



The Learning Connection



Robert Murray MD: Disclosures

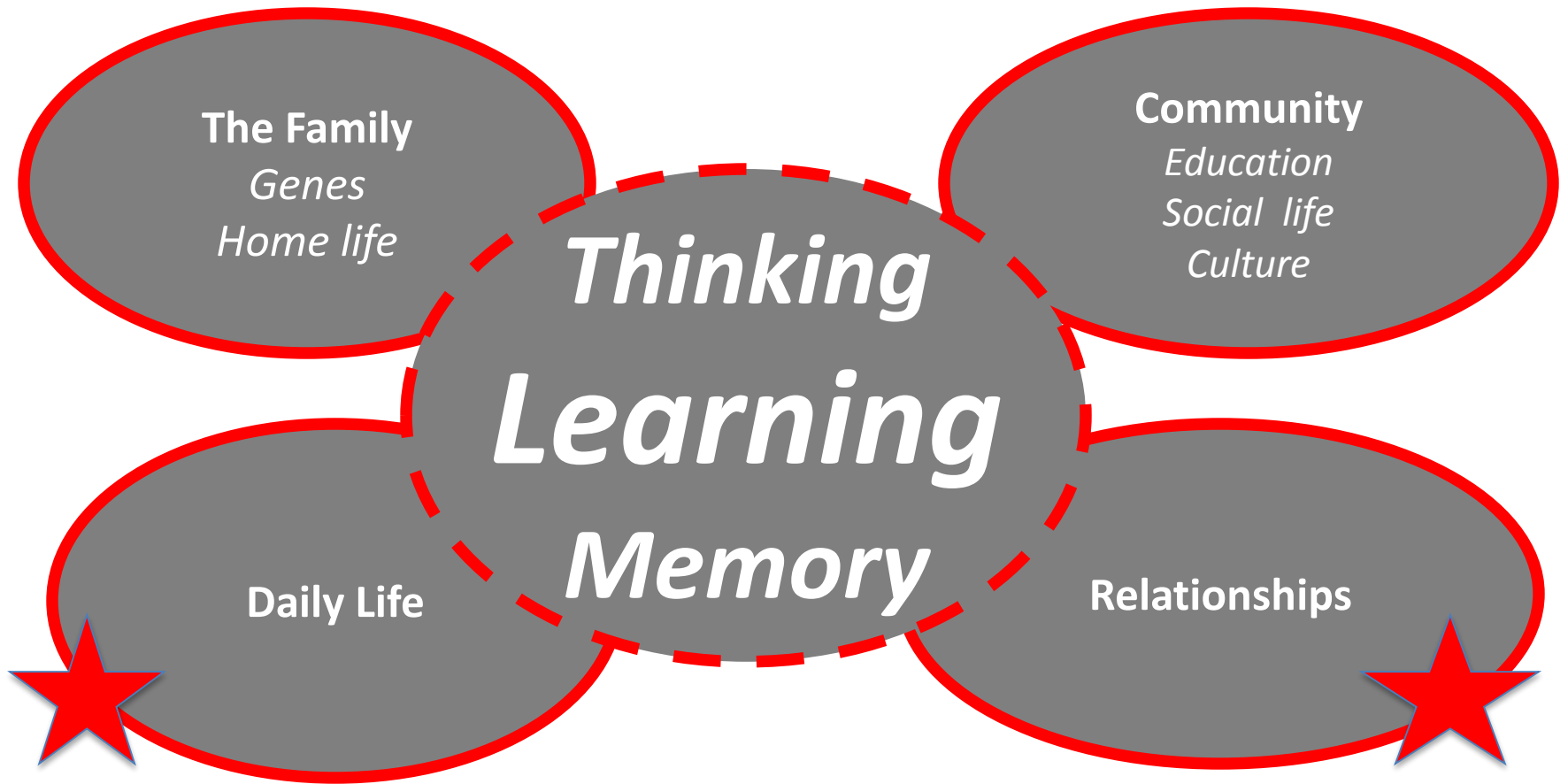
Advising
Speaking
Writing
Education

National Dairy Council
Abbott Nutrition
Dannon Co.
Cargill Inc.
Sabra Dipping Co.
Hass Avocado

Our Discussion

- Early life builds the brain
- Diet, activity, and social skills shape school success
- School meals are our most potent nutrition intervention
- Breakfast is a unique opportunity

More than Just the Genes



At Birth

Only the basic brain is in place

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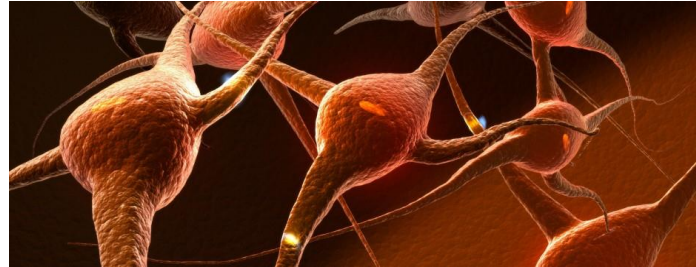
Brain cells, the spine, nerves and blood vessels form and grow during pregnancy

But only *after birth*

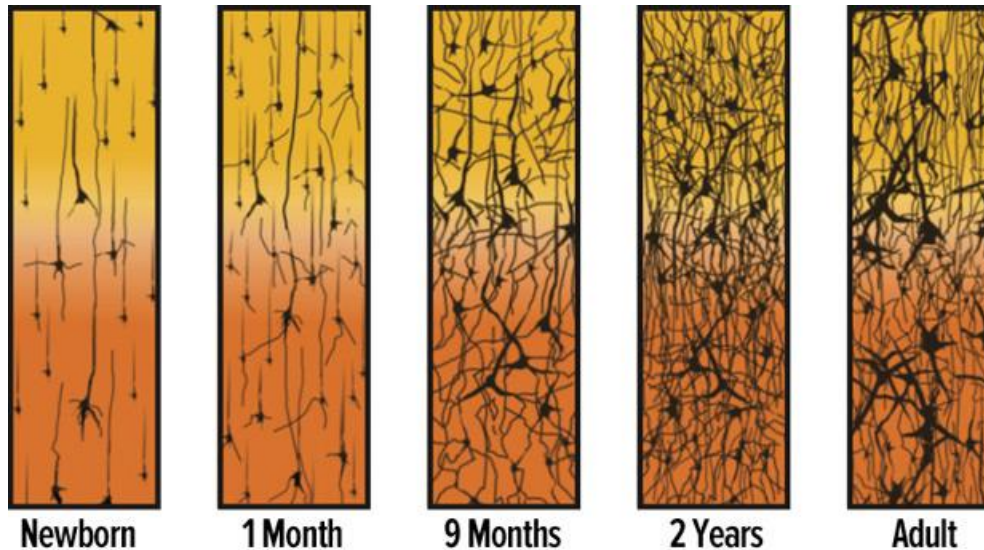
does the brain really turn on



The Developing Brain



Brain doubles in size in first year
Triples in size by the third year
Massive synaptic connections
Strengthened by use



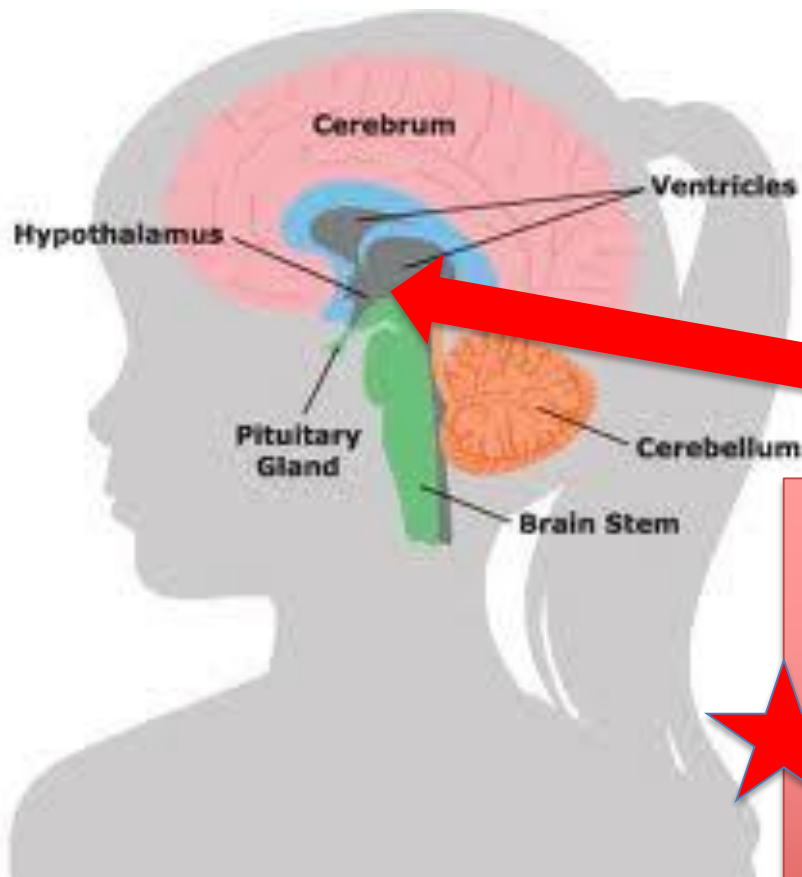
Newborn

1 Month

9 Months

2 Years

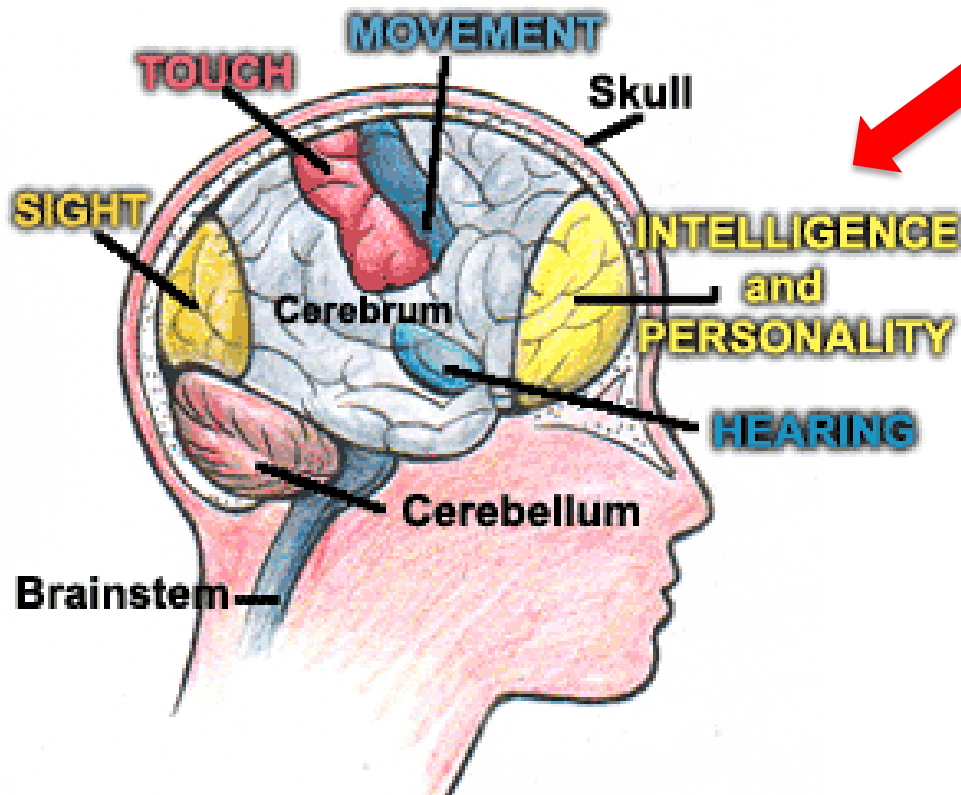
Adult



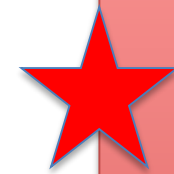
**The Middle
Brain
Develops
First & Fast**

**Emotional Outbursts
Fear Anxiety
Impulsive
Stress
First Reactions**

The Front Brain



The Frontal Cortex
Develops
Slowly

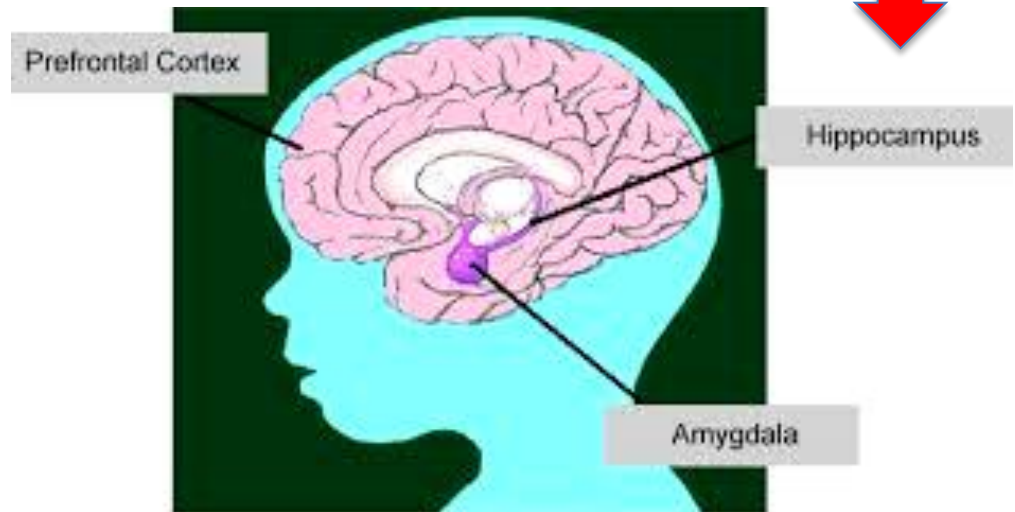


Calculating
Plans Ahead
Thinks First
Multi-tasks
Logical
Organized

The Hippocampus

- Working memory with the PFC
- Synthesizes information
- Encodes memory
 - Spatial
 - Relational
- Highly metabolic
- Highly plastic

- *Very responsive to lifestyle*



Stress Shapes the Brain

- **Positive Stress**

- **Is brief, infrequent, mild or moderate**
- **Is normal in everyday life**
- **Motivates, builds exploration and curiosity, and teaches the child to adapt**



**The child's social and emotional supports
help manage stress
and allow a return to normal**

Prolonged Stress can Harm a Child

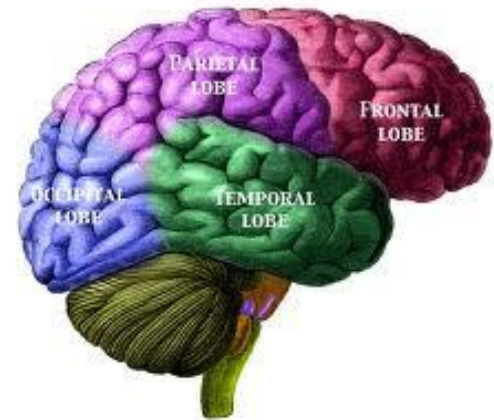


- Hunger & Malnutrition
- Illness or Chronic disease
- Injury or trauma
- Neglect
- Violence & Abuse
- Family chaos
- Environmental toxins



Toxic Stress Damages Brain

- **Toxic Stress**
 - **Long lasting, frequent, or intense**
 - **Adverse childhood events (ACEs)**
 - **Perceived by the child as overwhelming**
 - **Results in**
 - **Anxiety**
 - **Anger**
 - **Emotional outbursts**
 - **Fear**
 - **Withdrawal**



**Damaging if the child does not have sufficient
social and emotional buffers**

Lickers & Groomers

- Handling rat pups caused anxiety = stress
- Maternal behavior*
 - High L&G
 - Low L&G
- High = greater exploration, curiosity, socialization, healthier, less anxious, less aggressive
- Biochemical changes in brain: *stress hormones*



Series: M Meany et al, McGill University

We Can Build **SOCIAL-EMOTIONAL BUFFERS**

Self-Regulation

Coping, Persistence

Organization, Planning

Relief of anxiety and stress

Curiosity, Exploration

- **Learn through experience**
- **Modeled by others, reinforced**
- **Turn off stress hormones**
- **Academic and social success**



Building Control



Pay Attention

Ignore distractions
Control emotions
Stay focused



Work on an Idea

Evaluate new ideas
Use past experiences

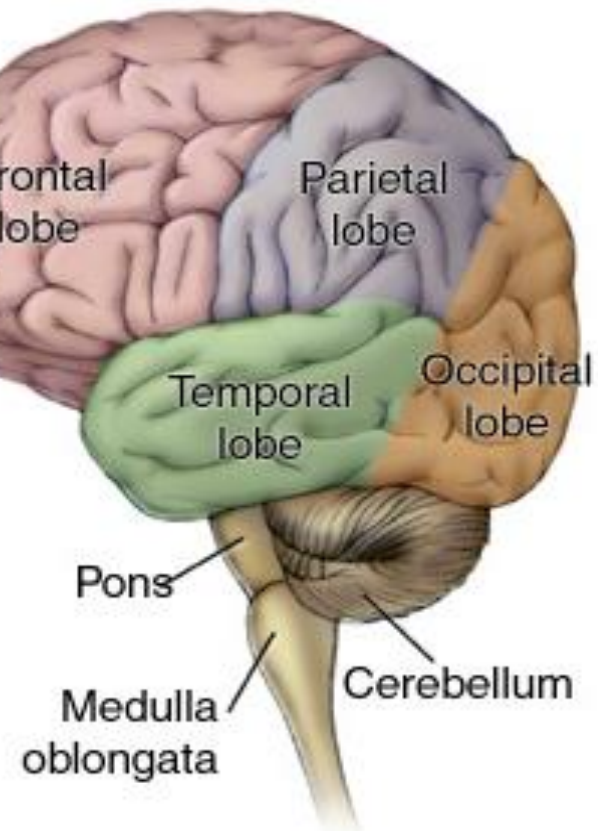


Adjust Thinking

Switch points of view
Overcome barriers
Think about "what if..."

The Pre-Frontal Cortex = Executive Function

- Inhibits impulsivity
- Curiosity and exploration
- Planning and organization
- Evaluating decisions, consequences
- Dealing with multiple things at once
- Making connections with past learning
- Sticking with a project
- Overcoming obstacles



Not Completely Developed until Our Mid-20s

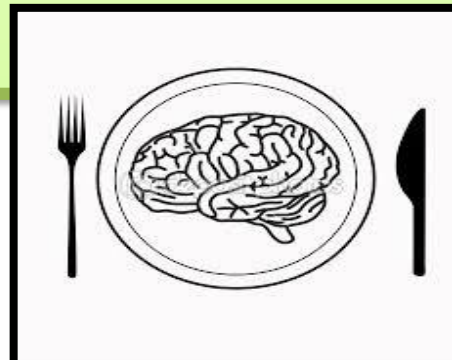
Nutrition, Activity & Brain Function



***Brain cells use nearly 20%
of all our daily calories***

A *Good* Diet Changes the Brain

- *More brain cells*
- *Stronger connections*
- *Faster communication*
- *More blood flow*
- *More glucose & oxygen*
- *Rapid repair*





*Brain Needs **Good Food***

- **Vit B1** – use glucose for thinking
- **Vit B6, B12** – make brain transmitters
- **Vit B12** – thinking and language
- **Vit C** – build nerve endings
- **Vit D** – prevent brain degeneration in adults
- **Vit E** – membrane protection
- **Flavonoids** – protect brain cell function
- **Iron** – oxygen supply, nerve coatings, nerve chemicals, & IQ
- **Magnesium** – chemical balance in brain cells
- **Zinc** – taste
- **Iodine** – control cell energy
- **Omega 3 PUFA** – thinking and visual development

1 in 5 Children are Food Insecure

- Food Insecurity

Is a risk for poor health

51% of US kids qualify for free-and-reduced



- Worse developmental outcomes
- Psychosocial, behavioral, and attention problems
- Depression and suicidal symptoms in adolescents
- Lower academic performance

Summer is 3 Months Long



The USDA Food & Nutrition Service

Child Nutrition Safety Net

- Child and Adult Care Food Program
- The National School Lunch Program
- School Breakfast Program
- The Seamless Summer Meal Program
- After-School Snacks
- Special Milk Program
- Fresh Fruit and Vegetable Program
- Commodity Supplement Program

The National School Breakfast and Lunch Programs



The School Nutrition Opportunity

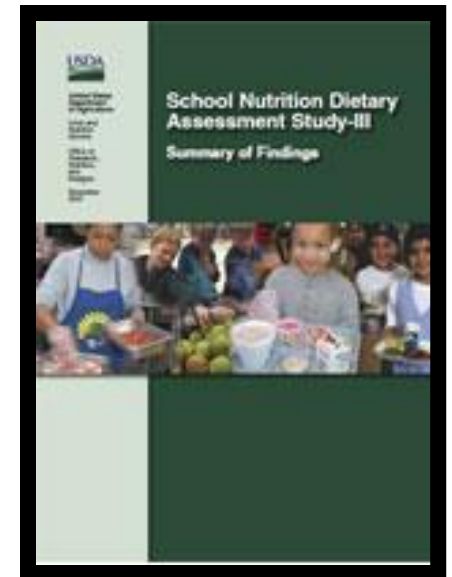
- 55 million students
- 32 million lunches/day
- 35-40% kcals school vs 56% kcals at home
- Improves diet quality
- Lessens obesity risk
- Boosts academic achievement



The National School Lunch Program

- **School Nutrition Dietary Assessment**
 - SNDA I (1995), II (2001), III (2007)
- **School Health Policies and Programs Study**
 - SHPPS 1994, 2000, 2006, 2012*

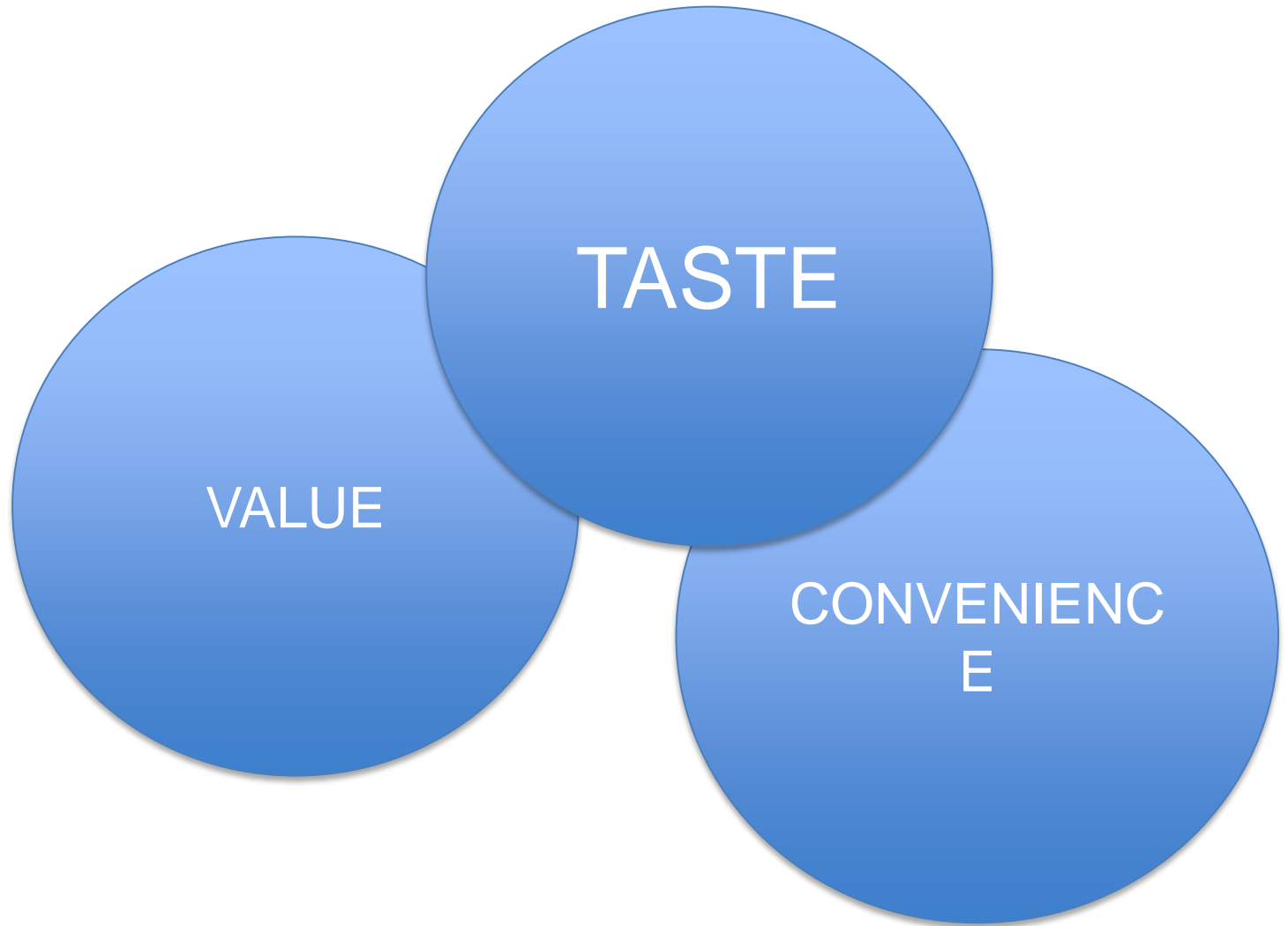
No Correlation of Obesity with NSLP



School Nutrition Standards 2010

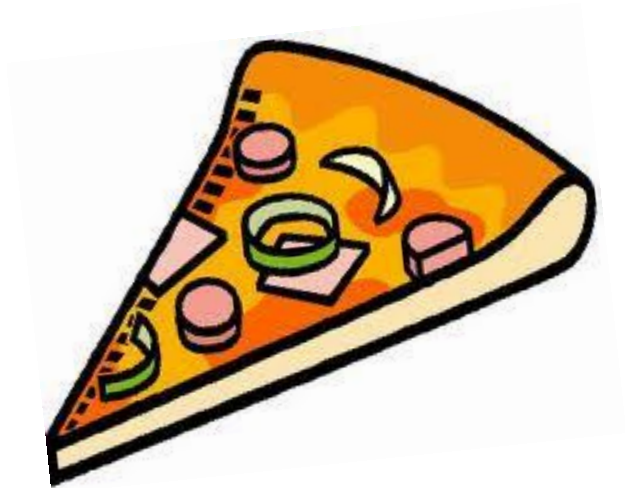
- Meal *servings* based on Dietary Guidelines
- Access to water
- Easier to qualify for school meal eligibility
- Nutrition and wellness in child care sites
- Local farm-to-school efforts
- Improved commodity food quality
- Food safety standards and rules
- Education for school nutrition staff
- *6 cents per meal to improve nutrition*
- *USDA given authority over all foods*

The **Holy Trinity** of Food Choice



Cut Out Pizza or Make it Better?

- The *New School* Pizza
 - Low fat cheese
 - Whole grain crust
 - Turkey or low-fat pepperoni
 - Veggies
 - Lower sodium



Core Principles of Food Marketing

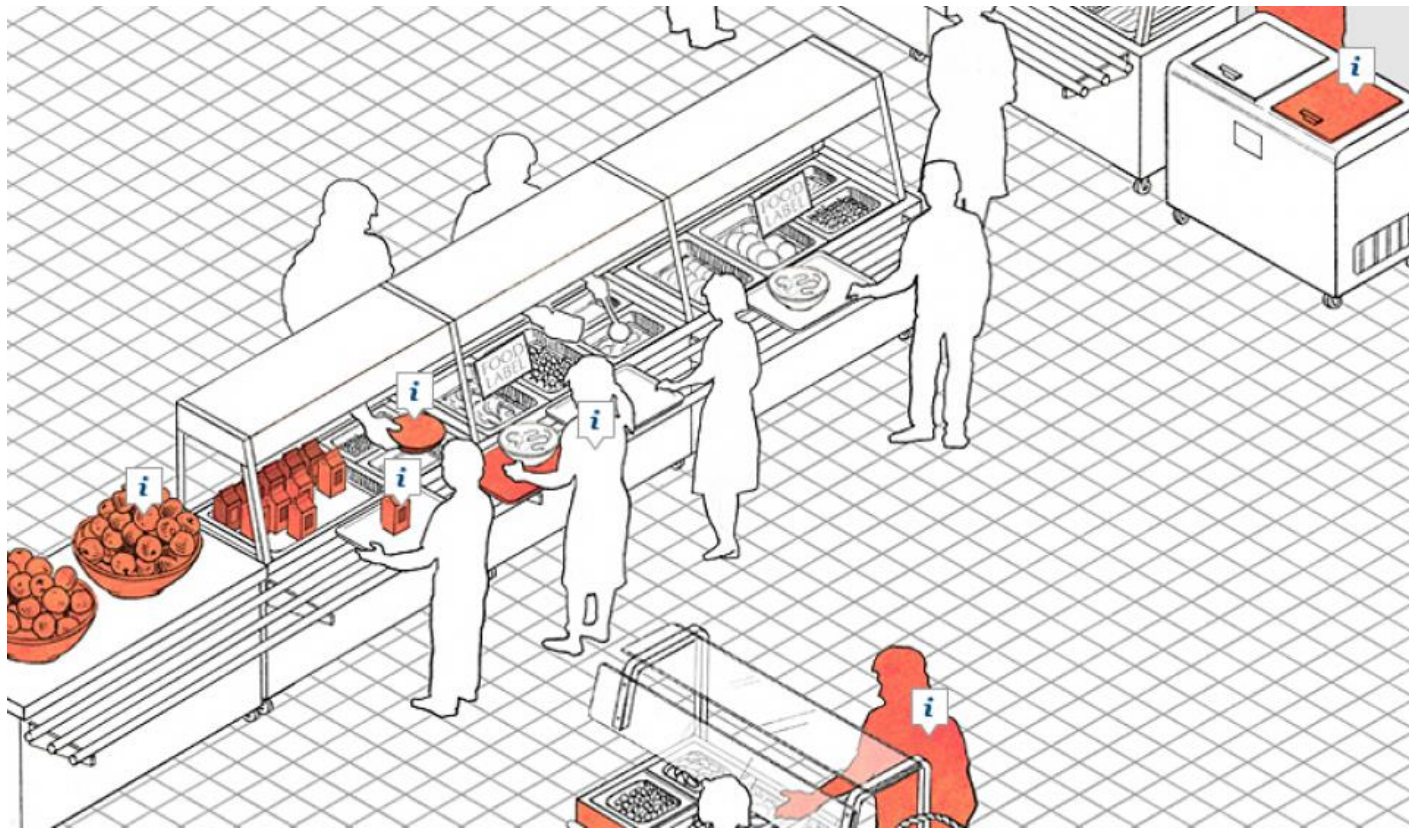
- Visual stimulation
- Self-service (convenience)
- Simple messaging, naming
- Pricing (value)
- “Sunk Cost” (value)
- Ambiance, atmosphere
- Satiety has both internal vs external cues
- Distractions, socialization
- *Reactance* = we rebel when denied or forced
- *Self-attribution* = we enjoy what we choose

Behavioral Economics

The Smarter Lunchroom Movement

1-minute videos on a make-over for school Lunch rooms

<http://smarterlunchrooms.org/videos.html>



Brian Wansink and David Just – Cornell University

New Rules

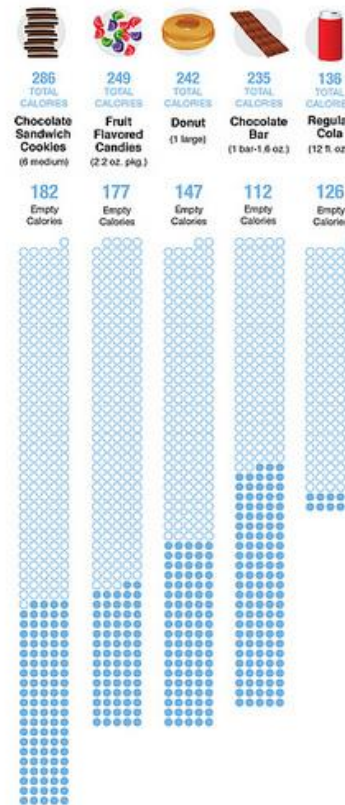
- Any of 5 food groups
- Grains: whole grains
- Combination foods with ¼ cup fruit or veggie
- 10% Daily Value (DV) of calcium, vit D, potassium, fiber
- Any entrée from NSLP
- Drinks: water; non-fat flavored or low-fat white; 100% juices
- Limits: Kcals \leq 200kcal; Fat \leq 35% of calories; sat fat \leq 10%; sugar \leq 35% of weight; sodium \leq 230 mg

SMART SNACKS IN SCHOOL

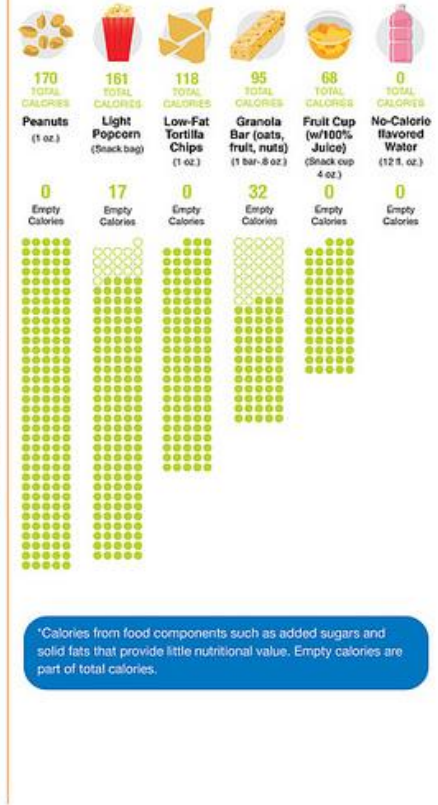
The Healthy, Hunger-Free Kids Act of 2010 requires USDA to establish nutrition standards for all foods sold in schools—beyond the federally-supported meals programs. This new rule carefully balances science-based nutrition guidelines with practical and flexible solutions to promote healthier eating on campus. The rule draws on recommendations from the Institute of Medicine, existing voluntary standards already implemented by thousands of schools around the country, and healthy food and beverage offerings already available in the marketplace.

● Equals 1 calorie ○ Shows empty calories*

Before the New Standards



After the New Standards



*Calories from food components such as added sugars and solid fats that provide little nutritional value. Empty calories are part of total calories.

Food in School


1. School meals
2. Vended foods & beverages
3. **Foods brought in**

Murray R, AAP.

Snacks, Sweetened Drinks, Sugars & Schools
Pediatrics, March, 2015; 135:

Other Foods in School

Rewards
Celebrations
Fundraisers
School Stores
After-Hours Vending
Booster Sales
Athletic Events
Packed Lunches

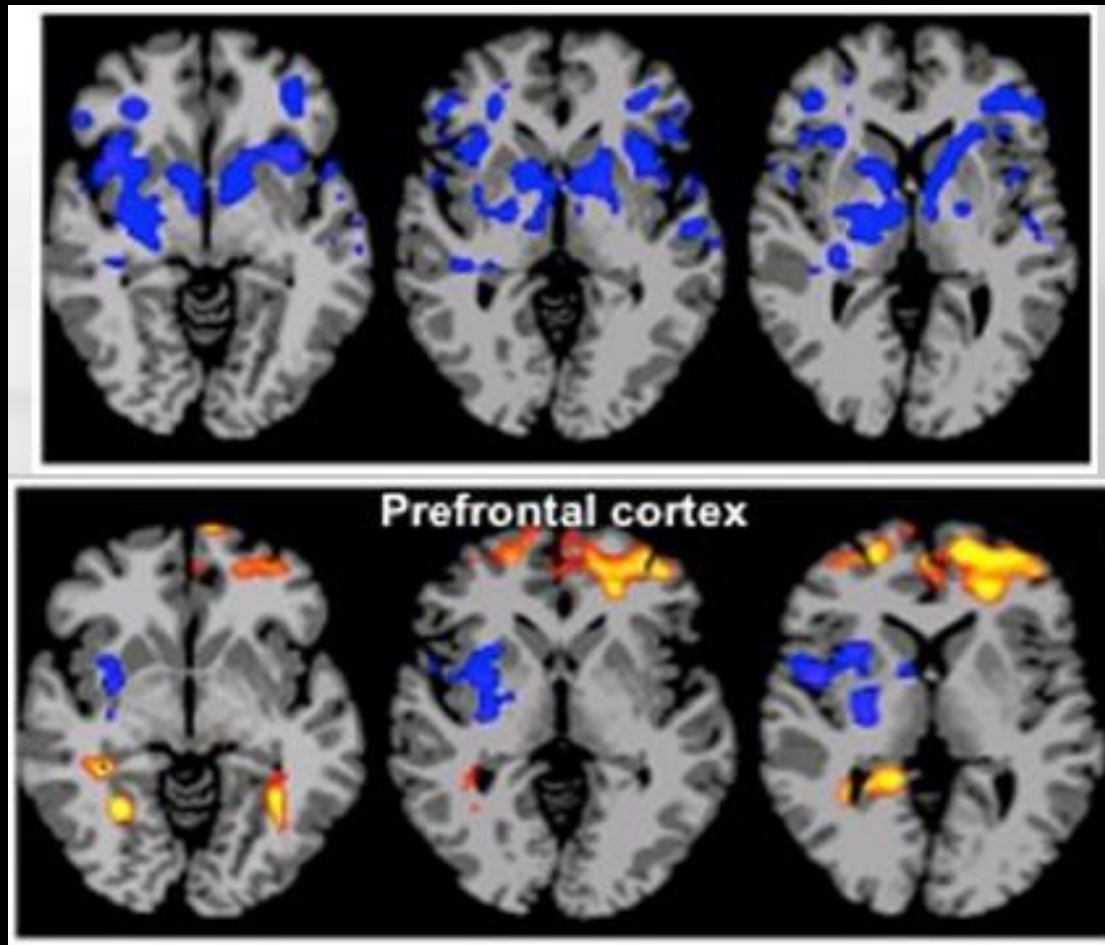


Parents
Teachers
Staff
Students

The National School Breakfast and Lunch Programs



Fasting vs Glucose-Rich Brain



FASTING

The Mid-Brain
Food Seeking Mode

** Distracted,
irritable, restless,
anxious*

Glucose-rich

The Front Brain
Working Mode

** Calm, focused,
organized,
thoughtful*



Breakfast: A Review

Research

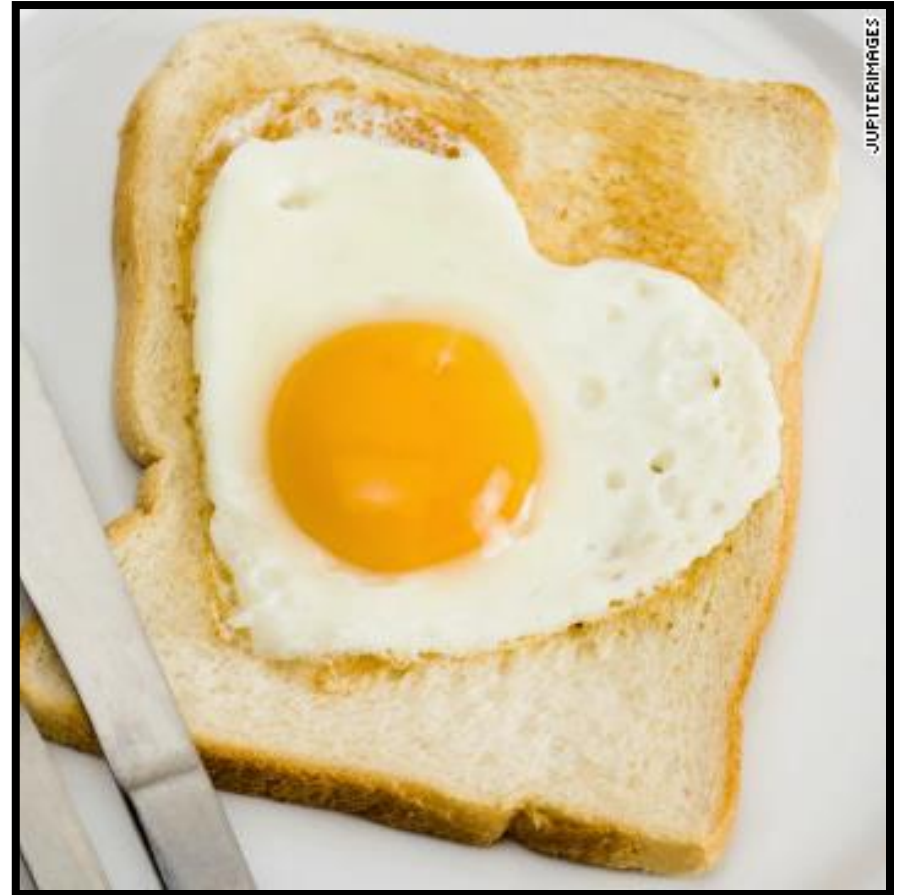
- 45 studies in 42 articles
- 1950-2008
- Lack Uniformity:
 - Design
 - Age (usually non-teen)
 - Socioeconomic status
 - Breakfast energy or content
 - Cognitive tests utilized
 - Timing after breakfast
 - Controls

Overall Findings

- Majority = positive effects
 - Vulnerable kids > effects
 - School BF showed most benefit
- Math & Memory
- Memory, attention:
 - Late morning benefits
 - For more demanding tests
- Hi-risk children:
 - Verbal fluency
 - Memory tasks
 - Matching familiar figures
 - Memory search

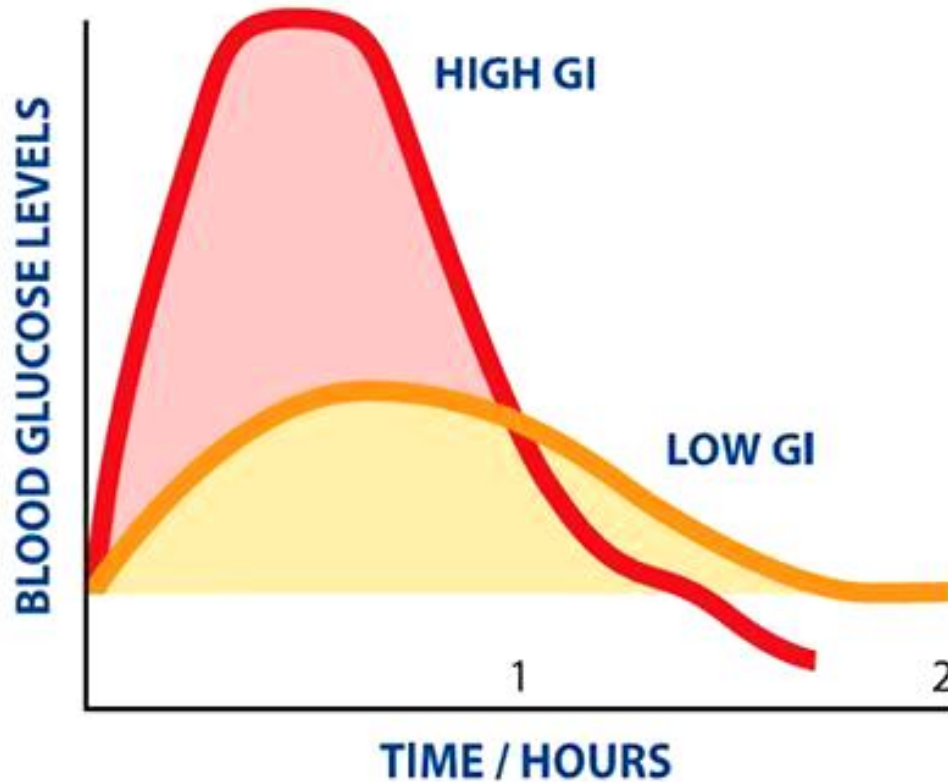
Only 1/3 of Eligible Kids Get Breakfast at School

- Less hunger during school
- More attentive, fewer behavioral problems
- Increased attendance
- Less tardiness
- Fewer visits to school RN
- Lower obesity rates
- Math scores 17.5% higher
- Higher graduation rates



Share Our Strength/ Delloite Study, 2013

Fast vs Slow Energy



Glycemic Index =
How **fast**
carbohydrates
are digested and
raise the blood sugar

"The Glycemic Index (GI)"

The Grab 'n Go Breakfast



OR



The Best Breakfast

- Food groups: dairy, fruit, grains, veggies, protein
- All 3: carbs, protein, fats
- Lots of vitamins, minerals, fiber
- A little sweet or spice for flavor to encourage nutrients
- Limited sodium
- *Right amount of calories - about ¼ daily total*



Speed BF



Cereal Bars

120 kcal

High in Vit A, Calcium, Zinc, Vit B6, Iron

Balance carbs, fats, proteins

Whole grains



Energy Bars

230 kcals

Grains, fruit

High in potassium, Vit A, Vit C,
Calcium, Iron, Vit D, Vit E, fiber,
Vit B12, Magnesium, Zinc, etc.

Balance: fats, carbs, protein



Nutrition Facts

Serving Size: 1 packet (36g)	
Amount Per Serving	
Calories 130	Calories from Fat 0
% Daily Value*	
Total Fat 0 g	0%
Saturated Fat 0 g	0%
Trans Fat 0 g	
Cholesterol 5 mg	2%
Sodium 100 mg	4%
Potassium 240 mg	7%
Total Carbohydrate 27 g	9%
Dietary Fiber 0 g	0%
Sugars 18 g	
Sugar Alcohols	
Protein 5 g	
Vitamin A 1750 IU	35%
Vitamin C 27 mg	45%
Calcium 250 mg	25%
Iron 4.5 mg	25%

Yogurt & ...

90-250 kcal

Calcium, Vit D

Other Vits & Minerals



Instant breakfast & Milk

130 kcals + non-fat milk = 220 kcals

High in potassium, Vit A, C, Calcium, Iron
w/ milk it blends carbs, protein, fats

Friends

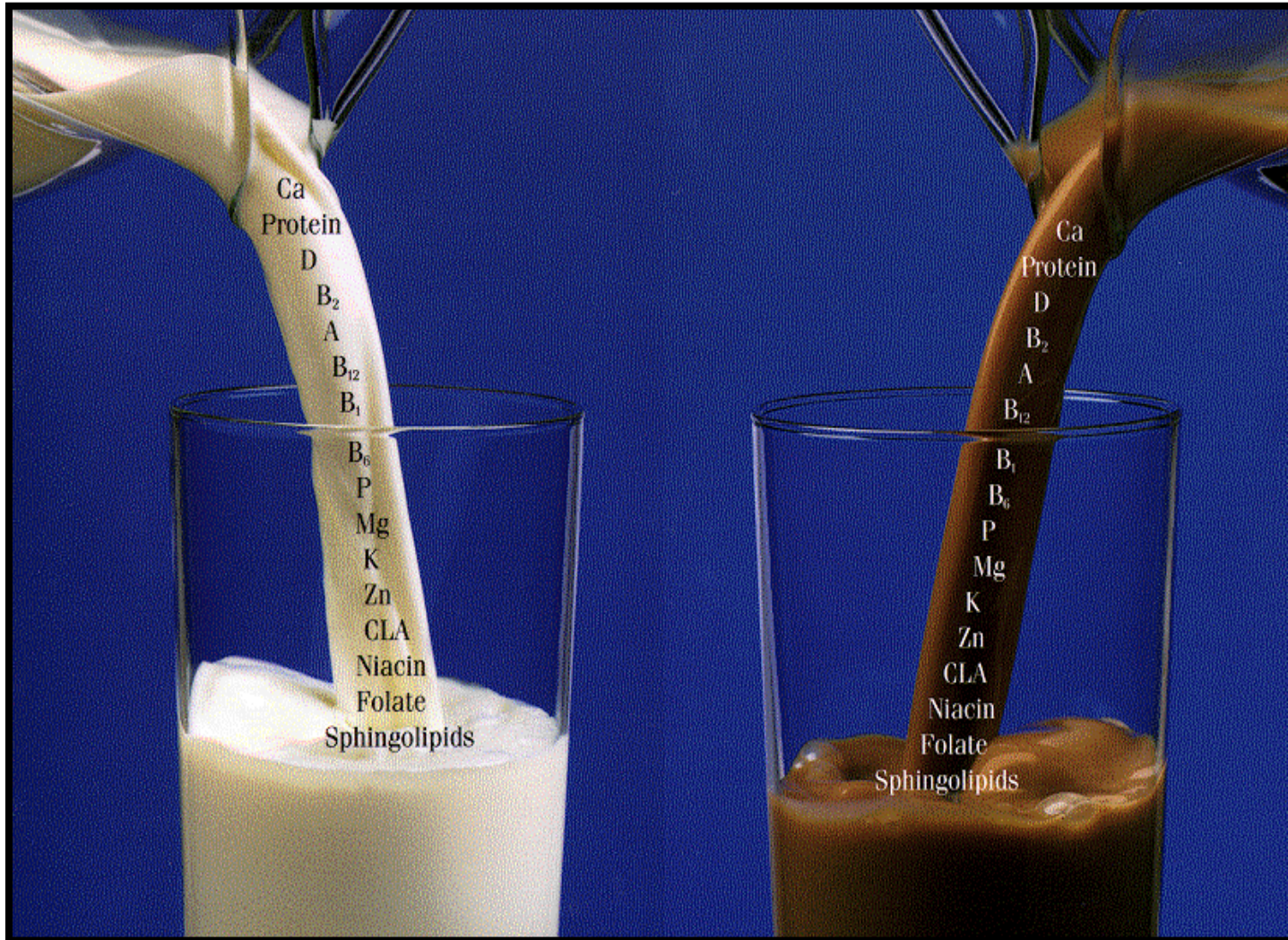
&

Fun

**What would happen
if we banned
all flavored yogurt
to cut sugar consumption
among adults?**



The Baby and the Bathwater?



Schools that Switched to **ONLY** low-fat white milk

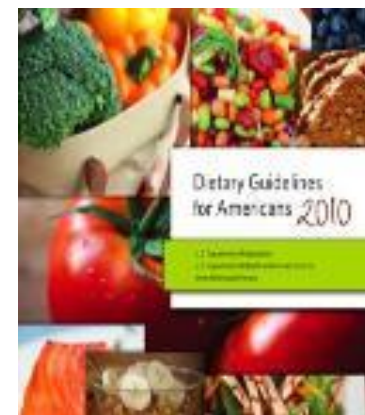
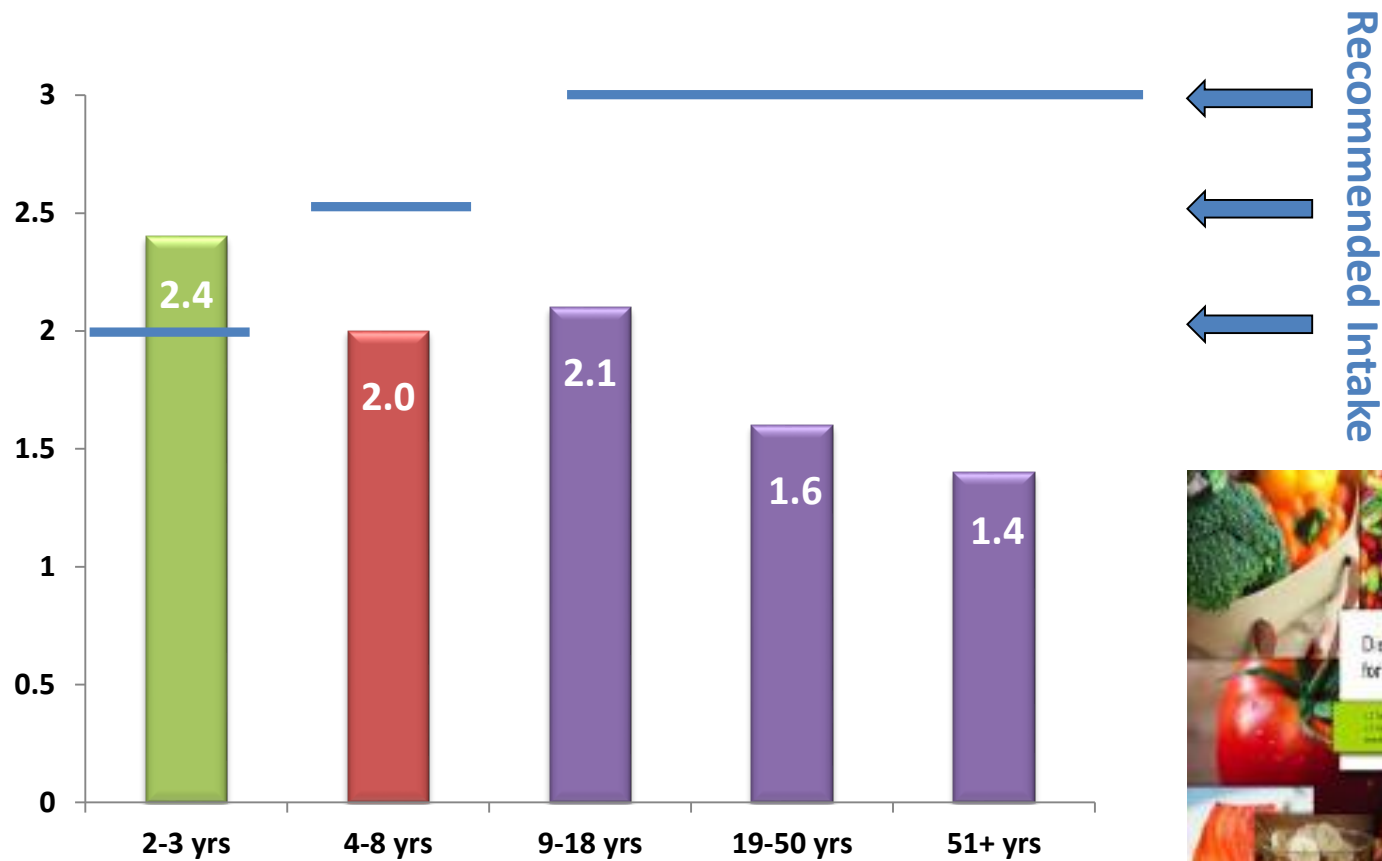


Waste rose

**Ounces Consumed Fell
By 35-45%**

Dairy intake falls below recommended intake by 4 years old

Average daily consumption of milk and milk products in the U.S.



School Chocolate Milk is Fat Free



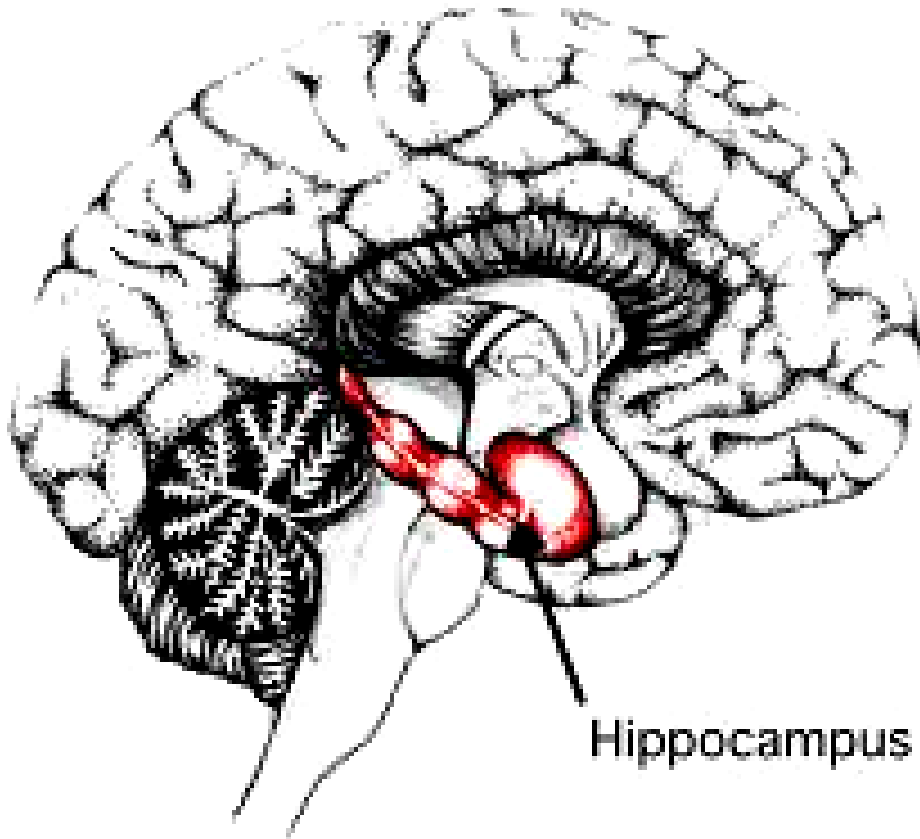
- Fat-free milk 90 kcal (vs 150 kcal whole milk/ 8 oz)
- 2-2.5 tspn added sugar (a 40% cut)
- Newest formulations: 6 grams added sugar (1.5 tsp = 24 kcals)

A Quality Dietary Pattern & Regular Activity = *Health*



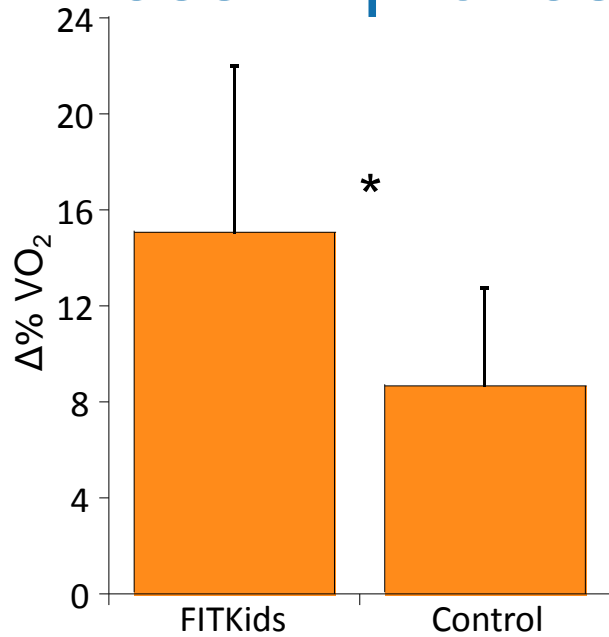
- Heart Disease
- Stroke
- Diabetes
- Obesity
- Hypertension
- Metabolic syndrome
- Osteoporosis
- Cancers
- Alzheimer's

Activity and Fitness Augment Cognition

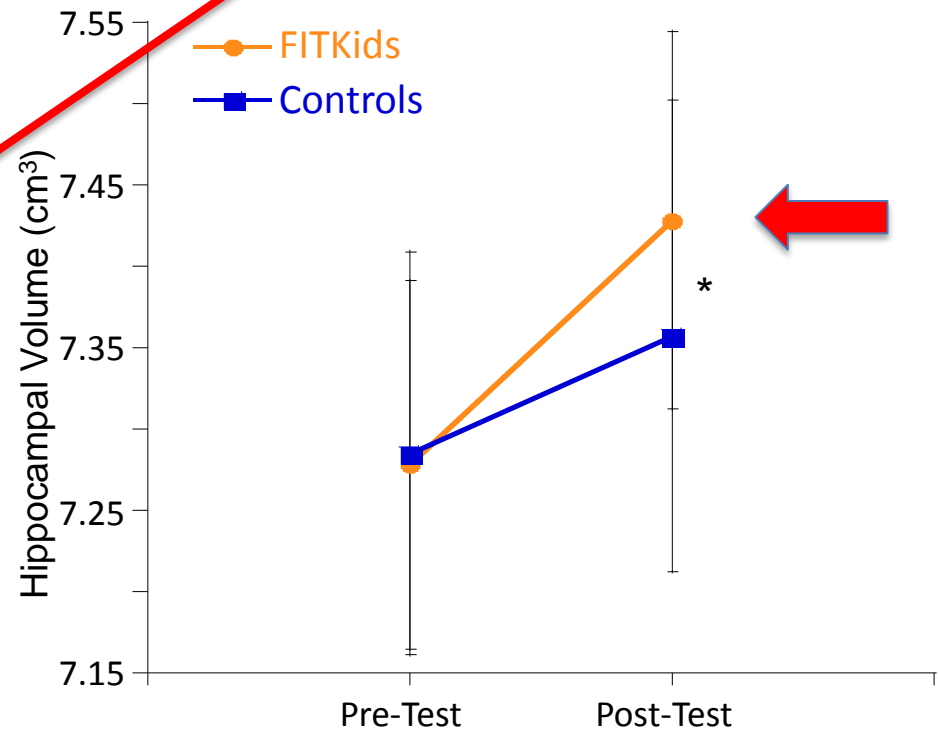
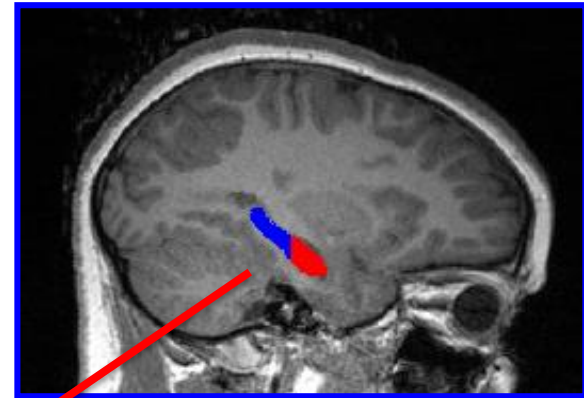


- Blood flow
- Glucose
- Oxygen
- Growth factors
- Neurogenesis
- Memory

Fitness Improves Memory: *The FitKids Study*

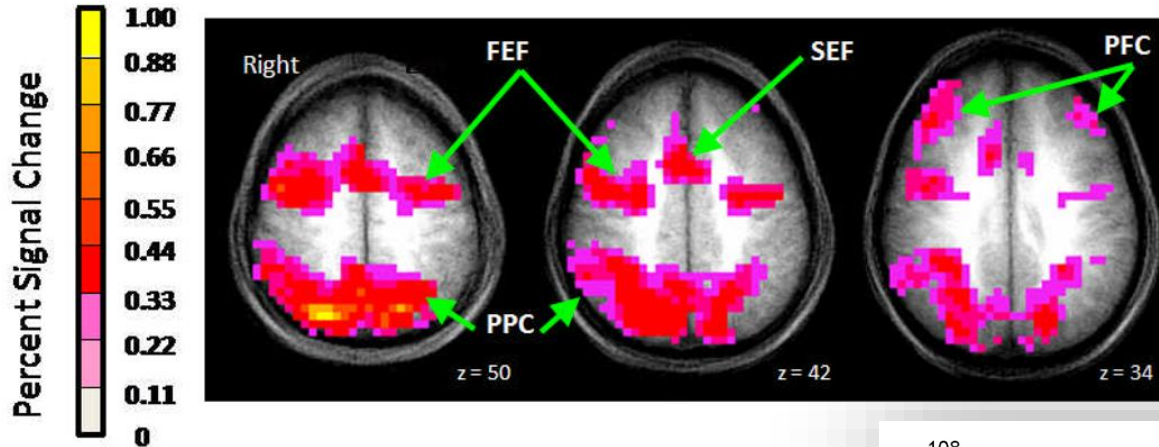


Better Aerobic Fitness
Bigger Hippocampus
Better Memory



Chaddock et al, Brain Res 2010; 1358: 172
Chaddock et al. Biol Psychol 2012; 89:260
Voss et al, Neuroscience 2011; 199:166
Erickson et al, Proc Natl Acad Sci USA 2011; 108:3017

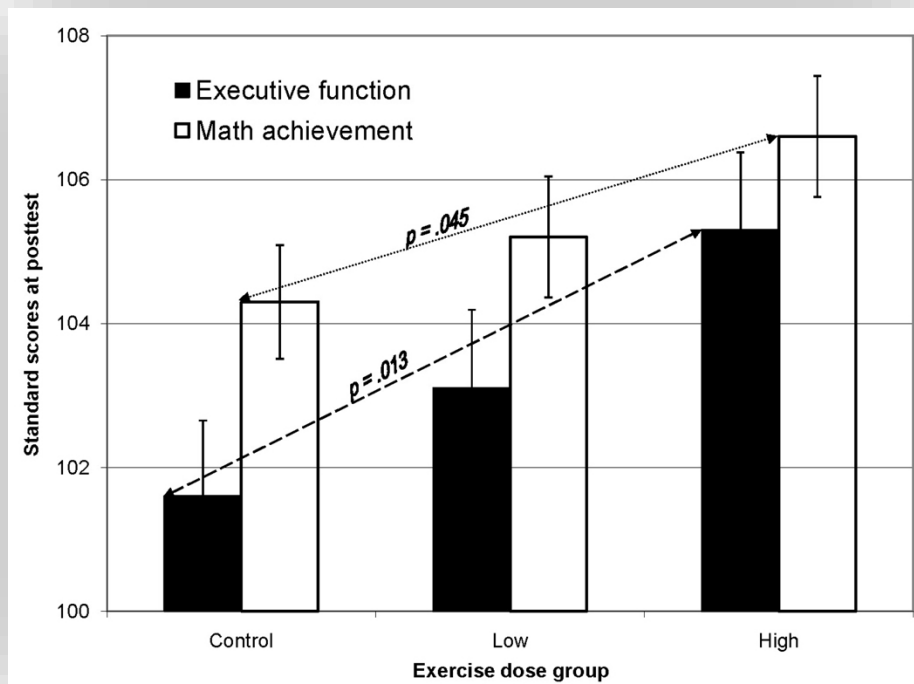
Exercise in Obese Children



Executive Function Improves

Math Scores Rise

Even in High-Risk Kids



Institute of Medicine Report

May 2013

60 minutes per day



<http://iom.edu/Reports.aspx>

A Whole-of-School Approach:

- Before school
- PE Daily
- Recess Daily
- 10-minute Breaks between classes ★
- Clubs
- After-school activity
- Active field trips

Optimal brain processing
requires
a period of relaxation
after a period of
concentrated learning



Play at
Recess
is
a
Life Skills
Class

Social
Emotional
Learning

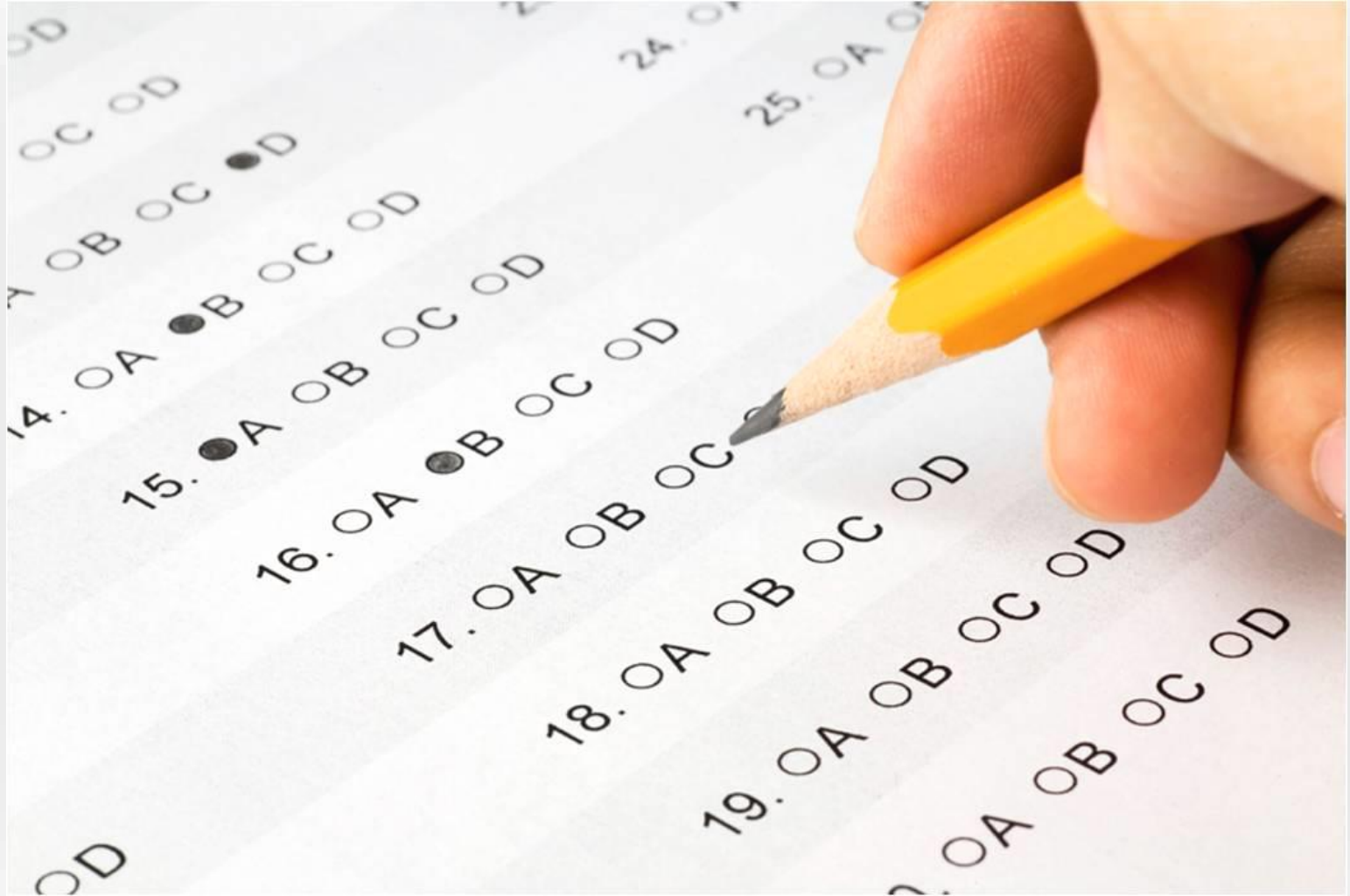


**Adapt, adjust to complex
school environment**

Practice & role-play social skills

**Learn communication:
negotiation, cooperation,
sharing and problem-solving**

**and
to**



manage stress, organize
learn and practice coping skills,
exercise curiosity and self-control



And Yet...

The fewest minutes of **recess**
occur in those schools
with
poor children –
those with the
highest need

Nutrition has a role in school success

