Cognitive Load and Neuro-Economics: Implications for Food Consumption and Health

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Introductions

- No Alisha
- George
- Elena
- You
  - Practitioners
  - EFNEP
  - SNAP-Ed
  - Researchers

Objectives

- The goal of this session is to provide you with:
  - foundational knowledge in cognitive load and neuroeconomics to help you develop more effective programming (and evaluation methods); and
  - skills to help you apply them to your nutrition education programs and research agenda

Outline:

I. Setting the Stage (Elena)
II. Cognitive Load (George)
  - Cognitive Resources and The Dual Systems/Dual Objectives
  - Framework Implications for Food Choices
III. Group Discussion of Your Program in This Context (Elena)
IV. Some Other Examples (Elena)
V. Neuroeconomics and Behavioral Economics (George)
VI. Applying Neuroeconomics and Behavioral Economics concepts to your Program and Research (Elena)
I. Introduction

- As nutrition education practitioners and researchers, our main goals are to:
  - improve food consumption of populations we work with
  - effectively evaluate the impact of our program and research activities
- This is clearly challenging given our national food landscape and lifestyle
  - America’s culture of “busy”

Socio-Ecological Model

- We know there are various factors and layers that may influence or shape food consumption behaviors
- Policy, Systems, and Environmental (PSE) factors

Food Consumption Decisions

- Additionally, each day each person may be confronted with up to 200-related food and beverage-related decisions, many unknowingly or “mindless” (making a number of assumptions)
  - Decisions in this context considered conscious and sub-conscious
  - Purchase, prepare, serve, eat, give away, throw away, clean up, store
  - Eating behaviors, such as choice of particular food or beverage, timing, location, distractions, start and end of eating, volume, number of chews/bites
  - Higher number of decisions for individuals with higher BMIs
- And yet, food is not the only thing we make decisions about

Decision Fatigue

- Decision fatigue has been shown to negatively impact food and health choices
- But … it is not always considered or addressed within nutrition education or evaluation
Cognitive Load and Neuroeconomics

- **Cognitive load** is determined by how much attention, focus, and concentration a decision requires.
- **Neuroeconomics** is a relatively new field of economics that combines methods and theories from neuroscience, psychology, economics, and computer science to better understand the process of decision-making and the resulting choices.
- Cognitive load and neuroeconomics offer **new frameworks for understanding food (and health) related decisions, as well as strategies to support positive changes, and potentially more robust evaluation.**

II. Cognitive Resources and Dual Systems

**Key Concepts**

- Cognitive resources at any given point in time are limited and can be depleted.
- Cognitive resources must be allocated to different tasks (*cognitive resource allocation model*) (Aloos, Brocas, Castillo 2014; Koel and Berrinick 2014)

**Dual Systems Processing** (e.g., Evans 1984; Kahneman 2011)

(i) **System 1** - uses a fast, reflexive, automatic, and perhaps 'mindless' process that operates heuristically and expends little cognitive resources.

(ii) **System 2** - uses a slow, reflective, analytical, and deliberate process that expends many cognitive resources.
What types of food or evaluation decisions fall into each system?

- **System 1**
  - Ex: candy bowl on your desk
  - Others?

- **System 2**
  - Ex: comparing food labels for two different products
  - Others?

Dual Objectives for Food, Nutrition, and Health

Foods are consumed for **hedonic and health (utilitarian) reasons**. (Antonides and Cramer 2013; Shiv and Fedorikhin 1999; Sullivan et al. 2015)

Three Major Implications of the Cognitive Resource Allocation Model

1. Cognitive effort is minimized implying a preference for system 1 (e.g., Kool, et al. 2010, 2014).

2. Resource depletion contributes to system 1 use (e.g., Pocheptsova, et al. 2009).
   - As your cognitive budget goes down, you are more likely to choose system 1 types of decisions

3. Hedonic decisions are associated with system 1, long-term and health-related decisions are associated with system 2 (e.g., Antonides and Cramer, 2013; Shiv and Fedorikhin, 1999).
Introduce yourself, your position/job duties, and your target population, whether your focus is on program and/or research, to others at your table or group. Now consider one program or research study you work on. Using the worksheet as a guide, discuss with your other group members the following questions:

• What are the benefits you are aiming for? What benefits have you found to date? What are challenges your participants face in achieving the net benefits?
• What stimuli are you addressing?
• What type of processing is required as part of your program?
• Can you consider some tweaks or changes to your program that would help reduce cognitive load?

III. YOUR PROGRAM IN THIS CONTEXT

- You are attending a working meeting with your colleagues and are offered a box lunch with the signature salad selections to the left? -Which one would you choose?
-You are super hungry.
-You have $20 cash.
-You can choose whatever you want, including side choice.
-What would you choose? Why?

-You are super hungry.
-But you only have $7.50 in cash and no credit card.
-What would you choose? Why?

-You are super hungry.
-But you only have $7.50 in cash and no credit card.
-You are also trying to manage your portion size and calories, so want to limit your main item and side choice to a total of 600 calories.
-What would you choose? Why?

-You are super hungry. Your childcare provider calls and asks you to pick something up for your child.
-But you only have $12.00 in cash and no credit card.
-What would you choose? Why?

Screaming Kid!!!!!! Consider other atmospheric effects like people around you, loud annoying music, etc. and how they might influence your processing.
WORKING, LIMITED RESOURCE, SINGLE MOM

- You have three kids, two in elementary school and one in middle school.
- Each are involved in different after school activities.
- You don’t own a super reliable car. You work with other parents to carpool your kids to different activities, which are all at different times.
- You are the sole financial provider and caregiver for your kids.
- Your parents live in the area, but are growing older, one has been diagnosed with heart disease.
- You finished high school and then began working at a retailer near your apartment. You don’t have much extra money, you do not earn a living wage.
- You are often tired.
- You did not learn to cook and given your schedule, you prefer to eat out.
- Using the concept of the cognitive resource allocation model, why would eating out be the preferred choice?

WEIGHT MANAGEMENT TECHNIQUES

- Evidence-based strategies for weight management highlight the following approaches:
  - Pre-plan/package portion sizes, meals, and snacks.
  - Establish similar routines, such as the same breakfast every day.
  - Eat at home.
  - Reduce exposure to ‘high-risk’ situations, such as buffets.
  - Self-monitoring/checklists.
- Depending on the weight loss approach utilized, long-term weight loss maintenance may range from 2 – 20% among individuals. Why?

CURRICULUM TO LOWER SUGAR INTAKE

- **TEACHER AS THE EXPERT**
  - General Nutrition Education
    - Program objective: General nutrition education, in addition to lowering sugar intake.
    - Uniform program

- **LEARNER-CENTERED AS THE EXPERT**
  - Focused Intervention
    - Program objective: Lower added sugar intake.
    - Educator guides the group in discussing foods and beverages that are high in sugars and participants do several hands-on experiences and activities over the course of the program.
    - Personalized, repetitive, allows for success – building that muscle

Which would be more effective for participants, based on the cognitive resource allocation model? Which one requires cognitive load on the instructor?

EVALUATION

- Which family record requires more ‘processing’ for the participant?
- Which requires more ‘processing’ for the program administrator?
Individuals must balance many conflicting messages that may cause tension to their cognitive load.

- Example 1: An overweight individual starts a new healthy eating regimen after attending a wonderful evidence-based nutrition education program without changes to his/her environmental settings, sectors of influence, and social and cultural norms and values. His/her socio-ecology may support unhealthy eating, but he/she is trying to eat better.

- Exactly why PSEs are important.
V. NEURO ECONOMICS - BEHAVIORAL ECONOMICS AS ORGANIZATIONAL CATEGORIES IN DUAL SYSTEMS

Behavioral economics is the field of economics that studies the interaction of the choice environment attributes with individuals’ psychological attributes or tendencies and the resulting choices.

A behavioral effect is a systematic and repeatable tendency toward a choice alternative resulting from the interaction of a choice environment attribute with a psychological attribute.

Four Behavioral Economic Effects Relevant for Food Choices

1. Environmental cue effect is a tendency to increase or decrease consumption in response to an environmental cue
   - Most Wansink “mindless” type effects (System 1 processing)
   - Examples: proximity of food, odor, serving size, noise, music, lighting, socialization
2. Default effect - the tendency to accept the option made available, even when some apparently more preferable alternative is available
   - Weak vs Strong Defaults (System 1 processing)
   - Example: Combo meal with side of fries vs side of apple slices

3. Ambiguity effect is the tendency for individuals to choose options where the probability of a favorable outcome (e.g., taste) is known over an option where the probability of the favorable outcome is unknown
   - System 2 processing required
   - Ex: future effects of an healthy unsavory meal; role of taste preference

4. Decision fatigue effect is the tendency for the quality or consistency of decisions to erode as more decisions have to be made (e.g., multiple decisions or temptations). In other words, there is a finite store of mental energy for exerting self-control or "willpower."
   - System 2 processing result
   - Ex: Eating when traveling with many unknowns; Being extremely tired; single, limited resource, mother example; weight management strategies

Think about the program you used earlier today.

Which of these choice architecture effects do you target within your program?

Which others could you consider adding?

What stimuli may be more effective than others?

BEHAVIORAL ECONOMICS
Contexts to Consider

• How do these frameworks apply and help provide insight into food and health-related decisions among the following populations?
• How should health education programs be developed and implemented to take these issues into consideration?
  • Low-Literacy
  • Children
  • Single-headed households
  • Aging audiences

Contexts to Consider

• How might emotions, personality style, etc. affect cognitive load and decision-making?
• How might mindfulness affect system 1 versus 2 processing?

Conclusions

• The neuro-economic model helps us understand food and health-related decisions with a new lens

Reference and Disclosure?

This presentation is based on Chapters 9 and 10 in our book.

(Oxford University Press, 2016)