

The Things We Don't Talk About When We Talk About ADHD

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Presentations on ADHD seems to generally focus on children, questions about the effectiveness of Ⓢ, and alternative treatments. However, they seldom talk much about

- the problems with the MTA study, and what the eight-year follow-up data showed
- what we know about ADHD and driving
- ADHD treatment for children, and life satisfaction and health outcomes for adults
- how fish oil, essential oils, a healthy diet, and exercise make everyone feel better... but that doesn't make them treatments for ADHD

- Ⓢ Stimulants (methylphenidate)
- Ⓟ Behavioral intervention
- ⓈⓅ Both stimulants and behavioral intervention

The MTA Study of Treatment Outcomes for ADHD

The **Multimodal Treatment of Attention-Deficit/Hyperactivity Disorder** study followed 579 children, age 7 to 10 years, 80% male, with ADHD (combined type), across four groups:

- intense management of ☺ alone
- combined ☺ and intensive ☹ treatment (☺☹)
- intensive ☹ treatment alone
- community care (other therapies, TAU)

The One Year Results

At 14 months (1999), based on teacher and parent ratings as well as reading tests,

- Children with *ADHD alone* showed the most gains when treated with ☺ (of note, ☺ and ☺☹ were *not* significantly different). Of note, 90% of those prescribed ☺ took them at least half the time.
- Children with *ADHD and another disorder* (anxiety, depression, oppositional behavior) showed the most gains when treated with the ☺☹ approach (which for some participants was *slightly* better than ☺ alone, and for all participants was significantly better than community care).

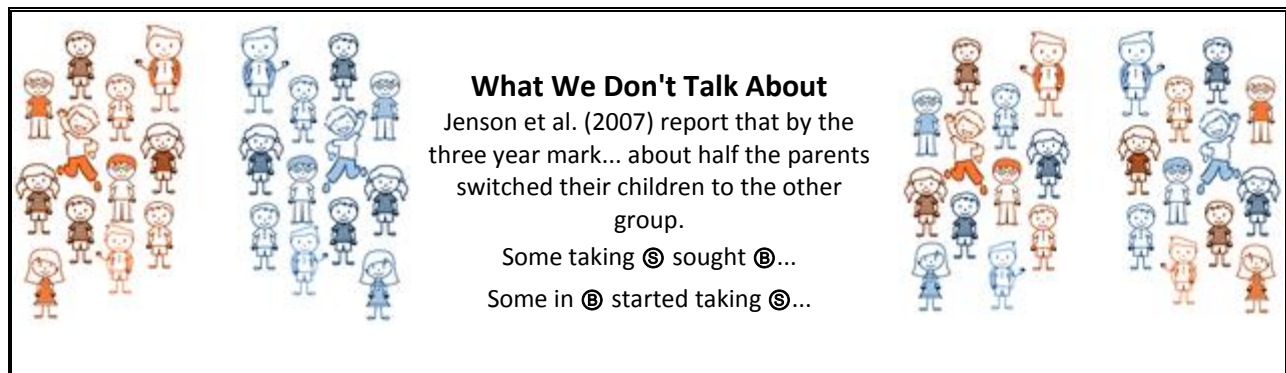
This *seemed* to indicate that ☺ was required for effective treatment.

The Three Year Results

At three years (Jensen et al, 2007), 84% of children remained in the study:

- Children with ADHD alone showed about the same improvement, regardless of the study treatment type.
- Children with ADHD and another disorder showed fewer treatment gains, regardless of treatment type.

This *seemed* to indicate that ☺ and ☹ treatment were equal. My anti-☺ colleagues rejoiced.



The Eight Year Results

At eight years (Molina et al, 2008), 75% of the children remained in the study:

- Results showed *all* children with ADHD had consistently lower adjustment than non-ADHD peers from the community. No treatment erased the effects of ADHD.
- ADHD teens overall performed about a half of a standard deviation below their non-ADHD peers. GPAs were lower (2.75 vs 3.02) and they were twice as likely to have been held back a year (37% vs. 18%).

Powers et al. (2008) followed 90 ADHD children for nine years, and found similar but smaller results:

- 25% (both ☺ and non-☺) of ADHD children repeated a grade vs 20% of community peers.
- ☺ ADHD children scored *below* non-ADHD peers on math (5 points) and reading (6 points), but *above* non-☺ ADHD peers on math (by 4 points) and reading (by 3 points).

- Non-ADHD children had average IQ scores of 96, Ⓢ ADHD children of 95, and non-Ⓢ ADHD children of 90.
- ADHD teens were less likely to have their driver's license when they became eligible (40% vs 58%).
- ADHD teens were more likely to have been arrested (39% vs 14%) and psychiatrically hospitalized (10% vs 1%).

At eight years, ADHD children/teens fell into three groups:

- **Group 1** (34%) - These children took Ⓢ for the whole study, with a good initial response and continued improvements (e.g., significantly better math achievement scores) eight years later. They were generally the only ones still receiving ADHD treatment at the eight year mark.
- **Group 2** (52%) - These children switched groups. They showed good improvements initially with Ⓢ, and maintained them. Of note, they showed less severe problems at the start of the study (e.g., better social adjustment, higher family stability, higher IQ scores). Over time, they discontinued Ⓢ and Ⓢ (even those who started them in the middle of the study). Overlapping ⓈⓈ needed *slightly* fewer school services.
- **Group 3** (14%) - Some of these children/teens switched groups, some did not. They showed *some* quick improvements at the start of whatever treatment which faded, and after a few years d/c treatment.



What We Don't Talk About...

In the focus on whether Ⓢ or Ⓢ is more effective... we miss that **this is a pointless question.**

- $\frac{1}{2}$ of ADHD kids needed *both*.
- $\frac{1}{6}$ were not helped sufficiently by *either*.
- $\frac{2}{3}$ were getting *neither* after just a few years.



ADHD and Driving

Many studies over the last 40 years find that both teens and adults with ADHD show difficulties driving.

General Outcomes of ADHD and Driving

- Weiss et al. (1979) conducted the first study of ADHD and driving. Adolescents/adults with ADHD were more likely to be involved in traffic accidents, and to do more damage to their cars in these accidents.
- Drivers with ADHD
 - underestimate their driving difficulties, such that family members and certified driving instructors riding with them judge their driving to be more unsafe than they do (Fischer et al., 2007).
 - *report* more errors/lapses in attention, such as almost rear-ending a car they did not realize had stopped, missing turn-offs, and not recalling portions of their driving route (Reimer et al., 2005).
 - *report* being more likely to chase a driver who angered them (Barkley and Cox, 2007; Reimer et al., 2005).
 - *report* being more likely to pass in the right lane (Reimer et al., 2005), and being twice as likely to speed (Barkley and Cox, 2007).
 - are 3x more likely to have traffic violations, almost 2x that of depressed drivers (Aduen et al., 2014).
 - are 3-4x more likely to have an accident; partitioning out as much variance as you can reduces this to 2x the risk (Barkley and Cox, 2007; Aduen et al., 2014).
 - *report* being less likely to wear seat belts, and are 3x more likely to be seriously injured in accidents (Barkley and Cox, 2007).
 - are 4x more likely to be judged, and 2x more likely to *admit* being at fault (Barkley and Cox, 2007; Aduen et al., 2014).
 - are 3-6x more likely to have suspended licenses... and keep driving (Barkley and Cox, 2007; Fischer et al., 2007).

Alcohol, ADHD, and Driving

- Barkley et al. (2006) followed 50 ADHD adults, 29-33 yo, and 50 controls. ADHD drivers report consuming more alcohol and becoming intoxicated more often per week than their peers. They split them into 3 groups:
 - high dose serving of alcohol (2 drinks to exceed the BAL required for legal intoxication).
 - low dose serving of alcohol (1 drink to reach < 50% BAL required for legal intoxication).
 - alcohol-free 16oz juice drink.

They put them in a driving simulator and found

 - All drivers w/ ADHD showed more attentional errors than drivers w/o ADHD.
 - ADHD drivers after *any* alcohol showed more errors and slower reaction times; the high dose group showed faster and more variable driving speeds, as well as more collisions.
- Weafer et al. (2008) conducted a similar study with drivers (20-23 yo). They examined variability in lane position, driving speed, and steering in a driving simulator:
 - Sober ADHD drivers showed more variability than sober non-ADHD drivers... in fact, they showed *almost* as much variability as intoxicated non-ADHD drivers.
 - Intoxicated ADHD drivers showed greater impairment with even small doses of alcohol.
 - Intoxicated ADHD drivers underestimated their intoxication and overestimated their ability to drive. This got worse with more alcohol; they showed *> 2x the variability of non-ADHD intoxicated drivers*.

Medication, ADHD, and Driving

- Barkley et al. (2005) studied 53 adults (37 yo) in a driving simulator (counter-balanced, double-blind):
 - Those given placebos also had *small* improvements (placebo and practice effects).
 - When ADHD drivers took ☹, steering control, consistency in speed, and use of turn signals all increased. Number of (virtual) objects "scraped", number of accidents, and driving time all decreased.
 - Higher doses sometimes were more effective than lower doses of ☹ ... but not always.
- Cox et al. conducted similar studies (2000 and 2004) with 16 -19 yo on 16 miles of Virginia roads used by the DMV for driving tests. Small doses of ☹ produced *significant* improvements in driving.

What We Don't Talk About

In all the discussions I have heard about ADHD... **no one** has explained how "poor parenting practices during formative years" affects driving skills *20 - 30 years later*.

Estimates vary, but

- There are roughly 5 million car accidents a year (National Highway Traffic Safety Administration - nhtsa.gov).
- Almost half require medical treatment, and over 32,000 people die in car accidents each year.
- Car accident fatalities has been decreasing over the last 20 years, but teens drivers remain **3x more likely to die in a car accident** than drivers 20 yo or older, and **car crashes are the leading cause of death among teens**, surpassing suicide and homicide.
- Male teens are 2x as likely to die as female teens (see cdc.gov/motorvehiclesafety/).

Do the math. A teen is 3x more likely to die in a crash than a young adult, and people with ADHD are 2x-4x more likely to have an accident, and are more likely to be seriously injured in one.

When a teen's parent ask you, "Do you think we should try ☹?" for their teenager (especially a son) who is driving, I think you should say, "It depends. Do you want them to survive to young adulthood?"



Childhood ADHD and Adult Outcomes

Below are some good studies of adult outcomes for children and teens treated for ADHD:

Substance Use and ADHD

- Wilens et al. (2003) reviewed 6 studies following both ☺ and non-☺ adults with ADHD (21-22 yo). Only 2 had control groups, and 1 of them had initial differences between control and experimental groups (☹):
 - 3 showed that ☺ correlated with lower levels of problematic alcohol use, 3 showed no difference (☹).
 - 4 showed ☺ resulted in lower levels of problematic drug use, 1 showed no difference, 1 showed no differences for marijuana but higher risk for cocaine and nicotine (☹).
 - Overall, based on 1000 ADHD subjects, those using ☺ were 50%+ *less likely* to show problematic use.
- Mannuzza et al. (2008) wondered how early ☺ should begin to have a protective effect. They followed 176 ADHD 6-12 yo taking ☺ and matched non-ADHD controls, and evaluated at age 18 and 24 yo.
 - Age when ☺ medications ended was not significant, but age when ☺ started was:
 - 29% of controls met criteria for alcohol/drug abuse *at some point* in the study.
 - 27% of ADHD beginning ☺ *before* 8 yo met criteria at some point.
 - 44% of ADHD beginning ☺ *after* age 8 yo met criteria at some point.
 - Antisocial Personality Disorder was more likely dx in ADHD who began ☺ after age 8 years; this explained most of the variance. Parental substance use and dx of ASPD had no predictive power.
 - Of note, Biederman et al. (1999) followed 75 ADHD 13 yo for 4 years:
 - Non-☺ were 3x more likely than ☺ to show 3+ signs of problematic alcohol use.
 - However, at 10 years (Biederman et al., 2008), differences had disappeared.

Employment and ADHD

- In general, adults with ADHD in the workforce
 - have less education (Altszuler et al., 2016; Küpper et al., 2012; Manos, 2010).
 - are less productive at work (Kessler et al., 2009) due more to inattention than hyperactivity (Nigg, 2012).
 - are 2x more likely to be absent from work due to injuries at work (Kessler et al., 2009; De Graaf et al., 2008), which cost one company over \$4300/year per ADHD employee in sick time, which is more than that spent on employees with other kinds of health problems (Kessler et al., 2009).
 - receive less pay compared to peers with the same level of educational, and show less achievement in their careers than peers with the same IQ scores (Manos, 2010).
 - show more angry outbursts at work, receive poorer ratings, and are fired more often (Nigg, 2012).
 - change jobs more (Manos, 2010), and are unemployed (Küpper et al., 2012) for longer (Manos, 2010).
- On the issue of pay, Altszuler et al. (2016... in an economics journal) followed 300+ ADHD children (5-12 yo) until age 25, and found ADHD young adults
 - remain financially dependent on family/welfare longer than non-ADHD peers.
 - earned 25% less/year, carried more debt, and saved half as much as non-ADHD peers.
 - rated their financial security as 25-30% better than their parents rated it; this discrepancy was not seen in non-ADHD young adults and their parents.
 - were projected to earn at least \$500,000 less over their lifetime than non-ADHD peers.
- Fletcher (2014) analyzed data for 15,000 participants in the Add Health Study followed for 13 years.

- He estimated a 33% loss in earnings for ADHD adults (less in higher SES families).
- This is larger than ♂ and ♀, White and Black, and college graduate and non-graduate gaps in the sample.

Quality of Life and ADHD

Physical Health and Injury

- Nigg (2012) reports studies of ADHD and sexual health, and notes
 - ♂ and ♀ ADHD adults had sex at a younger age, more sexual partners, and more unprotected sex.
 - ADHD adults were 4x more likely to have a STI.
- Nigg (2012) reports Pagoto et al. (2009) studied a representative sample of 6700+ adults and found
 - 29.4% of ADHD adults were obese, compared to 21.6% of the total sample
 - Nigg notes possible reasons, including adults exercise w/ peers, so social skill differences are possible.
- Wynchank et al. (2017) review studies of ADHD and sleep, and conclude (based on 3 studies totaling 1500+ ADHD adults not taking ☹) that those with ADHD are about 40% more likely to report insomnia.
- Merrill et al. (2009) examined almost 500,000 insurance claims (1100+ child and 900 adult ADHD). Those with ADHD had increased risk for physical injuries:
 - ADHD patients were 1.7x more likely to have minor injuries (sprains, dislocations, bruises and contusions, burns, and poisoning).
 - ADHD patients were 3x more likely to have serious injuries (trauma and fractures to the skull, neck, and spinal cord).
 - ADHD females were at greater risk during child/teen years; this disappeared by adulthood.

Mental Health

- Faraone & Beiderman (2005) surveyed 500 ADHD adults and matched controls, and asked about their high school years. They found that ADHD adults reflecting on their high school years
 - were 55% less likely to say they fit in with peers.
 - were 45% less likely to report a good relationship with their parents.
 - reported 40% less time spent socializing with friends and family, and 75% less time spent dating.
 - were 50% less likely to say they had a positive outlook on their future.
 - were 2x more likely to say they struggled with depression, and 8x more likely to say with anger.
- Kessler et al. (2006) screened almost 3200 adults in a nationally representative sample:
 - 4.4% of adults met six or more criteria for ADHD (they note that many studies show ADHD adults *underestimate* the severity of their symptoms, so 4.4% may be an *underestimate*).
 - ADHD adults were
 - more likely to be white, ♂, unemployed/disabled, and divorced.
 - 2x more likely to have a single and 6x more likely to have recurrent depressive dx.
 - 3x more likely to have anxiety disorder, PTSD, or phobia (4x for social phobia).
 - 2-3x more likely to abuse alcohol or drugs.
- ADHD adults were 2x more likely to have a chronic pain disorder, depression, insomnia, and chronic fatigue (Kessler et al., 2009).
- ADHD adults reported less satisfaction in their family, peer, and work relationships, as well as quality of life (Manos, 2001).

Suicide Risk

- Agosti et al. (2011), studied 365 ADHD adults from the National Comorbidity Replication Survey:
 - 4%-5% of all adults have attempted suicide, but 16% of ADHD adults in their sample had.
 - ADHD was not a strong risk factor, but was when combined with dep, beh probs, and subs abuse.

- Ljung et al. (2014) 50,000 ADHD adult medical records over 20 years and matched controls:
 - ADHD adults were 8x more likely to attempt, 12x to complete, suicide compared to peers.
 - 1/3 of ADHD adults showed subs abuse and/or dep; after controlling for this, ADHD adults were 4x more likely to attempt, 6x more likely to complete, suicide compared to peers.
- Allely (2014) reviewed 15 studies on ADHD and suicide risk. There are issues (e.g., few females, sample sources, few adults), but mostly they show increased risk for those with ADHD (esp combined type).
- Connor et al. (2013) studied 1000+ college students (62% ♀) in into psych. Inattention and hyperactivity did not predict separately, but overall severity of symptoms correlated with increased suicidal ideation.

What We Don't Talk About



- ☹ is *not* associated with increased risk of substance abuse; in fact, it *may* decrease risk into *young adult* years.
- ADHD adults experience more workplace problems, injuries, and terminations; they achieve less in their careers and are paid less too.
- ADHD adults experience more (and more serious) injuries as well as physical pain.
- ADHD adults are more likely to experience anxiety and depression, use substances, and then to attempt (and succeed) at suicide.



In all the debates I have heard and read about ☹ being an "unfair advantage" because they are "performance enhancers" and "everyone does better on stimulants"... which is not true, by the way...

I have never heard anyone reference any of this data.

What's Good For Everyone... and What's a Treatment for ADHD?

Food Additives and Dyes, and ADHD

In 1975, Feingold designed an elimination diet to remove the food additives/dyes (and salicylic acid) that he thought caused ADHD. He estimated 50% of ADHD children he treated showed improvements:

- Connors et al. (1976) placed 15 hyperactive children on a Feingold and placebo diet (counterbalanced). Parents reported no improvements, but 25% of teachers did... when children were on the placebo diet.
- Haley et al. (1978) placed 45 hyperactive boys on a Feingold diet and placebo diet (counterbalanced). *Some* parents reported improvements, but teachers and RAs saw no changes in behavior or cognitive performance.
- Swanson and Kinsbourne (1980) reported positive effects of the diet. They drew 40 children (10 yo) from a developmental clinic, 20 (ADHD) responded well to Ⓢ (halted during the study) and 20 (non-ADHD) who did not, and *fed them at the hospital*. After 4 and 5 days, they tested memory before and after giving one of three "challenge" pills (placebo/no additives, low dose additives, high dose additives). ADHD children showed poorer test performance after challenge (though parent ratings of behavior showed no difference), while non-ADHD children showed no differences.
 - Of note, the challenge pills contained 6x and 10x more additives/ dyes than used in any prior research. This was also 4x and 6x larger than the estimated daily consumption of additives/dyes by children.
- Curtis et al. (2008) reviewed 15 well-designed studies of food additives and ADHD using challenge tests (most often a drink full of dyes/additives). Challenge tests were associated with *small* increases in symptoms in 5 studies, and no significant change in 10.
- Stevenson et al. (2014) reviewed 49 studies of restrictive diets. They report that many of the studies showing effects are flawed:
 - Some studies did not use typical ADHD children, but rather ones with food allergies. Some meta-analysis included studies conducted with non-ADHD children as well.
 - Some studies (like Bateman et al., 2004) reported positive findings, but used children who were parent-referred (meaning parents sought out a study of restrictive diets), used children under 6 years of age (when the dx of ADHD is more tentative), and assessed hyperactivity but not inattention.
 - Some studies were based on evaluations by parents... who were feeding their children, so not blind.
 - After controlling for quality of study, meta-analysis for
 - elimination diets with blind raters showed no significant differences.
 - diets removing dyes only with blind raters showed an effect size of .35 (significant, but small).
- In fairness... Schnoll et al. (2003) note that the Feingold diet removed *over 3,000 additives*. Many studies in this area only removed ten or so, and so may not have tested the effects of the full diet.

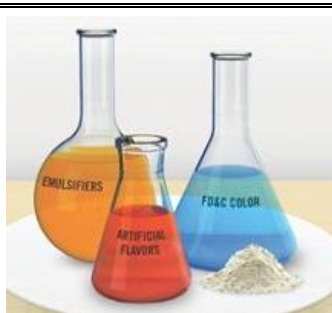
Sugar and ADHD

- Curtis et al. (2008) reviewed 16 well-designed studies of ADHD symptoms and sugar intake. Giving sweetened drinks to children with ADHD was associated with
 - increased hyperactivity in 4 studies.
 - no change in hyperactivity in 11 studies.
 - decreased hyperactivity in 1 study.

Essential Fatty Acids and ADHD

- Stevenson et al. (2014), noted above, also reviewed diets adding omega oils:
 - There are problems, as some studies used only omega 3s and placebo controls, while some used 3s and 6s as controls. Some meta-analysis combined studies of children, adolescents, and adults.
 - Overall, studies with blind raters showed an effect size of .17 (significant, but small).

- Agostoni et al. (2017) review 25 RCTs of the effects of EFAs on ADHD. They note some studies test EFAs as *supplements* to medications (8) and others *alone* (17). Further, researchers use varying doses and different sources of EFAs alone and mixed:
 - EFAs as supplements to ADHD medications
 - Voigt et al. (2001) and Salehi et al. (2016) studied EFAs with ☺ for 4 mos and 2 mos. Both found improvements in reports of inattention, but no changes to hyperactivity or cognitive performance.
 - Barragán et al. (2017), Assareh et al. (2017), and Behdani et al. (2013) studied EFAs and placebos with ☺ for 12 mos, 2.5 mos, and 2 mos. *All* groups showed similar reductions in symptoms.
 - Anand et al. (2016) studied EFAs with atomoxetine for 4 mos. They found improvements for combined type only.
 - EFAs alone for ADHD
 - Belanger et al. (2009) studied EFAs and placebos for 2 mos. *All* groups showed similar reductions in symptoms.
 - Milte et al. (2012 and 2015) conducted a cross-over design using three oils over 12 mos. EFA groups showed improved inattention (parent report), but no change in hyperactivity or cognitive performance.
 - Bos et al. (2015) and Gustafsson et al. (2010) studied EFAs and placebos over 4 mos. They found reductions in reported inattention, but not hyperactivity.
 - Manor et al. (2012) studied EFAs over 4 mos. They found reductions in hyperactivity and "mood and behavior-dysregulation," but not reports of inattention.
 - Keen et al. (2017) studied PCSO-524® (New Zealand green-lipped mussels) over 2 mos. They found improvements in attention and hyperactivity... for controls but *not* for children with ADHD.
 - Stevens et al. (2003) studied high doses of a mix of EFAs over 4 mos. Teachers reported improvements in inattention, parents reported improvements in hyperactivity, but they found no improvements in cognitive performance (attention, processing speed, and memory).
 - Johnson et al. (2009) studied EFAs over 4 mos. They found improvements... but only for 26% of ADHD children (all boys with learning/motor disabilities).



What We Don't Talk About

- Should people *with* ADHD eat foods with lots of additives? **No.**
- Should people *without* ADHD eat foods with lots of additives? **No.**
- Should people *with* ADHD take omega oils? **Yes.**
- Should people *without* ADHD take omega oils? **Yes.**
- Are these replacements for treatment for ADHD? **No. ☺ and ☹ have far more reliable benefits.**

