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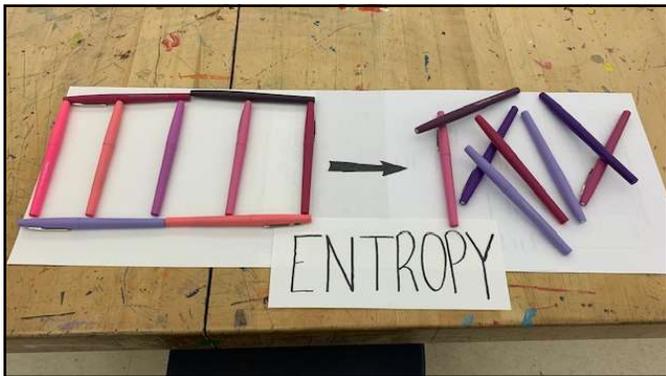
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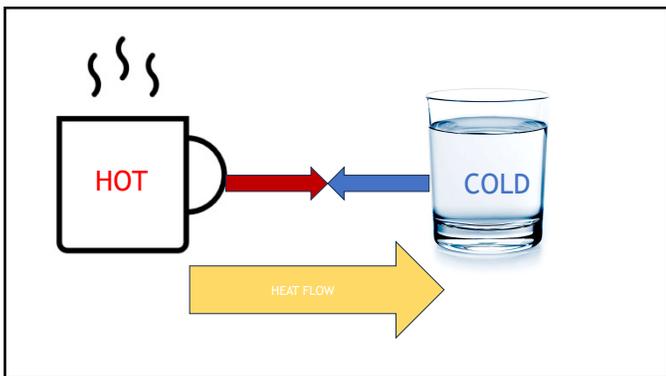
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### Student Behavior contributes to Teacher Stress

Teachers: 178  
Students: 2,339 (age 6-10)  
• Students with ADHD 4.98%



Survey	Description
Classroom Behavioral Survey	Prevalence of specific student issues
Psychological Stress Measures	Perceived stress of teachers
Structural Education-School Entropy	Structure in the classroom and school
Personal Teacher Entropy	Teacher's attributes influence classroom

Fabio et al 2023

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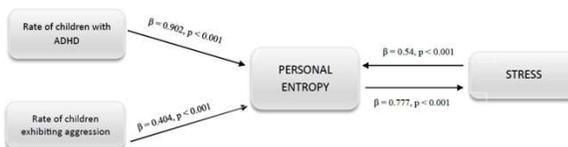
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### Student Behavior contributes to Teacher Stress

• Increased frequency of ADHD students increased teachers' entropy



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graph LR; A[Rate of children with ADHD] -- "β = 0.902, p < 0.001" --> C[PERSONAL ENTROPY]; B[Rate of children exhibiting aggression] -- "β = 0.404, p < 0.001" --> C; C -- "β = 0.54, p < 0.001" --> D[STRESS]; C -- "β = 0.777, p < 0.001" --> D;
```

Fabio et al 2023

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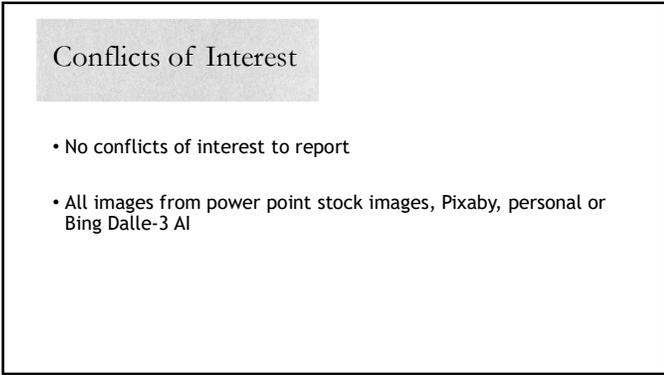
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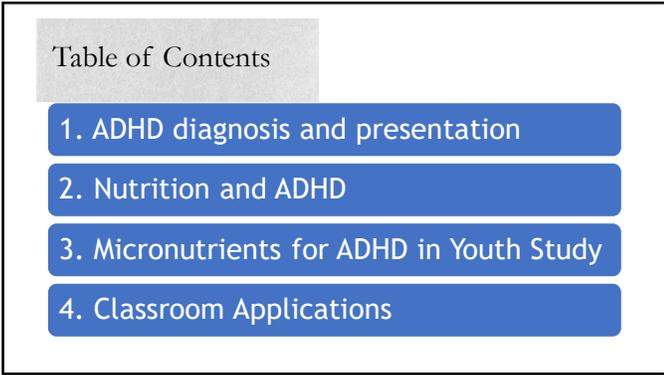
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AMERICAN ACADEMY OF CHILD & ADOLESCENT PSYCHIATRY

## ALL ABOUT ADHD

**Definition**  
is a condition which includes difficulties with attention, increased activity, and impulsivity. About 11 % of children and 4% of adults have ADHD.

**Presentations of ADHD**

- Inattentive
- Hyperactive/Impulsive
- Combined

\*ADHD = ADD as this term is no longer used

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## ALL ABOUT ADHD

To get a formal diagnosis symptoms must occur in two or more settings:



HOME



SCHOOL



FAMILY or FRIENDS

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### When do symptoms appear?

As early as toddler years

**BUT**

Diagnosis is closer to age 6 or older

### What do parents notice?

"Cannot sit still in school and is even worse after a full school day"

"Would run before they could walk"

"Gets in trouble for talking when they are not supposed to at school"

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### Racial Disparities

- Under diagnosis
  - "Black children are 17% less likely to be diagnosed with ADHD but are over 2.4 times more likely to receive a diagnosis of conduct disorder." (CHADD)
- Barriers to treatment
  - Asian community had the highest odds of not receiving treatment compared to Black, White, LatinX
- Perception of ADHD driven by individual biases

Resources:

CHADD:

- [Why are Black Preschoolers with ADHD expelled?](#)
- [Black History Month Resources](#)

Shi et al. 2021

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When you think about  
the content of food,  
*what do you think about?*

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### Comparing *Macronutrients*



Protein - 26g  
Carbs - 42 g  
Fat - 23g  
467 Calories

Protein - 20g  
Carbs - 43g  
Fat - 24g  
468 Calories

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What are micronutrients?

Periodic Table of the Elements

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What are micronutrients?

Minerals

- Magnesium
- Calcium
- Chromium
- Lithium
- Iodine
- Copper
- Zinc
- Iron
- Molybdenum
- Nickel
- Phosphorous
- Potassium
- Selenium
- Vanadium
- Boron



Vitamins

- Vitamin A
- Vitamin D
- Vitamin E
- Vitamin B<sub>1</sub>-B<sub>12</sub>
- Vitamin C
- Vitamin K



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The need for micronutrients

Modern farming practices have altered soil nutrients

- o Herbicides and pesticides chelate (pull) minerals
- o Monocropping



Individual differences in genetics

- o Example: MTHFR gene

Gut dysbiosis (leaky gut)



Benton, 2013, Molecular Nutrition & Food Research, Kaplan, 2015, Clinical Psychological Science Pauling, 1995, J of Nutritional & Environmental Medicine Ames, 2002, J Clin Nutrition

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### The Brain Needs Nutrients



It accounts for  $\approx 2\%$  of our body weight but represents 20-50% of our metabolic demands

Leonard (2003) Comp Bio & Physio

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## The MADDY Study (Micronutrients for ADHD in Youth)

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### Micronutrients for ADHD in Youth (MADDY) Study



**Micronutrients** (n=71): Baseline Visit, Week 8 Visit, Week 16 Visit

**Placebo followed by micronutrients** (n=55): Baseline Visit, Week 8 Visit, Week 16 Visit

Legend: ● Micronutrient Intervention, ● Placebo Intervention

Created with BioRender.com

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### Safety



- No between group differences on parent reports of 43 possible adverse events
- No concerning blood work (CBC, CMP) or values from urinalyses

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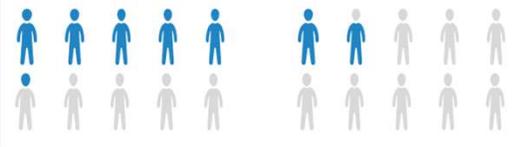
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### TREATMENT RESPONDERS

Micronutrient Group: **54%**      Placebo Group: **18%**



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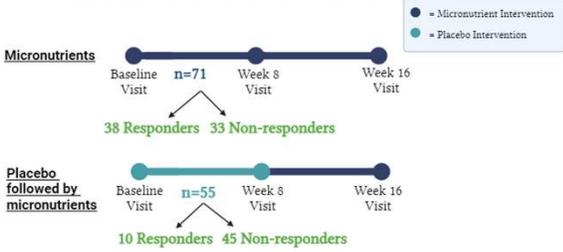
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### TREATMENT RESPONDERS



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## HEIGHT GROWTH



Children in the micronutrient group grew more than 6 mm than those in the placebo group within 8 weeks  
( $p=0.002$ )

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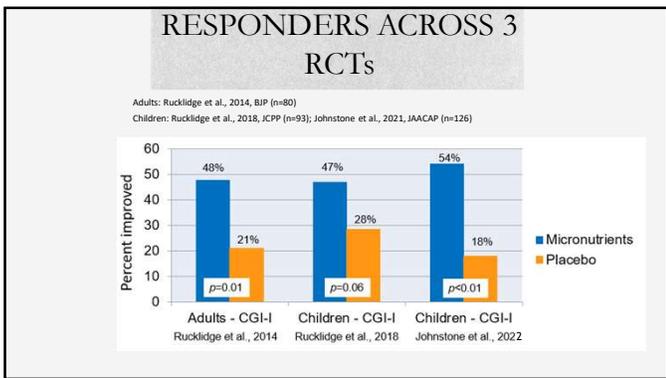
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## Micronutrients, Multivitamins and Food

	Studied Formulas	Over-the-Counter Formulas	Amount in Food
Vit B6	70 mg	0.4 mg	47 cups of wheat bran
Vit D	40 mcg	6 mcg	six 100 g servings of salmon



Rucklidge. 2014. NZ Medical Journal.

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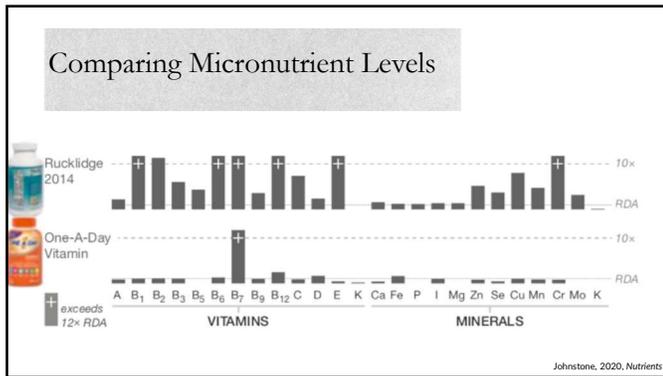
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### Why do micronutrients work?

Theories:

- Meeting nutrient needs
- Example: MTHFR gene
- Addressing inflammation
- Influencing gut health

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### What impact do micronutrients have on our body?

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# Inflammation

Preliminary analyses point towards changes in the Th2 pathway in children who received micronutrients.

- Classic Clinical Triad
- Allergies
- Eczema
- ADHD



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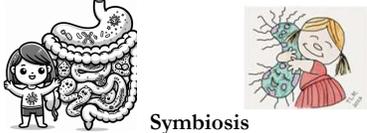
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# Gut Microbiome

Definition: A diverse array of microorganisms consisting of bacteria, viruses, fungi, and other microbes.



Symbiosis

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# WHERE IS IT ON YOUR BODY?

- All OVER!
- Bacteria: Human Cells ratio is 1:1
- 2,000 different species of bacteria.
- It is said to weight 4 pounds in a 200lb person.
- Think of it as another organ.



Sender 2016

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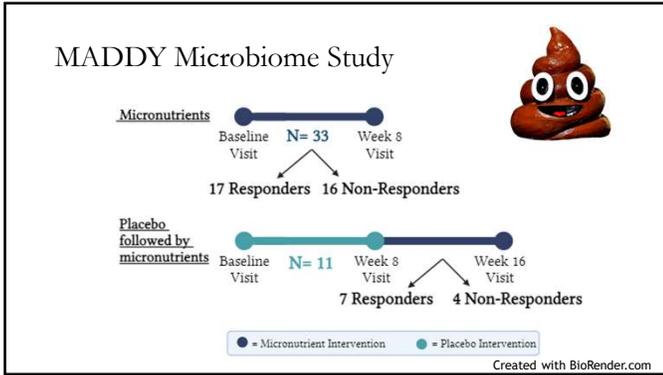
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### Results

**Micronutrients versus Placebo:** *Actinobacteriota* (phylum) was significantly decreased in children who received micronutrients

**Responders versus Non-Responders:** *Oscillospiraceae* and *Rikenellaceae* (families) were significantly increased in responders

Big Picture: Micronutrients led to a change in the microbiome over the course of 8 weeks.

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Why is this child not paying attention?

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Did they poop today?

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It is important to poop every day to:

- Remove toxins
- Relieve discomfort
- Reduce anxiety
- Optimize the gut microbiome

Liang et al. 2022

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How can you help?

- Movement
  - Yoga Dice
- Moving mindfulness
  - Dancing
- Guided Imagery



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Did they eat breakfast?

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Eating breakfast is important for:

- Blood sugar regulation
  - Fiber
  - Protein



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**The Top 20 Fiber-Rich Foods to Add to Your Plate**

- Lentils = 1 cup has 16 grams of fiber
- Black beans = 1 cup has 15 grams of fiber
- Pistachios = 1 cup has 13 grams of fiber
- Prunes = 1 cup has 12 grams of fiber
- Chickpeas = 1 cup has 10.6 grams of fiber
- Artichokes = 1 artichoke has 10 grams of fiber
- Peas = 1 cup has 9 grams of fiber
- Oatmeal = 1 cup has 8 grams of fiber
- Raspberries = 1 cup has 8 grams of fiber
- Avocado = ½ avocado has 7 grams of fiber
- Pears = 1 medium unpeeled pear has 6 grams of fiber
- Chia seeds = 1 tablespoon has 5 grams of fiber
- Brown rice = 1 cup has 4 grams of fiber
- Apples = 1 small, unpeeled apple has 4 grams of fiber
- Broccoli = 1 cup has 2.4 grams of fiber
- Kale = 1 cup has 2.6 grams of fiber
- Spinach = 1 cup has 4.3 grams of fiber
- Celery = 1 cup has 1.6 grams of fiber
- Dark chocolate = 1 ounce has 3.1 grams of fiber



[Linus Pauling Institute\\_Fiber](#)

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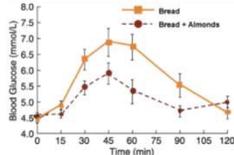
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### How can you help?

- **Snack**
  - Ask parents/guardians to pack a snack with protein and fiber
  - According to the Linus Pauling Institute:
    - 60 percent of the younger children (5 to 8 years old) and
    - 78 percent of the older children (9 to 11 years old) do not meet the recommended intake for fiber.
  - Recommended Fiber:
    - Ages 3-7 years old: 10 grams of fiber per day
    - Ages 7+ years old: 15 grams of fiber per day
  - Lead by example
- **Movement after meals**
  - Unclear guidelines for kids



Jakstas et al., 2023  
O'Keefe et al., 2008  
[Linus Pauling Institute\\_Fiber](#)

Citation: <https://doi.org/10.1016/j.jacc.2007.10.016>

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### How do children with ADHD thrive?

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### How can you help?

- Embrace creativity
- A classroom that can nourish spontaneity
  - Redirection, Self-Management, Frequent Breaks
- Talk to parents about:
  - Learning styles
  - Breaks with homework
  - After school let it OUT!
    - Masking



Harrison et al. 2022  
 Hinshaw et al. 2023  
[The Atlantic article on Finnish School](#)

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**Key Messages**

- ADHD is a common disorder can be managed with an actively supportive community.
- By addressing nutrient needs, ADHD symptoms can improve.
- Your health and health education influences students.

"You're only given one little spark of madness. You mustn't lose it."  
 -Robin Williams

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Thank you to the teachers!

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Questions?

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Scan Code for  
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