Non-Pharmacologic Treatment for ADHD: What is the Evidence?

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Disclosures

- on the Scientific Advisory Group of Start to Finish which promotes exercise as a developmental support for children
- Member of CADDRA
- No pharmaceutical industry sponsorship
“If I had an hour to solve all the problems of the world, I would spend 59 of those minutes defining the problem.”

Albert Einstein
Learning Objectives

• How we got here: revisiting the MTA study
• Re-defining treatment goals for ADHD
• Explore evidence for some non-pharmacologic treatments available for ADHD
• Consider how we look at evidence for different kinds of treatments
One important consideration when reviewing the literature

• 1,560,000 results come up when you google alternative treatments for ADHD

• In evidence based summaries, they refer to evidence that a given treatment changes ADHD symptoms; they don’t refer to a treatment’s likelihood of altering function or long term outcomes.
What is our intention?

A. To manage the symptoms of inattention, hyperactivity and impulsiveness.

OR

B. To improve long term outcomes related to academic achievement, social integration, family contentment and overall adjustment.
Where we came from:
The MTA study

• In 1992, NIMH launched the Multimodal Treatment Study of Children with ADHD

4 arms X 14 months:

1. expert titrated stimulant medication
2. behavioural treatment: (both clinical behaviour therapy and direct contingency management)
3. combination of medication and behavioural treatment
4. community-based treatment
Initial findings from the MTA

- Behavioural treatment plus medication is only slightly more efficacious than medication alone, but not enough to justify the expense.
- All groups improved over time (When using behaviour management plus medication, significantly lower doses of drugs could be used)
Repercussions of the MTA results

• The finding that behavioural support is only marginally better than medication alone has become a pillar of pharmaceutical companies’ campaigns to market A.D.H.D. drugs.

• used by government payers and school systems to argue against therapies that are usually more expensive than medication.
In the management of ADHD, reveal his potential.

ADDERALL XR® Improves Academic Performance

- Objective measures of academic performance improved significantly.

For the treatment of ADHD (Attention Deficit Hyperactivity Disorder)

A typical school day

- Starts CONCERTA®
- Pays attention during class
- Interacts well with classmates
- Keeps interrupting teacher
- Forgets homework
- Eats lunch alone

Time to ask your child's doctor about CONCERTA®

Today I got a good mark.
And made a new friend.
What a great day!

For children with ADHD getting through the day can be difficult.
MTA findings continued...

• Several years later, alternative analyses including more reliable outcomes featuring functional impairment indicated **significant superiority** for multimodal intervention: **significant incremental benefit from adding behavioural treatment to medication**

• These results got far less media attention

• 22 months after the end of formal treatment all four treatment arms looked the same

• This pattern of initial superiority of medication treatment that evaporated over time has continued across all subsequent years of follow-up
MTA findings continued...

“...the initial superiority of medication with respect to symptom improvement gradually abated after the randomly assigned interventions ceased, becoming nonsignificant 2 years later. At the same time, certain side effects (e.g., a slight diminution of ultimate adult height) persisted in some cases, leading to additional questions about the long-term advantages and disadvantages of pharmacologic intervention for ADHD.”

(Swanson et al., Unpublished manuscript).
Clinical Result of the MTA

- North American treatment guidelines featured medication as the first line treatment (parallel European recommendations did not)
- These results led to significantly increased use of stimulant medications in children.
- Not much attention has been paid to the long term studies showing lack of efficacy of medication on functional outcomes
Treatment Subgroups: Aggressive Behaviour + ADHD:

• the 54% of the MTA sample with comorbid diagnoses of aggressive behavior patterns (i.e., oppositional defiant disorder or conduct disorder) did not show an appreciably different response to any of the four randomly assigned treatments.
Treatment Subgroups: Group with significant parent improvement

- The kids in the behaviour + medication group whose parents improved the most had major improvements in school function
Treatment Subgroups: Anxiety + ADHD

• the subgroup with ADHD plus a comorbid anxiety disorder showed a better response to Behavioral Treatment and Combined Treatment than did those lacking such comorbidity.

• for youth with comorbid anxiety disorders, response to Behavioral Treatment was comparable to response to Medication Management, and response to Combined Treatment was even better.
Treatment Subgroups: Poverty+ADHD

Families on welfare in the MTA trial:

only Combined Treatment yielded meaningful benefit with respect to the outcome of teacher-reported social skills.
A.D.H.D. Experts Re-evaluate Study’s Zeal for Drugs

New York Times 2013

“I hope it didn’t do irreparable damage. The people who pay the price in the end is the kids. That’s the biggest tragedy in all of this.”

Co-author of the MTA, Dr. Lily Hechtman (McGill University)

“My belief based on the science is that symptom reduction is a good thing, but adding skill-building is a better thing.” If you don’t provide skills-based training, you’re doing the kid a disservice. I wish we had had a fairer test.”

Dr. Stephen Hinshaw, psychologist at the University of California, Berkeley, Co-author of the MTA

“Pills don’t build skills.”

Dr. Gabriel Weiss
“Analyses revealed that when accompanied by clinically significant improvements in parenting style, multimodal treatment yielded not just improvement but even *normalization of school-reported behavior patterns*.”

*Hinshaw, Cogn Sci 2015, 6:39-52*
Placebo + Medication

Conditioned Placebo Dose Reduction, Sandler et al, J Dev Behav Pediatr 31:369-375, 2010

RCT, 3 groups of kids with ADHD: normal stimulant dose, reduced dose (by half), reduced dose (by half) + placebo

• Told kids and parents that they were going on a reduced dose + a placebo, that might have a “dose extender effect”

• Kids on reduced dose did poorly

• Kids on normal dose and ½ dose + placebo had equal results
Redefining Our Goals

1. Improve academic performance
2. Enhance social skills and peer relationships
3. Improve family life
4. To help the child be happier
5. To provide long term benefits.
Summary: The rationale for looking beyond medication

- Stimulant medication relieves the symptoms of ADHD but has not been shown to improve long term outcomes.
- Common side effects are well known and apart from growth delay are not usually serious.
- Some children do not respond or experience side effects precluding their use.
- Many parents and children are not comfortable with medication as an ongoing intervention for children.
- A majority of individuals prescribed medication stop taking it within the first year, and once medication is terminated, symptoms typically return the next day.
- Medication is less effective for treating associated features, such as poor social skills, academic difficulties and executive function deficits.
- We don’t have a lot of evidence for the use of stimulants in preschoolers.
Differential Diagnosis of Disruptive Behaviour

- Home environment, maternal/paternal mental health, parental relationship
- Learning disorder/Intellectual Disability
- Anxiety/depression
- Fetal Alcohol Spectrum Disorder
- Autism Spectrum Disorder
- ADHD
- Sensory processing challenges
- Attachment Disorder
- Child maltreatment
- Poverty
- Untreated/poorly treated medical conditions (e.g. asthma)
Re-thinking how we use medication

What if we start to think of stimulant medication as something that might set the stage for *skills building/treatment* that will provide long term, functional benefits to the child?
Levels of Evidence

Is it reasonable or practical to hold some of the non-pharmacologic treatments to the same level of evidence as medication?

Shouldn’t we also be considering safety, cost and time expense?
Case

Anna is an 11 year old girl in grade 6. Her teacher encouraged her single mother to take her to the doctor for evaluation of possible ADHD. Anna was very inattentive in class.

History and classroom observations confirmed the teacher’s concerns and it was evident that Anna’s symptom of inattention was impacting her academic achievement and her home function.

• Anna met criteria for ADHD, inattentive presentation
• Detailed history from the teacher revealed an unusual pattern of behaviour: Anna’s inattentiveness was worse on Mondays, gradually lessening to Friday.
• Her mother related that Anna went to the maternal grandparents every weekend to give the mom some respite.
• Interview with Anna revealed that her grandfather was sexually abusing her every weekend.
Is this really ADHD??

- Still sad about dumping Aunty's ashes in water.
- My stepmom not getting enough food; she's not selling enough to buy food. She's on methadone.
- Morgyn.
- My dad using drugs.
- Me not doing enough work.
- Not going in a regular school.
- Can't concentrate.
### Non-Pharmacologic Therapies from an Evidence vs. Risk Perspective

<table>
<thead>
<tr>
<th>Good Evidence, low risk</th>
<th>Some Evidence low risk (in terms of time/money investment)</th>
<th>Poor Evidence, low risk</th>
<th>Poor Evidence, higher risk</th>
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</thead>
<tbody>
<tr>
<td>Parent Education</td>
<td>Omega-3 fatty acids</td>
<td>CBT/psychotherapy (except with co-morbid anxiety/depression)</td>
<td>Cognitive Training (CogMed)</td>
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<td>Parent Behaviour Training</td>
<td>Social Skills training for parent/teacher</td>
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<td>Organizational Skills Training</td>
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- **Parent Education**: Omega-3 fatty acids, CBT/psychotherapy (except with co-morbid anxiety/depression)
- **Parent Behaviour Training**: Social Skills training for parent/teacher, Social Skills Training for child
- **Organizational Skills Training**: Mindfulness Training/Meditation, Nutritional supplements, Traditional Chinese Medicine
- **Aerobic Exercise**: Elimination Diets (except in specific children with proven sensitivities)
- **Time in nature**:
Behavioural Parent Training/Summer Treatment Program

• Parents of children with ADHD show more negative and ineffective parenting (e.g., power assertive, punitive, inconsistent) and less positive or warm parenting

• Targets functional impairments, not symptoms.

2 Main components:

1. Teach parents to see their child through the “ADHD lens”. Understand their behaviour as being reflective of their condition.

2. Contingency Programs: Reward systems for targeted behaviours.
Behavioural Management

Functional Behavioural Analysis: figures out which behaviours should be targeted and what the triggers for the behaviours are.

Parent-Child Interactions adjustments: tries to figure out the coercive, negatively reinforcing parenting that affect home life, etc.

http://keltymentalhealth.ca/resources?tid6[]=124
Limitations of Behavioural Interventions

• Outcomes tend to be setting specific, so that behavioral interventions implemented in one setting (e.g., home) often do not generalize to another setting (e.g., school) without behavioral intervention in that setting as well.

• Although treatment effects can persist for at least several months after treatment ends, beyond that time, periodic treatment may be necessary.
Organizational Skills Training

• 20 sessions with a therapist that includes parent and teacher participation, specific handouts and an evolving schedule of tasks
• RCT randomized kids to OST, standard contingency-based behaviour program or a wait-list control group
• Results showed improved school, homework and family functioning
• At the end of treatment, 60% of children no longer met the criteria to be included in the study!
• The benefits were the same for kids on or not on medication
• The behaviour treated group had similar results with the exception of parent ratings at home (OST better)
• Self-ratings and school success better with OST
Organizational Skills Training vs Executive Function Training

• Not designed as “EF training”
• EF uses computerized lab-based training
• It assumes that what is learned in the lab will transfer to real life
• There is no direct association between what is trained in the lab and what the target behaviour is in real life
• The rewards available in the on-line training don’t exist in real life
• OST targets real life skills in real life
Omega-3 Fatty Acids

• Essential nutrients (we don’t make them): made of 2 components: EPA and DHA
• Omega-6 is much more plentiful in western diet, especially in processed foods
• The ratio of omega 6:omega-3 may be important
• Doses in most studies are a lot higher than in children’s gummies or other usual omega-3 supplements
Omega-3 Fatty Acids

- Various meta-analyses have produced conflicting results
- Most recent RCT from Netherlands found positive effects using EPA 450 mg daily (Bos, et al. Neuropsychopharmacology, 2015, 40)
- Seems to especially affect attention
- Other studies showed that with omega-3’s, lower doses of stimulants were needed
Social Skills Training

- Remember to ask about peer relationships as this is a major issue for kids with ADHD
- Treating symptoms of ADHD (with meds) may not lead to improved social skills
- Social Skills Training (SST) doesn’t generalize well; it is better to train teachers and parents to implement social skills training in situ
Mindfulness

• Aim is to teach long-lasting skills for self-management
• Goal is a cognitive and intention-based process characterized by self-regulation of attention to the present moment
• Various studies have shown that it modifies attention networks, changes neural activity, alter dopamine levels, modulate EEG pattern and potentially increase cortical thickness
• Emotional regulation is another possible outcome of mindfulness
Mindfulness

• ADHD affects the whole family
• Mindfulness may help adults cope better
• some small studies show improved behaviour and attention, but it may wane after the program ends
• Improvement on tests of attention and some tests of executive function
Mindfulness: meta-analysis

largest effects were seen for:

• parent-rated functional impairment
• teacher-rated ADHD symptoms
• academic productivity.
• These effect sizes are in the same range as those for stimulant medication.
• Previous meta-analysis showed smaller effect sizes because it only looked at effect on symptoms, not on functional impairments
Physical Activity

- Aerobic exercise stimulates neurotrophic factor which stimulates neuronal growth and differentiation
- Exercise acutely improves neuropsychological functioning including executive function, processing speed, memory and learning.
- In typical kids, increases in physical activity resulted in small, but significant improvements in children’s academic performance.
- After long-term (i.e. ≥5 weeks) moderate–vigorous exercise interventions (20-30 minutes 3X weekly), research suggests that children’s ADHD-related behaviors may be less severe and improvements in performance on measures of neuropsychological function may be observed.
- Physical activity may offer benefits over and above psychostimulant use.
• Improving general health and fitness may improve peer relations and self confidence
Time in Nature

Concept of ‘Attentional Restoration Therapy’
Try to address the question of why some kids with ADHD concentrate well some of the time.

• Studies compare the effect of walking in urban/neighborhood settings, to walking in natural park settings on children’s function on various cognitive tasks
• Parents rated children’s symptoms post-walk and testers assessed them on one cognitive measure
• Children who had been in the park did better on both measures
Cognitive Behavioural Therapy (CBT)/Psychotherapy

• 2 parts: education about the condition and ‘cognitive re-structuring’ (getting the child to think about their problems in a different way)
• Very helpful for depression and anxiety
• Studies are in adolescents and adults only, show some real world benefits, but needs more study
• Any CBT intervention that is focused more on cognitive therapy (eg, modifying irrational thoughts, increasing self-monitoring) without concurrently incorporating contingency management principles, especially reinforcement, is not likely to be effective.
Nutritional Supplements

Gingko Biloba: has some effect but increases bleeding risk. The reduction in ADHD symptoms was much less than with methyphenidate.

St. John’s Wort (hypericum): no effect above placebo.
Nutritional Supplements

L-Carnitine: no evidence
Iron: improves ADHD symptoms in children with low ferritin
Zinc: not recommended unless there is zinc deficiency (very rare in healthy Canadian children)
Magnesium: no good evidence, several poorly designed trials recommend it. High dose Mg is toxic
Elimination Diets

• Many decades of research, but very little that is recent
• Food has changed, many more additives allowed, especially in the U.S.

If we think of ADHD as an epigenetic condition triggered, in susceptible individuals, by varying environmental amplifiers, it makes more sense why a small number of children have a good response to elimination diets.
Food Additives to Avoid

- Food additives to avoid:
  - All artificial colors
  - All artificial flavors
  - All artificial sweeteners, including aspartame, acesulfame K, neotame, saccharin, sucralose
  - Sodium benzoate
  - Butylated hydroxyanisole and Butylated hydroxytoluene
  - Carrageenan
  - Monosodium or monopotassium glutamate
  - Any hydrolyzed, textured, or modified protein
Cognitive Training

• Based on evidence that there are neuropsychological differences in kids with ADHD: working memory, processing efficiency, inhibitory control, and attention
• Assumes that because of neuroplasticity, training can alter neural function
• Functional and structural changes have been found but the mechanism is unknown
• Studies show effects, but not when only blinded subjects were used
• At this point, there is no real evidence to support it for ADHD, may be useful for working memory deficits
Neurofeedback

• Hook patients up to EEG’s and then give them immediate feedback on how they are regulating their brain waves to look like those of typical children
• Stronger effects for attention and impulsivity than hyperactivity
• Many studies show promising results, but they are mostly un-blinded and the teacher ratings haven’t been positive
• Difficult to generalize to real life
Traditional Chinese Medicine (TCM)

• Has been used for >2000 years
• 2500 years ago: “Excess Yang leads to raving speech, chiding and cursing regardless of who is present.”
• caused by the imbalance of yin-yang and dysfunction of the Zang-fu (viscera) organs.
Traditional Chinese Medicine

Treatment attempts to balance Yin and Yang using: Traditional Chinese Herbs, acupuncture, Chinese medical massage, Tai Chi, TCM diet therapy

Empirical support: very difficult to evaluate as by its very nature, TCM, is individualized and doesn’t lend itself well to RCT’s, but has been informed by centuries of trial and error

“Cultural acceptance leads to belief and good compliance, resulting in the expected treatment effect.”
When considering the evidence:

• Most studies look at how treatments affect core symptoms

• Look for an evaluation of how the treatment changed function and whether it persisted over time

• Consider possible side effects

• Consider expense of time and money
Fig. 2. ADHD treatment effect sizes.

Stephen V. Faraone, Kevin M. Antshel

Towards an Evidence-based Taxonomy of Nonpharmacologic Treatments for ADHD


http://dx.doi.org/10.1016/j.chc.2014.06.003
Incorporating Non-Pharmacologic Treatment for ADHD

- Parent Education and Parent Behaviour training: on-line, group or individual classes, books
- Teacher education
- Organizational Skills Training
- Adequate sleep
- Whole foods diet: avoid processed food and red/yellow food colouring (and additives listed above)
- Omega-3 fatty acids (750-900 mg of EPA portion daily)
- Daily aerobic exercise
- Daily time in nature
- Mindfulness training for the whole family
- Long acting stimulant medication if indicated as per CADDRA guidelines
Resources

1. CADDRA: http://www.caddra.ca/
2. CHADD: http://www.chadd.org
3. The National Institutes of Mental Health (www.nimh.nih.gov)
6. Organizational Skills Training for Children with ADHD, Richard Gallagher, Howard Abikoff, Elana Spira
8. Mindfulness app: Simply Being
9. Mindfulness for young children: Sitting Still Like a Frog, Eline Snel
Children’s Assessment Team


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