

EATUNIQUELY

Can Nutrition Improve Cognition?

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Outline

- Define cognition
- A little bit about brains and their development
- Effects of prenatal alcohol exposure on developing brain
- Effects of prenatal alcohol exposure on cognition
- Choline as an intervention for prenatal alcohol exposure



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Key Points

- Cognition is defined as thinking, knowing, and/or perceiving
 - Perceiving become aware or conscious of (something);
 come to realize or understand

• Many things affect cognitive ability including age, nutrition, and environmental factors



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https://easyscienceforkids.com/all-about-your-amazing-brain/





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https://upload.wikimedia.org/wikipedia/commons/1/13/GarpenBrain.jpg



http://newsroom.ucla.edu/releases/ucla-research-upend-long-held-belief-about-how-neurons-communicate

 $\widehat{\mathbb{I}}UNC|_{\text{institute}}^{\text{nutrition research}}$

Pop Quiz: How many cells are in a human brain?

- 100 million (100,000,000)
- 1 billion (1,000,000,000)
- 10 billion (10,000,000,000)
- 100 billion (100,000,000,000)



Pop Quiz: How many cells are in a human brain?

- 10 million
- 1 billion
- 10 billion
- 100 billion (100,000,000,000)





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https://news.psu.edu/story/441320/2016/12/08/research/how-make-motor-neuron



Early Development of the Brain







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Photo courtesy of Sterling Clarren, MD



http://www.medimaging.net/mri/articles/294744129/mr_images_show_how_fetal_alcohol_exposure_affects_childrens.html





Fetal Alcohol Syndrome

- Facial features
- Growth head circumference, height, weight
- Brain structure and/or function





- Learning and remembering
- Understanding and following directions
- Shifting attention
- Controlling emotions and impulsivity
- Communicating and socializing
- Performing daily life skills, including feeding, bathing, counting money, telling time, and minding personal safety

Cognition is defined as thinking, knowing, and/or perceiving



Fetal Alcohol Syndrome

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Fetal Alcohol Spectrum Disorders

- FAS
- And other disorders that occur after prenatal alcohol exposure but that don't have all the above



Somewhere between 10 and 30% of pregnant women drink alcohol

Somewhere between 1 and 5% of 1st grade children IN THE US are affected by alcohol



The good news... not everyone is (severely) affected

The bad news... we don't know why some people are protected

and we don't have many interventions that work



- Factors that modify the risk include:
 - Amount of alcohol & pattern of consumption
 - Timing
 - Genetics
 - Socio-economic status
 - Nutritional status
 - Underlying health status
 - Other exposures (smoking, drugs, chemicals, environmental stressors etc.)



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Choline

- Accumulates during brain development and is used in cell membranes
- Critical chemical for cognition acetylcholine
- Needed during adolescence when the brain is being remodeled
- AI (adequate intake, mg/day) adult men 550, adult women 450



FOOD	Choline (mg/serving)	% Adequate Intake (adult men)
Liver (3 ounces)	356	65
Egg (large)	147	27
Beef top round (3 ounces)	117	21
Soybeans (1/2 cup)	107	19
Chicken breast (3 ounces)	72	13
Ground beef (3 ounces)	72	13
Fish, cod (3 ounces)	71	13



https://ods.od.nih.gov/factsheets/Choline-HealthProfessional/







Working Memory





https://ods.od.nih.gov/factsheets/Choline-HealthProfessional/









https://www.psytoolkit.org/experiment-library/experiment_wcst.html

Findings – adolescent task

- Alcohol exposed animals took longer to learn the task
 - Alcohol exposed males did worse than females
- Animals given choline did better on the task



Findings – adult test

- Control animals performed as expected
 - Choline +/- training did not help
- Alcohol exposed males did worse than females
 - Choline + training helped ~50% of these males



Findings – other people's work

• In some experiments kids with a fetal alcohol spectrum disorder given choline do better on later testing



Future Directions

- Why does choline help?
- Does choline only help cognitive function? What about other behaviors like social behavior? Or sleep?
- Other than behavior, is there anything else you can add to choline to make the intervention work better?
- In the adult test, choline + training helped ~50% of the males what makes these animals different to the 50% that are not helped?



Jaylyn Waddell Eric Ho Elizabeth Hill

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of the NATIONAL INSTITUTES OF HEALTH





in such a

UNC INSTITUTE

National Organization on Fetal Alcohol Syndrome www.nofas.org



What Are FASDs?

http://www.fasdinnc.org/



North Carolina Fetal Alcohol Prevention Program







Resources Resources for Learn More

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