADHD individuals. There is also a 15% increased dependence on social assistance programs.

A third problem area that ADHD adults have elevated problems with is in their behavior relative to breaking social and legal controls. This includes a higher rate of:

- shoplifting
- stealing without confronting a victim
- breaking and entering
- assault with fists
- carrying an illegal weapon
- selling illegal drugs
- being arrested
- being jailed

Still another area that is adversely impacted by ADHD in adults is money management. This includes common issues of:

- managing money
- saving money
- buying on impulse
- nonpayment of utility bills resulting in their termination of service
- missing loan payments
- exceeding credit card limits
- having poor credit ratings
- not saving for retirement

A fifth concern is driving. It is a legal privilege, not a right. It is also extremely dangerous, as virtually all adults appreciate. The numbers killed and injured on American roads every year are staggering; the figures are well known and will not be repeated here.

Research has been done on ADHD adults and their driving skills. What has been found includes:

- more variable reaction times
- more variable steering
- more impulsive errors
- greater inattention to the road
- more unsafe driving practices
- more road rage
- more traffic citations especially for speeding
- more likely to be in a crash and to be at fault for such a crash
- crashes more likely to be severe
- attention lapses as short as two seconds have been shown to result in severe or fatal driving accidents
- more likely to have a revoked or suspended license due to the above types of issues
- more likely to have driven without a valid license
- less ability to appreciate one's own driving skill accurately. The majority of people, with or without ADHD, overestimate their skill, thinking they are above average in ability when they are only average most likely. With ADHD adults there is a greater disparity between what they believe about their ability and what it really is.

- drinking & driving with ADHD is worse than in individuals without ADHD. Drivers with ADHD are more impaired while driving at lower levels of intoxication than drivers without ADHD.
- drivers between the ages of 16-25 have the highest rate of cell phone use while driving. Driving while talking or texting impairs driving just as much as driving while intoxicated. Hands-free devices do not decrease this risk.

A sixth issue is social-emotional difficulties, especially for females, but men are included too. This includes what has been called 'intimate partner violence' such as one study finding about a third of women with ADHD being subject to it which was about five times higher than women without ADHD.

Parenting problems are more common with both men and women who have ADHD. Such mothers have increased risk of engaging in harsh and negative parenting practices, being less consistent with discipline, and being less positive. Such behaviors affect the parent, child and family functioning. Fathers with ADHD have comparable difficulties, such as over reactivity, laxness, and arguments.

One other issue to mention is that much like adolescents often have a comorbid disorder with ADHD (as shown on page 10 of this report), so do adults. But for adults anxiety and depression are the two most common comorbid disorders to ADHD, with rates of 72% and 70% respectively. (Scientific Reports, "Attention-deficit hyperactivity disorder traits are a more important predictor of internalizing problems than autistic traits" Luca Hargitai et al, 1/16/2023).

Treating ADHD can be helpful in reducing some of these risks.

What should you do if you have these problems, or if there is an adult ADHD person in your life you love such as a parent, spouse, or sibling? There are practical limitations, because they are legally adults, and can make their own decisions. You have no legal power over them, except in rare circumstances such as when power of attorney privileges have been given to you. You can try to talk to and persuade them to consider getting treatment. But there can be a fine line between being concerned vs. being perceived as a nag, which can be counter-productive.

The best advice I can offer is that my attitude toward most anything in life is 'Be educated.' What harm is there to simply seeking out more information, learning options, and discussing the pros and cons of treatment? Talking to a physician about medication is different than taking a drug. Have the person you love at least take the first step and get the facts. Have them make a decision based on information rather than inaccurate beliefs.

Treatment

For now, one of the only treatments for ADHD that has been shown to be fairly effective is medication. Recent research that came out in the Journal of Psychiatric Research in 2020 by Boland et al found that ADHD meds offer a "robust protective effect" on issues including mood disorders, suicidality, criminality, substance abuse, accidents and injuries, TBIs, and motor vehicle crashes. Does it fix everything? No, a fair number of problems still remain. Some of the executive skills in particular are not always helped that much by medication. What seems to benefit most is attention. Attention is the foundation for everything else such as academic learning. (Consider

what the absence of attention looks like: coma, unconsciousness, being asleep, or stuporous. Can anyone learn under such states?)

There is some recent research that has found that for ADHD adolescents, who are on stimulant medication for it, they will do even better if they receive cognitive behavioral therapy (CBT) as well, especially when the ADHD is more severe. Adolescents who also have substance abuse problems such as with alcohol and/or illegal drugs, along with conduct issues such as those that cause legal entanglements, may also do better with stimulant medication and CBT combined together.

Stimulant meds do improve driving safety and reduce the incidence of crashes. However, there are some caveats here. One is that this is true when stimulant meds are in a person's system. This means that it takes a certain amount of time for the drug to start working after ingesting a dose. It also means that when the drug has worn off after some number of hours it is not effective any longer. Plus, some drivers may be worse after the drug wears off as to a 'rebound effect.' Whether non-stimulant meds (e.g. Strattera) help with driving is not known as of 2019.

There have been two large studies in 2019 and 2020 on the effect of stimulant medication and suicide. One study looked at over 3.8 million people ranging from kids to middle aged adults and there was a 31% reduction in suicide attempts, but this did not apply for non-stimulant (e.g. Strattera) medicine. The second study looked at almost 800,000 people with ADHD, with 622K on stimulants and 54K on non-stimulants, and the balance not on meds. For ADHD individuals the rate of suicidal ideation and attempts was about 40% lower for those on meds vs. the other two categories.

Side effects of medications are another real concern. I never give advice to parents on medication and tell them to talk to a doctor of their choice. But possible side effects of ADHD medication include:

- appetite suppression, and possible weight loss
- abdominal discomfort
- chest pain
- dizziness
- growth inhibition
- headaches
- high blood pressure
- insomnia
- irritability
- lethargy
- moodiness
- nausea
- paranoia
- tachycardia (rapid pulse)
- tics
- vomiting

Research done in 2020 seems to have settled two issues. One is that 'drug holidays' and 'caloric supplementation' allowed kids to regain weight, but neither of those approaches helped with suppression of height. Research also has found that taking larger amounts of stimulant medication over the years, especially in the growth spurt time frame (about 10-16 years old) has a bigger impact on suppressing height, with some research suggesting a suppression of a little under two inches occurring on average.

Individuals often adjust to medication side effects after a few days, but sometimes they don't. And if side effects arise from one drug, that does not necessarily mean they will happen with another. If side effects like these arise, a parent should talk to the prescribing physician about their concerns.

Some parents become upset that the doctor keeps trying different doses and drugs on their child in an attempt to find the Goldilocks formula that is 'just right.' And parents can become upset over their kids being a guinea pig for such experimentation.

Sometimes there may be a bit of truth to such guinea pig labeling. But consider what you do when you first become an adult and want to figure out which type of drug to use for a bad headache. Aspirin? Tylenol? Advil? There is no way to know which will work best until you try each. You have a learning process by which you discover what works and what doesn't for you. Medical doctors are no different.

There is also some research that has been done more on lab animals, but some humans too, that has found that stimulant drugs (e.g. Adderall, Concerta, Ritalin, Vyvanse) affects an area of the brain called the nucleus accumbens. And that with kids such drugs can impact the development of this brain region. When a person goes off the drug at some point what is being found is that they lack motivation, drive or are apathetic, because of the under development that occurred from medication side effects.

There was a study that was highly regarded called the Multimodal Treatment Study of Children with ADHD (commonly called 'MTA') that looked at 579 kids diagnosed with ADHD. Four groups existed (medication, behavior management, a combination of these two, or usual community care. Treatment lasted fourteen months, and after the experiment ended they were followed for another eight years.

In August 2007 the MTA researchers reported their first follow-up data. This included that kids who took the drugs for 36 months were about an inch shorter and six pounds lighter than those who did not. Other conclusions included "Type or intensity of 14 months of treatment for ADHD in childhood (7-9.9 years old) does not predict functioning 6-8 years later. Rather, early ADHD symptom trajectory regardless of treatment type is prognostic. This finding implies that children with behavioral and socio-demographic advantage, with the best response to any treatment, will have the best long-term prognosis. As a group, however, despite initial symptom improvement during treatment that is largely maintained post-treatment, children with combined type ADHD exhibit significant impairment in adolescence." (Journal of the American Academy of Child & Adolescent Psychiatry, May 2009, 48(5), 484-500, Brooke Molina, et al.)

Another finding of the MTA study that was published in The American Journal of Psychiatry in August 2021 involved the kids being followed for sixteen years. Only 9.1% of them "recovered"

from ADHD by the end of the research study when most were about 25 years old. They also found that ADHD symptoms wax and wane over time. But "the results suggest that over 90% of individuals with childhood ADHD will continue to struggle with residual, although sometimes fluctuating, symptoms and impairments through at least young adulthood."
One way of understanding these results is that meds buy parents and clinicians time to teach kids behavioral strategies to combat inattention and hyperactivity. And over the long-term parents need to rely on those skills.

There was also the Raine study done in Western Australia on ADHD and stimulant medications that was published in 2009. Conclusions include "medication temporarily assists in the management of symptoms. Overall, whilst stimulant medication may be effective in managing the immediate symptoms of ADHD, these short-term effects may not translate into long term benefits to the child's social and emotional outcomes, school based performance or symptom improvement."

Research suggests that a small percentage of kids never respond well to any drug. Either the side effects are too troublesome, or they do not get the desired benefit.

Other research that came out in September 2018 in the journal Neuropsychopharmacology found that people on stimulant drugs and especially Ritalin for ADHD may be at elevated risk for developing Parkinson's disease. The research looked at almost 200,000 Utah residents born between 1950-1992 with Parkinson's onset tracked up until the age of 60. ADHD patients were 2.4 times more likely to develop Parkinson's-like problems prior to the age of 50-60 compared to those with no ADHD history. This is an association between the two and not necessarily reflective of causation. e.g. Confounding variables could include traumatic brain injuries or environmental toxins that could contribute to the development of both ADHD as well as Parkinson's. However, the flip side of this argument is that epidemiological reports have found that people who abuse amphetamine and methamphetamine are more likely to develop Parkinson's along with other similar disorders of that nature.

The risk of actually developing Parkinson's-like diseases between the ages of 21-49 was 8.6 times higher for those on stimulant meds. But the actual number of people affected is roughly 1 per 100,000 vs. 9 per 100,000 as to off vs. on meds.

A Swedish study (JAMA Network, "Attention-deficit/hyperactivity disorder medications and long-term risk of cardiovascular diseases" Le Zhang et al, 11/22/23) looked at over 278,000 medical records covering 2007-2020 for people ages 6-64. They found that the longer they were on stimulant meds like Adderall or Ritalin the greater the risk of cardiovascular disease compared to those who did take such meds with the primary contributors being high blood pressure and arterial disease. Each additional year such drugs were used increased the risk of heart disease by 4%, and that for 5 or more years the risk of heart disease increased by 23%. The results applied to both females and males. However, this does not prove causation.

Overall, medication for ADHD is far from perfect. But I liken it to chemotherapy, surgery or radiation for the treatment of cancer. Are those good ways to treat the disease? If you or someone you know well has undergone such treatment, you know the answer is 'no.' But other options are very limited, as discussed below.

One other issue to mention is that I have seen a small number of adults who are about age 50-70 who are wondering about a diagnosis of ADHD. Research on medication side effects is more limited and some drugs are only FDA-approved up to the age of 55 or 65. There may be issues with insurance not covering such drugs because of the lack of proven research for such people. Plus, there are additional risks such as health problems like cardiovascular disease that arises with getting into this age bracket.

Secondary ADHD from TBIs does respond very well to medication. Some research has found that measured over the short term such as three months, stimulant medication like Ritalin have a 80-90% success rate with secondary ADHD. Use of placebos in such research saw improvement at a dramatically lower rate, about 13%. Such a stark contrast between the meds and placebo for secondary ADHD is unheard of in the mental health field when compared to other conditions, like depression or anxiety.

What else is there besides medication?

Neurofeedback ('biofeedback for the brain') is an interesting option that I am now recommending based on newer research that is supporting it. Biofeedback in general has been studied for many years and has been found to be effective for a number of common mental and physical health problems. Neurofeedback is a variation on it, and involves using an EEG ('brain wave') machine. The idea behind it is that medication for ADHD involves the concept of changing the brain's chemistry to make it function more effectively on an electrical level. Neurofeedback skips that intermediate step, and in essence says 'Change the brain's electrical functioning directly.' What some research has found is that individuals with ADHD often have a brain wave that is reflective of being nearly asleep. Or in other terms they are daydreaming too much which makes learning difficult. There has been some recent research that has come out that is now offering considerable support to neurofeedback being a good approach to treating ADHD. Research has found that it is effective in treating ADHD for about 75% of people, which is the same rate that is generally cited as medication helping. Research also has shown that neurofeedback treatment of ADHD tends to 'stick' for at least 1-10 years after treatment has ended. Some research also has found that the effect of neurofeedback actually can *increase* over time after the treatment has ended. Medication of course is good for a handful of hours on a single day, and then the person starts all over again at square one the next day, and more doses have to be taken each and every day thereafter.

Research on other possibilities is mostly limited. What are these methods?

1) Diet, additives and exercise.
    a) There has been talk dating back to at least the 1970's that too much junk food, and sugar in particular, is responsible for ADHD. This notion was disproven back in that decade, but it seems to be resurfacing now. There are some people, with ADHD or not, who are more sensitive to the effects of sugary foods. The phrase most often used to describe them is that they 'bounce off the walls' under the influence of sugar. Eating healthy and reducing sugar intake are virtues I will always support for anyone. Whether it will reduce or eliminate ADHD is another matter. There is some early research which is suggesting a possible link between gut bacteria (microbiome; see below) and ADHD. The idea is that imbalances in gut bacteria (e.g. good vs bad) may contribute to inflammation. And one idea is that ADHD

may involve a low-grade inflammation in the brain. Sugar may cause an overgrowth of some gut bacteria leading to an imbalance that could be adding fuel to the fire of such brain inflammation. Try cutting back on it and see what happens. At least your child will lead a healthier life for other reasons, such as avoiding potential obesity, diabetes, etc.

- some research (e.g. Pediatrics, 2010) concluded that organophosphate pesticides found in fruits and veggies may be linked to ADHD. Higher levels of these chemicals found in a kid's urine led to a greater likelihood of an ADHD diagnosis. A Western diet such as processed meats, fast foods, high fat dairy products and sugary food doubled the risk of an ADHD diagnosis compared with a healthier diet (Journal of Attention Disorders, 2010). Other research has found that kids who adhered to a Mediterranean diet had lower rates of ADHD compared to those who did not and who consumed high amounts of candy, soda, sugar and fast foods (American Academy of Pediatrics, Jan. 2017,https://pediatrics.aappublications.org/content/early/2017/01/26/peds.2016-2027)
- the Raine study looked at 1,799 adolescents over the first fourteen years of life. They looked at the 'standard American diet' (SAD) and a 'healthy' diet. The former more than doubled the risk of ADHD by association. The healthy diet was not associated with ADHD. (Journal of Attention Disorders, "ADHD is associated with a 'Western' dietary pattern in adolescents" Amber Howard et al, July 2011).
- There also has been some research that suggests that the bacteria in a person's gut can be involved with ADHD symptoms. Some research has found that kids with ADHD have more constipation and flatulence than healthy controls, which could suggest a microbiome connection ("A gut feeling: a hypothesis of the role of the microbiome in ADHD" Child Neurology Open, 7/11/2018, Xue Ming et al). Other research thinks there may be an ADHD/microbiome link because the gut bacteria can affect the immune system. And ADHD kids are more likely to have asthma and atopic dermatitis which are immune system disorders. Consequently, it is thought that probiotic foods (e.g. good quality yogurt, kefir, sauerkraut, miso, etc.) can be helpful in treating ADHD. One study found that probiotics and nutritional supplements were as effective in improving ADHD symptoms as Ritalin. Use of prebiotic foods (e.g. oats, onions, garlic, bananas, etc.) can be helpful too it is believed, along with more fruits and vegetables in general. Research into this issue is in its earliest stages right now so much more investigation is needed.

b) Food additives, such as coloring, have been coming under question of late as to their potential role for ADHD. Research is limited to date. Again, eating healthier food in a more natural and less processed state can be subscribed to for its own reasons, regardless of what it might do relative to ADHD. There is some research which suggests that Red 40, Yellow 5 and Yellow 6 may cause hyperactivity. ("Food Dyes: a rainbow of risks" Center for Science in the Public Interest, https://cspinet.org/sites/default/files/attachment/food-dyes-rainbow-of-risks.pdf). Another study ("Potential Neurobehavioral Effects of Synthetic Food Dyes in Children" California EPA, Children's Environmental Health Center, April 2021) offers concluding remarks of: "We found a fairly extensive body of evidence that the sensitivity to synthetic food dyes varies greatly from person to person and that some children are likely to be more adversely effected by synthetic foods dyes than others. We conclude that the current human epidemiologic evidence supports a

relationship between food dye exposure and adverse behavioral outcomes in some children, both with and without pre-existing behavioral disorders."

c) Exercise does have a lot more research done on it, and it dates back at least to the 1970's as well. A survey of 4,425 caregivers and adults with ADD who completed ADDitude magazine 2017 treatment survey ranked it as the #1 most effective treatment for ADHD. Half of respondents ranked it as "extremely" or 'very effective' at managing symptoms. Meds got about 40% such approval. A meta-analysis on studies between 1980-2017 (published in The Journal of Psychiatric Research, 2019, Bar Lambez, et al), found that physical exercise was the most effective form of natural therapy for improving ADHD. And within exercise, martial arts along with complex ball sports that target executive functions were the best for treating ADHD cognitive symptoms. Exercise is usually looked at relative to whether or not kids in school get phys. ed. classes, or how many hours per week they receive. Research has consistently shown that more exercise equals better academic performance in kids. Common sense applies here. e.g. Little kids should not be running the Boston marathon. That is, exercise that is appropriate for a child's age, undertaken with appropriate precautions and safeguards is always advisable. This also does not mean that a child can go run a lap around your block and POOF! their ADHD is permanently cured. Rather, it means that staying physically fit, throughout one's entire lifetime, is a desirable goal, and that better mental and physical health can be expected. Exercise is known to raise dopamine levels in the brain, and it is low for ADHD kids. Exercising in the morning is believed to give a more lasting boost of dopamine levels throughout the rest of the day. Exercise also releases a natural chemical called BDNF (brain derived neurotrophic factor) which promotes the growth of new brain cells especially for memory. BDNF has been called 'Miracle-Gro for the brain.' And teaming up with an exercise partner may help with motivation to do it regularly. Exercise may also help with improving emotional control such as being able to inhibit inappropriate behaviors like impulsivity. Having made the point that exercise is important for improving ADHD, research has found that kids aged 6-17 are less likely to engage in physical activity than their non-ADHD peers: 14% of kids with ADHD have zero days of physical activity per week vs. 8% for non-ADHD kids. The American Academy of Pediatrics has recommended that kids have 60 minutes of physical activity every day.

   There was also a meta-analysis (Medicine, "Impact of physical exercise on children with ADHD" Yu Zang, Nov. 2019) that looked at 14 studies involving 574 kids with ADHD. About half were in a physical activity group and the other half were a control group. " Physical exercise has a major contribution owing to significant improvement in anxiety and depression, aggressive behaviors, thought and social problems among children suffering from ADHD. Therefore, physical exercise should be incorporated in the daily life of children with ADHD." It also noted "Depression is a major problem in children with ADHD. …Improving depression through physical exercise by these children with ADHD will result in far less use of pharmacological drugs, thus sparing these children from adverse drug events." Which exercise is best and how much to do remains to be determined for ADHD individuals.

d) Disciplined forms of exercise such as yoga have some limited research to suggest they might be helpful with ADHD.

2) Vitamins, minerals or other natural supplements. The biggest proponent I know of for such an approach is Dr. Daniel Amen (www.amenclinic.com), who is a psychiatrist. He has written a book on the subject of ADHD and includes a chapter on alternative treatments, such as over-the-counter supplements. His research on ADHD is thought provoking in my opinion. It is by no means widely accepted in the mental health field. Nor is there much research behind the use of 'natural' supplements for the treatment of ADHD.

   a) One such nutritional approach is omega-3 fish oil, which has some preliminary research to suggest it may be helpful with ADHD, although research done by Consumer Reports magazine had respondents to a survey giving it a very low level of effectiveness. One study published in Pediatrics in May 2005 found a positive correlation between use of fish oil and reduced ADHD symptoms. 117 kids ages 5-12 were given omega-3's for three months and they showed "significant improvements in behavior, reading and spelling."

   b) Other research (in Child & Adolescent Psychiatric Clinics of N. America, July 2014) found that "individuals with ADHD who have low levels of omega-3's will show the biggest improvement in mental focus and cognitive function when they add more of these healthy fats to their diet."

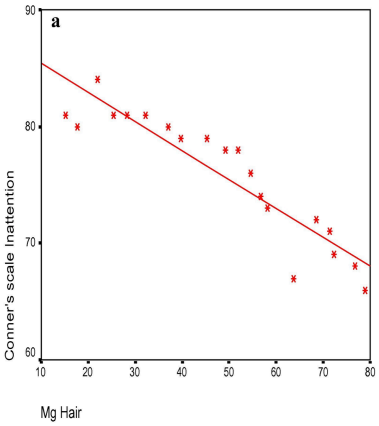
   c) A meta-analysis (Neuropsychopharmacology, "Omega-3 polyunsaturated fatty acids in youth with ADHD: a systematic review and meta-analysis of clinical trials and biological studies" Feb. 2018, Jane Pei-Chen Chang, et al) found that omega-3 supplementation improved kids' clinical symptoms as reported by parents but not by teachers. "Parents are more likely to detect changes in the child's daily activities, such as getting ready for school, getting dressed, getting ready for bed, eating meals, and completing their homework. Teachers' reports are more representative of the child's… peer interactions and talking in class." The meta-analysis also found that kids with ADHD had lower levels of EPA and DHA (the two primary forms of omega-3). However, if you are thinking about use of natural supplements you should always consult a medical doctor first. e.g. Fish oil is known to thin the blood.

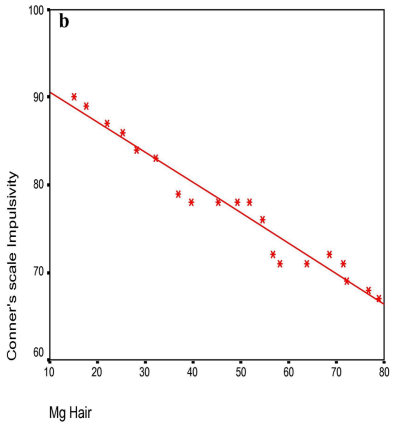
   d) A study in the Journal of the American Academy of Child & Adolescent Psychiatry ("Micronutrients for ADHD in. Youths: A placebo-controlled randomized clinical trial" Jeanette Johnstone, et all May 2022) took 135 kids ages 6-12 with ADHD who were on no meds and were from three cities. They were randomly assigned to either getting capsules with all the vitamins and minerals at doses between the RDA and upper tolerable limit – or gave them placebos and in a double-blind manner. After 8 weeks 54% of the treated group vs. 18% of the placebo showed improvement in symptoms. The treated group also grew 6 mm more than the placebo group. The treated group did not have more adverse side effects.

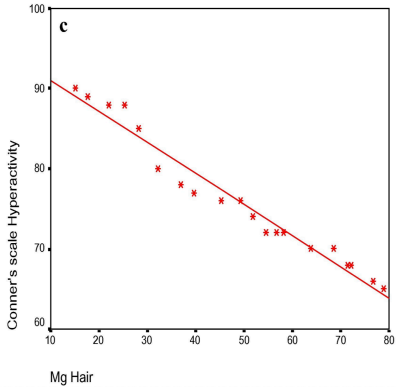
   e) niacin, and a version of it in particular called niacinamide in high doses are said by some to reduce ADHD symptoms. One doctor on YouTube recommends 250 mg 6-8 times/day. It does so by supporting dopamine production. However, ADHD is a complex issue and there are various factors that can cause it such as genetics, diet and environmental factors, and how well it works may vary by genetic factors. High doses of niacin can cause mild problems such as 'flushing' which can feel like the skin is burning. Stomach discomfort, heart burn, nausea, and headaches might also result. It may also lead to insulin resistance, and there is the possibility of liver damage and even death resulting from higher doses done

over longer periods of time such as months or years. Usually, but not always, such liver damage is reversible.

3) Research also exists that suggests ADHD may be based on an excess or deficiency of various chemicals and minerals in our bodies, but this is by no means conclusive. This may include:







a) deficiencies of zinc. Zinc is involved in the regulation of the neurotransmitter dopamine that helps control mood. One small study involving 20 ADHD and 20 controls (Egyptian Journal of Medical Human Genetics, "Magnesium, zinc and copper estimation in children with ADHD" Farida Elbaz, et al, April 2017) found deficiencies in ADHD children of

- ❖ magnesium: 65%
- ❖ copper: 70%
- ❖ zinc: 60%

This study found that magnesium and zinc deficiencies were correlated with hyperactivity, inattention, and impulsivity. It was not found for copper. The zinc graphs looked almost identical to these.

As to why there are deficiencies of these minerals the authors offer that "We can speculate the trace element deficiency in ADHD patients may be an outcome of behavioral manifestations related to the core pathology of ADHD. Children with ADHD may suffer from feeding problems owing to their stubbornness. Also they lack the attention required to sit through a meal to obtain adequate levels of nutrient intake. It may also be due to the appetite suppressant effects of treatment medication. The deficiencies could also be due to a wide range of other factors including suboptimal nutrition during pregnancy, metabolic abnormalities, gut dysbiosis leading to nutrition malabsorption and other causes of malabsorption. Celiac disease is markedly over-represented among patients presenting with ADHD. We may speculate that these deficiencies [in zinc and magnesium] may be incriminated as a contributing factor leading to this behavioral disorder, or may at least play a role in worsening of the symptoms. These results suggest that magnesium and zinc supplementation, or at least proper amounts of them in the diet, may prove to be beneficial for children with ADHD." As to the copper issue, they cite other research that found "excess copper was associated with hyperactivity and inattention and chelation leads to a significant improvement." Soft drinks contain phosphoric acid which is said to interfere with the absorption of calcium, magnesium, and zinc. According to some researchers these three minerals are deficient in almost all ADHD children. Other research into zinc and ADHD has been mixed.

b) Other research (e.g. BMC Psychiatry, April 2004) has been done on iron. It found that kids with ADHD had an average iron level of 22 ng/mL vs. 44 ng/mL in kids without ADHD. Other research has found that increasing iron levels improved symptoms of ADHD almost as much as taking a stimulant. But too much iron is dangerous.

c) research also has found that 72% - 95% of people with ADHD have a magnesium deficiency. Magnesium has over 600 functions in the human body, but in broad brush strokes one of them is that it is a calming agent in that it activates the receptors for the neurotransmitter GABA which is an emotional brake for the nervous system. In the process it can reduce issues like anxiety, insomnia, and irritability. One study (Egyptian Journal of Medical Human Genetics, "Magnesium supplementation in children with ADHD" Faria El Baza at al, July 2015) looked at kids getting magnesium or not. For those receiving magnesium supplementation vs. not improvement over time included:

	Supplement	Control
Oppositional behavior	55.6%	22.2%
Inattention	77.7%	11.1%
Hyperactivity	88.9%	0.0%

Two other studies looked at ADHD kids who were supplemented with magnesium plus vitamin B6 which increases absorption of the mineral. Almost all of them showed improvement in hyperactivity, inattention at school, and physical aggressiveness. Another study (Public Health Nutrition, 11/6/2014) looked at 684 14-17 year old ADHD kids and what resulted when consumption of magnesium-rich foods (e.g. avocados, beans, bananas, leafy greens) was increased. They too found a reduction for inattentiveness, aggressiveness, and delinquency.

So, this does not mean you should pour magnesium down your kid's throat. There are other concerns to pay attention to. Nutritional intake needs to be kept in balance. e.g. A proper ratio needs to be kept between calcium and magnesium and having too much of one can inhibit absorption of the other, with various health problems resulting. Magnesium is also hard on the kidneys and anyone with impaired renal function needs to be careful. There are literally hundreds of medicines that can be impacted by magnesium. Consequently, talking to a physician and/or nutritionist is advised. Deficiency in vitamin D also has been associated with ADHD.

d) Other possibilities include elevated levels of cadmium, antimony (which can leach out of PET and recycled plastic bottles into the water, as well come from other sources like brake linings). One study found that antimony levels were positively correlated with the severity of ADHD symptoms rated by teachers. Still other toxins include mercury, or lead; low or high levels of histamine; or depressed levels of manganese or chromium. One study found that environmental mercury exposure was associated with a 160% increased risk of ADHD. Blood tests are obviously needed to determine if any of these deficiencies or excesses exist, and then appropriate treatment instituted if such a problem is found.

e) there is also research on BPA (PLoS, "BPA and phthalate metabolism in children with neurodevelopmental disorders" T. Peter Stein et al, 9/13/23) having a direct link to ADHD; it binds to and blocks zinc. So, even if you have enough zinc in your diet or take a supplement of it, the question becomes are you actually able to make use of it as to it not

being bound up by toxins like BPA? The ability to detoxify BPA has been found to be reduced 17% in kids with ADHD. Other research says that phthalate exposure in early childhood is even worse for ADHD kids with autism spectrum disorder. (Environmental Health, "Early childhood exposure to environmental phenols and parabens, phthalates, organophosphate pesticides, and trace elements in association with ADHD symptoms in the CHARGE study" Jiwon Oh et al, March 2024). Then there was a Norwegian study that looked at expectant mothers with high phthalate levels in their urine and what happened to their offspring after birth as to ADHD. Those with the highest level of a phthalate called DEHP had almost 3 times the odds of ADHD vs. those in the lowest. (Environmental Health Perspectives, "Prenatal phthalates, maternal thyroid function, and risk of ADHD in the Norwegian mother and child cohort" Stephanie Engel et al, May 2018). 'BPA-free' is not better and alternatives like BPS may be as bad if not worse than BPA according to research. Foods that are said to be helpful for detoxing include:

- cruciferous veggies (e.g. broccoli, cauliflower, Brussels sprouts, etc.)
- citrus
- rooibos tea
- turmeric
- rosemary
- mung, adzuki beans
- oranges
- spinach
- alfalfa sprouts
- Brussel sprouts
- cauliflower
- broccoli
- grapefruit
- grapes
- peaches
- plums
- lemons
- apricots
- strawberries
- high fiber diet

Ways to avoid BPA in the first place include limiting canned foods, use of glass containers, avoid putting plastic in microwaves, not washing plastic containers in dishwashers, and not handling receipts or washing one's hands after doing so.

4) Behavioral approaches. Research has found that behavioral methods, such as increased supervision, punishment, or reward systems do not work on their own relative to ADHD. That

is also what I have heard for over thirty-four years in my own practice. Used in conjunction with medication cognitive-behavioral methods (CBT) may help some percentage of kids. Some behavioral approaches to consider using:

a) Act, don't yak.
b) Use rewards twice as much as punishment.
c) Change rewards periodically.
d) Think of how you can create win/win scenarios for your child and you, so you both come out ahead.
e) When you use punishment, consequences need to be swift, and incentives are needed to not only stop the bad behavior but to get a good behavior to replace it.
f) Set your priorities; you can't fix everything all at once.

Another set of behavioral approaches to consider to work on any child's behaviors, and those with ADHD perhaps especially includes:

Low quality corrective behaviors	**High quality corrective behaviors**
Ignore	Explain
Criticize	Confront calmly
Sarcastically ridicule	Enforce 'un-do the mistake, re-do it correctly'
Commit abuse	Rehearse or model correct behavior
Harsh or threatening voice	Enforce limits with action that is both calm and firm
Insult	Withdraw abused privileges
Berate	Interrupt misbehavior by moving people or objects
Low quality directive	**High quality directive**
Ignore	Instruct
Remind repeatedly	"I suggest…"
Demand	Discuss at family meeting
Yell	Politely request one time
Commit verbal abuse	Problem solve calmly
Nag	Challenge the child to try it as an experiment
Grab and force child to perform the demanded action	Allow some element of choice

There are some behavioral approaches to improve any child's ability to take better notes in class, and pick out the salient material that probably needs to be retained, such as for upcoming tests as well as understanding the content. The acronyms spell BROIL and LOTS.

- ❖ B: anything written on the board should be copied down in notes
- ❖ R: the teacher repeats it two or more times
- ❖ O: the teacher says 'This is going to be on the test.'
- ❖ I: the teacher says, 'This is important to understand.'
- ❖ L: anything in a list, with two or more items, such as 'The three events that led up to the Civil War were…'

Important information to learn and retain from books can be highlighted such as by:

- ❖ L: lists of stuff
- ❖ O: one test item is hidden in each paragraph. 'What's the main idea of this paragraph?'
- ❖ T: the teacher says it'll be on the test
- ❖ S: special print (e.g. italics or bold)

5) Teaching self-awareness and to be more tuned into others can be helpful, such as helping a child to understand silent body language and facial expressions of others' reactions to their behavior.

6) 'Green time.' This refers to spending time in natural settings such as parks. One study published in the American Journal of Public Health in 2004 surveyed over 400 U.S. families with at least one ADHD kid. Survey results showed that ADHD kids who spent time in the most natural settings displayed less inattentiveness. Four years later the same researchers showed that ADHD kids had better attentiveness from taking a 20 minute walk in a park vs. in a downtown or residential area. Such improvements were not found from playing indoors or in a cement filled playground or skate park. Kids who were exposed to open fields, wooded areas or other natural environments seemed to have the greatest reduction in symptoms. Side effects of green time are likely to be limited to stuff like bug bites, scrapes and bruises.

7) Acupuncture. It is a form of treatment that dates back thousands of years. Western medicine has been researching this form of treatment for several decades now, and generally finds it can be effective for a number of problems. To date, research has not shown it to be effective for ADHD. And insurance may not pay for it.

8) Eliminating video games. Much like television, video games are often considered not only a waste of time but also cause kids to become at least temporarily too aggressive. The extreme 'blood and guts' of many video games have made big headlines in recent years, and there is a continuing controversy as to whether they actually cause an increase in violence. The debate on television and violence has yet to be fully settled, and it began in the 1960's. So, the verdict on video games is still out. There is some research that video games can cause ADHD like problems. Computerized brain imaging has been done on people who were playing video games. What was found is that an area of the brain called the basal ganglia is activated during such games, and dopamine, one of the brain's chemicals, is released in the process. Dopamine is involved with a number of brain functions, including attention span, focus, and motivation. It is thought that the video games effectively use up the dopamine for a while, and so it is not

available when needed such as for doing homework. In my opinion, playing video games is like eating junk food: they may be fun, but there are better, more wholesome choices available. Reading, playing, or socializing with other kids in various ways are all better than video games in my opinion. Whether cutting down or eliminating video games from your child's daily routine will make a substantial difference in ADHD symptoms can only be determined by trying it. And enforcing the rule can be difficult, given that you may stop the game playing at your house, but not elsewhere such as at a friend's.

9) Improving sleep. Some people have sleep apnea and there has been research that attention deficits exist in 95% of such individuals. There are other reasons for having difficulties with getting a good night's sleep. Common sense and experience tells everyone that being tired impairs one's attention. Figure out what is causing sleep difficulties and fix them.

10) 'Cognitive training' approaches. There are some programs such as Cogmed and Lumosity that are advertising that they can 'train the brain' such as through computer-based games and exercises to improve skills like attention and memory. Limited research has been done on them to date to see how effective they are, but from what I have seen of it, evidence does not support their being that effective. One issue is that they increase skill for similar activities, but not very different ones. e.g. If you 'train your brain' to be more attentive through playing a video game, maybe it will carry over somewhat to playing an old fashion 'pin ball' game. But it does not carry over to something like reading a textbook for school, or staying attentive to doing homework, or preventing 'distracted driving' of a car. Maybe they will improve in the future. But for now, I would not recommend using them.

11) THC/CBD. Use of marijuana or cannabinoids in various forms such as gummies is being suggested by many for all manner of problems these days, including ADHD. The amount of research on this issue is minimal. What is known can be categorized as good news/bad news.

    a) As to the good, the research has been limited and of a more simplistic design. It includes:

        - effects include it releasing more dopamine in the brain, which is a neurotransmitter that is reduced in ADHD individuals. Such people claim that marijuana helps them focus, sleep, or slow their thoughts down.
        - one study in 2020 involving 112 adult medical cannabis patients with ADHD found that those who used a higher dose of CBD took fewer ADHD meds.
        - a study in 2017 with 30 people using a CBD nasal spray had a small reduction in hyperactivity, impulsivity, and inattention. But it was not a big enough improvement for the researchers to say it was better than a placebo.
        - a German study in 2015 looking at 30 people with ADHD using cannabis, all reported better sleep, improved concentration, and reduced impulsivity while using the drug.

    b) As to the bad, there has been a little research of a higher quality, including:

        - one study (Neuropsychopharmacology, "Long term effects of cannabis on brain structure", Giovanna Battistella et al, Aug. 2014), took 22 healthy male cannabis smokers between the ages of 18-30 (using 1 joint/month to less than1 joint/week), and 21 male regular cannabis smokers (a minimum of 10 joints/month). All had no history of neurological or psychiatric disorders. Results were that the 'gray matter' of the brain shrank in users impacting areas that are involved with motivation and emotional processing, with the age of onset for such use correlating with the magnitude of such changes.

- other research has offered that "regular cannabis use can alter brain function, especially in networks that support working memory, attention, and cognitive control processing. …Memory has been the cognitive domain most consistently impaired, with verbal learning and memory tasks particularly sensitive to the acute and chronic effects of cannabis. In long-term users, lasting impairments in memory and attention worsened with increasing years of regular cannabis use. …[There is] a dearth of scientific evidence supporting a role for cannabis in ADHD treatment." (American Journal of Drug and Alcohol Abuse, "Cannabis effects on brain structure, function, and cognition: considerations for medical uses of cannabis and its derivatives" Alison Burggren et al, 7/31/2019).
- NIH (National Institutes of Health) as of 2023 is conducting the largest long-term study of brain development and child health ever done in the U.S., in a project called Adolescent Brain & Cognitive Development Study (ABCD). One of the questions they are looking at is if marijuana changes vein structure and function, and early results are suggesting 'Yes.'
- other research has found that smoking marijuana can negate or diminish the positive effect of some ADHD meds such as Ritalin (methylphenidate). There is research that Ritalin and Concerta react significantly with marijuana and it can cause increased strain on the heart (Journal of Substance Abuse Treatment, "An exploratory study of the combined effects of orally administered methylphenidate and delta-9 THC on cardiovascular function, subjective effects, and performance in healthy adults" Scott Kollins et al, 2015). Cannabis also inhibits certain liver enzymes which can impair drug metabolism which may lead to having to increase the dosages of other meds being prescribed.
- use of synthetic cannabinoids (e.g. K2, Spice) has problems too according to the National Institute on Drug Abuse, which is part of NIH. Some users have reported symptoms of psychosis such as paranoia and hallucinations. Others have been taken to the ER with problems such as violent behavior and suicidal thoughts. They can also elevate blood pressure, reduce blood supply to the heart, cause kidney damage and seizures.
- one study found that heavy use of marijuana in adolescence was associated with an 8 point loss of IQ, on average, in adulthood.
- driving ability can be impaired in regular marijuana users even while not under the influence.
- cannabis can interact with ADHD drugs like Ritalin and Concerta leading to a strain on the heart.

Summary

ADHD is a real problem. It affects a large number of people. Estimates vary as to its frequency, but typically have ranged between 3-6% of the population, although as of 2015 estimates have been as high as 10%. ADHD has consequences, in terms of poor performance in school. Behavioral, social, occupational and financial consequences are also possible.

Many parents I speak to are leery about using medication. There is still a lot of controversy about how safe such drugs are in the short term. Long term consequences of such drugs are even less well known. I am reminded of hormonal replacement therapy (HRT) for post-menopausal women, and how it was widely touted by medical doctors for decades. Only more recently was it learned that HRT does more harm than good. So, the jury is still out on the safety and effectiveness of ADHD medication, and risks do exist if they are used.

The one point that all parents need to keep in mind is that every choice that is made, or avoided, carries a risk. That is, you know that your child with ADHD is having serious problems. Doing nothing will change nothing. It is your responsibility as a parent to try and do the best you can to help your child develop and grow. What choice you make as how to treat ADHD is your decision.

I hope this article has helped to further educate you on some of the issues of ADHD. The next step is yours to make.