Eating behaviors, emotion, and executive function in young children

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KEEP CALM AND DELAY GRATIFICATION
Executive Function
What is it? Why is it important?

EF enables **mindful decision making** vs. habitual tendencies often triggered by external stimuli or emotions.
Lower executive function and emotional regulation are associated with:

- Higher BMIs
- Unhealthy eating behaviors

....in adults and adolescents
30 years later, adults who were able to delay gratification as a child had lower BMIs

Schlam et al. 2013

Seeyave et al. 2009:
Preschoolers unable to delay gratification were \textbf{30\% more likely} to be overweight at age 11
How does emotion affect eating in adults?

40%

40%

20%

Dallman, Trends in Endocrinology and Metabolism 2010
Macht, Appetite 2008
Do children emotionally eat?

Farrow et al. 2015
Children ages 5-7 exposed to stress ate more calories in the absence of hunger than those in the control group

Of note: this relationship was seen more in children whose parents used food as reward and restriction of food

$p=0.02$
Is there a relationship between executive function and emotional eating in young children?

Research report

Preschool children with lower executive function may be more vulnerable to emotional-based eating in the absence of hunger☆

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Decayed executive function (EF) has been linked to unhealthy eating behaviors and obesity in older children and adults, however little is known about this relationship in young children. One possible reason is that EF is required for the inhibition of eating in the absence of hunger. The aim of the current study was to assess EF and eating behavior in preschool children and to examine the relationship between these two variables. Executive function was assessed using the California Cognitive Abilities Test (CalCAT), and eating behavior was assessed using a modified version of the Children's Eating Behavior Questionnaire. Results indicated that preschool children with lower EF scores were more likely to report eating in the absence of hunger. These findings suggest that EF may play a role in the development of unhealthy eating behaviors in young children.
Methods

Conducted at UC Davis CCFS- ECL

- 29 children age 3-5 y
- Each participated over a period of 2 weeks

Assessed
- Executive Function
- Emotional Arousal
- Eating in the Absence of Hunger
Executive Function

• Parent Reports
  • Child behavior questionnaire
• Delay of Gratification

1 now or more later?
Emotion

Skin conductance
- marker of emotional arousal
- measured continuously by wireless sensor worn on wrist of child (Q Sensor)

Qscore
- composite of mean skin conductance and peak response frequency before, during, and after an eating task.
Eating Behavior

Eating in the absence of hunger

After indicating being full, kids were presented with palatable sweet (cookies) and savory (crackers) snacks.
There is a relationship between emotion and eating in the absence of hunger, BUT it depends on executive function.

- Lower delay of gratification: $R^2 = 0.514$
- Higher delay of gratification: $R^2 = 0.0575$

Pieper & Laugero, Appetite 2013
There is a relationship between emotion and eating in the absence of hunger, BUT IT DEPENDS ON EXECUTIVE FUNCTION.

**lower inhibitory control**

![Graph showing a positive correlation between Qscore and Cookies Consumed with an R² of 0.5293.](image)

**higher inhibitory control**

![Graph showing a negative correlation between Qscore and Cookies Consumed with an R² of 0.0538.](image)

Pieper & Laugero, Appetite 2013
For the first time, we examined executive function, emotion, and eating behavior in preschool children.

Higher emotional arousal is related to greater eating for some children.

Executive function affects the relationship between eating and emotional arousal.
Ultimate Question

If we target executive function at an early age, can we prevent unhealthy eating behaviors and obesity?
Executive Function and Emotion in Young Children

- Both EF and emotional regulation are rapidly developing in early childhood

- Early childhood programs can foster executive function development
Preschool Program Improves Cognitive Control

Adele Diamond,1* W. Steven Barnett,2 Jessica Thomas,2 Sarah Munro1

Executive functions (EFs), also called cognitive control, are critical for success in school and life. Although EF skills are rarely taught, they can be. The Tools of the Mind (Tools) curriculum improves EFs in preschoolers in regular classrooms with regular teachers at minimal expense. Core EF skills are (i) inhibitory control (resisting habits, temptations, or distractions), (ii) working memory (mentally holding and using information), and (iii) cognitive flexibility (adjusting to change) (1, 2).

Significance
EFs are more strongly associated with school readiness than are intelligence quotient (IQ) or entry-level reading or math skills (3, 4). Kindergarten teachers rank skills like self-discipline and attentional control as more critical for school readiness than content knowledge (5). EFs are important for academic achievement throughout the school years. Working memory and inhibition independently predict math and reading scores in preschool through their second year of preschool (average age: 5.1 years in both) who received dBL or Tools for 1 or 2 years. Those who entered in year 2 had attended other preschools for a year. All came from the same neighborhood and were randomly assigned to Tools or dBL with no self-selection into either curriculum. All came from low-income families; 78% with yearly income < $25,000 (2).

After year 1, so convinced were educators in one school that Tools children were doing substantially better than dBL children that they halted the experiment in their school, reducing our sample of dBL children.

Measures of EF. Outcome measures (the Dots task and a Flanker task) were quite different from what any child had done before. These measures are appropriate for ages 4 through adults, assess all three EF components, and require prefrontal cortex (20–21). They were administered in May and June of year 2.

In all conditions of the Dots
I’ve often marveled at how some adults who had the most horrific childhoods are so resilient and successful while others continue to suffer as adults. Likewise, affluent and relatively uneventful childhoods do not reliably predict later happiness in life. Research repeatedly demonstrates that while some outcomes are largely due to our genetic blueprint, how we shape that blueprint is the key to thriving.

As a parent, I have always been
Chronic Stress and Food Cues

Activates EMOTIONAL BRAIN

Deactivates EXECUTIVE BRAIN

Tryon et al. 2013

Tryon et al. 2013

Chronic Stress and Food Cues

Tryon et al. 2013
Perspectives and implications for obesity prevention

Healthy development of the executive brain
improves emotional regulation
protects against a habit of comfort food and obesity?

EF Interventions as early as preschool are possible
  e.g. Tools of the Mind

Early childhood programs should emphasize social and emotional development
  key paths to self regulation and healthy decision making

Chronic stress may play role
  biases highly rewarding habits, dampens executive brain
  stress reduction interventions are possible
Thank you!

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