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## Memory, Attention & Cognitive Flexibility:

Our Brain's Executive Functions

Billie Enz, Ph.D.  
Arizona State University  
[bjenz@asu.edu](mailto:bjenz@asu.edu)

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## Today

- We will:
  - Define Executive Functions (EFs)
  - Briefly review EF assessments
  - Discuss practical ways to maintain and strengthen EFs

You will need enthusiastic participation

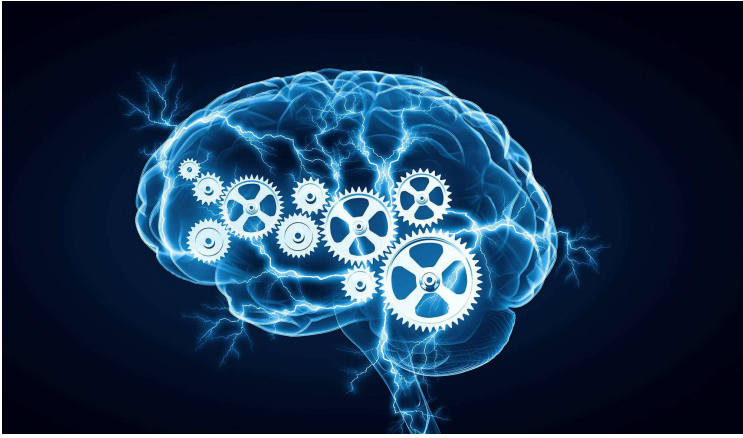
- Later a pencil & paper

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**Brain's ability to:**

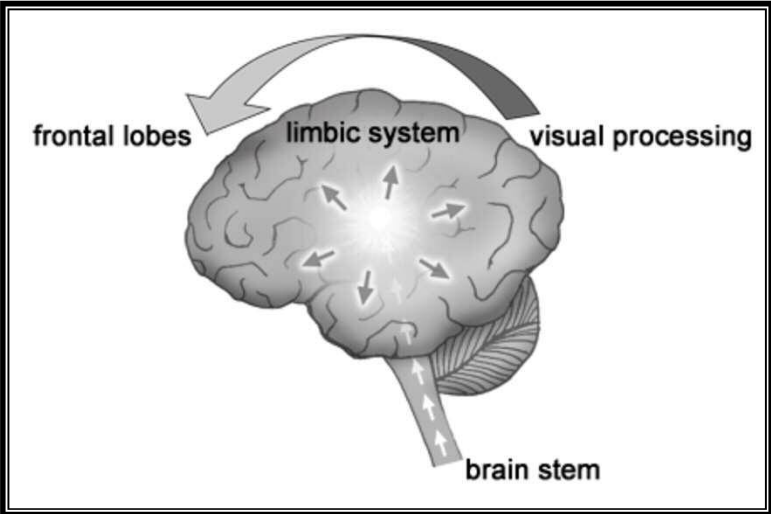
- Analyze situations,
- Plan and take action,
- Adjust actions as needed to complete desired tasks.

**Orchestra of Executive Functions**

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## How the Brain Develops Over Time



frontal lobes    limbic system    visual processing

brain stem

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# 1<sup>st</sup> Set of Executive Functions

<b>Inhibition/ Action</b>	<ul style="list-style-type: none"><li>• Monitoring and self-regulating actions,</li><li>• Inhibiting action when necessary – impulse control</li></ul>
<b>Working Memory</b>	<ul style="list-style-type: none"><li>• Utilizing working memory and accessing recall,</li><li>• Using feedback to improve performance,</li><li>• Consequences of behavior (if-then)</li></ul>
<b>Focus &amp; Attention</b>	<ul style="list-style-type: none"><li>• Selective attention,</li><li>• Joint attention,</li><li>• Sustained attention,</li><li>• Response inhibition</li></ul>

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Say the color out loud (unmute)

Purple

6

Say the color out loud

Yellow

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Say the color out loud

Orange

Stroop Test 1930's (John Ridley Stroop)

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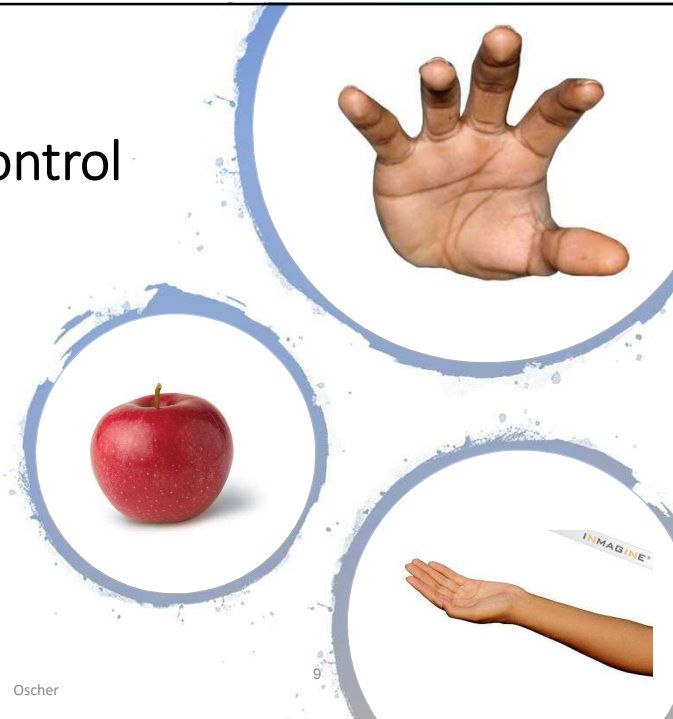
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## Inhibition - Impulse Control

- The capacity to put a moment between the impulse and the action.
  - Grabbing or asking
  - Talking or listening
  - Reacting or waiting



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## The Marshmallow Test -1970s

- **Delayed gratification** denote a person's ability to wait to obtain something that he or she wants.
- This attribute is also called impulse control, will power.
- This skill is developmental (brain maturation) but also taught and reinforced.





[https://www.youtube.com/watch?v=QX\\_oy9614HQ](https://www.youtube.com/watch?v=QX_oy9614HQ)

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 <p>Fast Brain Reacting</p>	 <p>Slow Brain Planning</p>
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## Marshmallow Test 2000s

Children's ability to inhibit impulses also depends on their ability to trust the word of the adult in their environment.


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As we mature.....



Healthy brains maintain strong impulse control



Poor impulse control is an indicator of potential brain health issues.

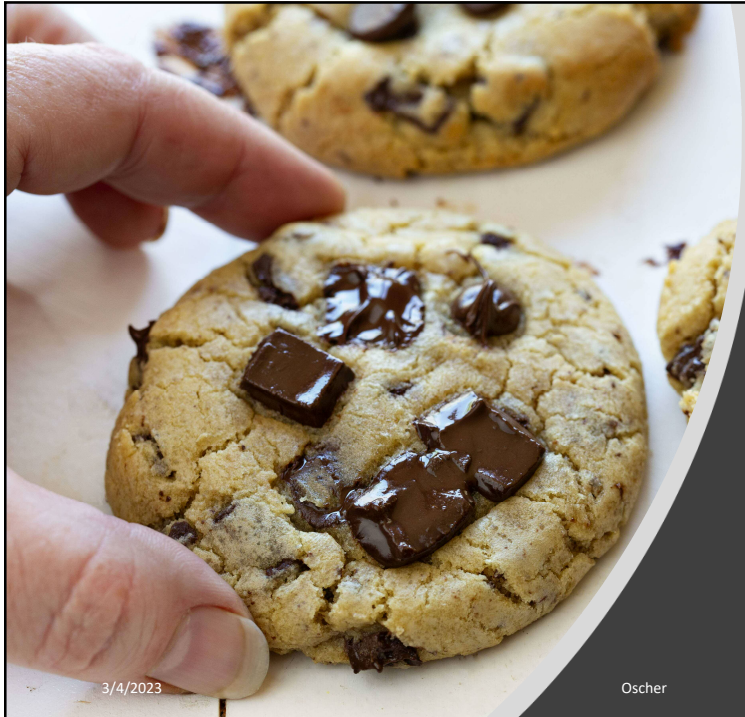
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<b>Trait - Inhibitory Control</b> The ability to integrate and simultaneously control attention, impulses and emotions and behavior.	Exactly like you	Very much like you	Somewhat like you	Not too much like you	Not at all like you	Total Score
If I'm in a noisy room, I can still pay attention to the task I'm working on	5	4	3	2	1	
I tend to blurt out what I'm thinking even if it might hurt someone else	1	2	3	4	5	
If I interrupted while I'm working on a task, I can switch gears and pay attention	5	4	3	2	1	
If others are having dessert, I usually have one too, even when I want to lose weight	1	2	3	4	5	

See Executive Function Quiz

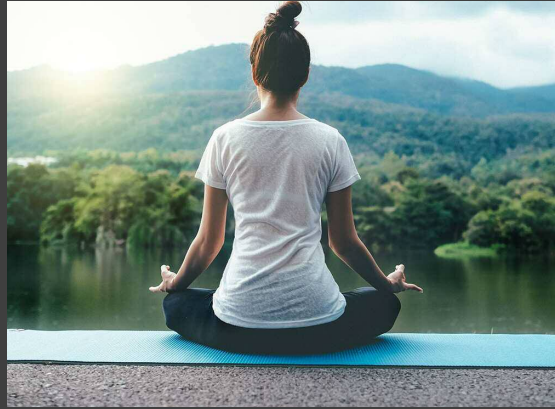
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How do you strengthen the ability to put a moment between impulse and action?

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Mind before muscles activities.....

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The diagram illustrates the components of Working Memory. It features a central brain with four colored segments: a blue segment labeled 'operates over a few seconds' with an hourglass icon; a green segment labeled 'temporary storage' with a box icon; a yellow segment labeled 'manipulates information' with a graph icon; and a purple segment labeled 'focuses attention' with a person thinking icon. The text 'Working Memory' is centered below the brain.

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### Tray & Objects Game

- What's there?
- What's missing?

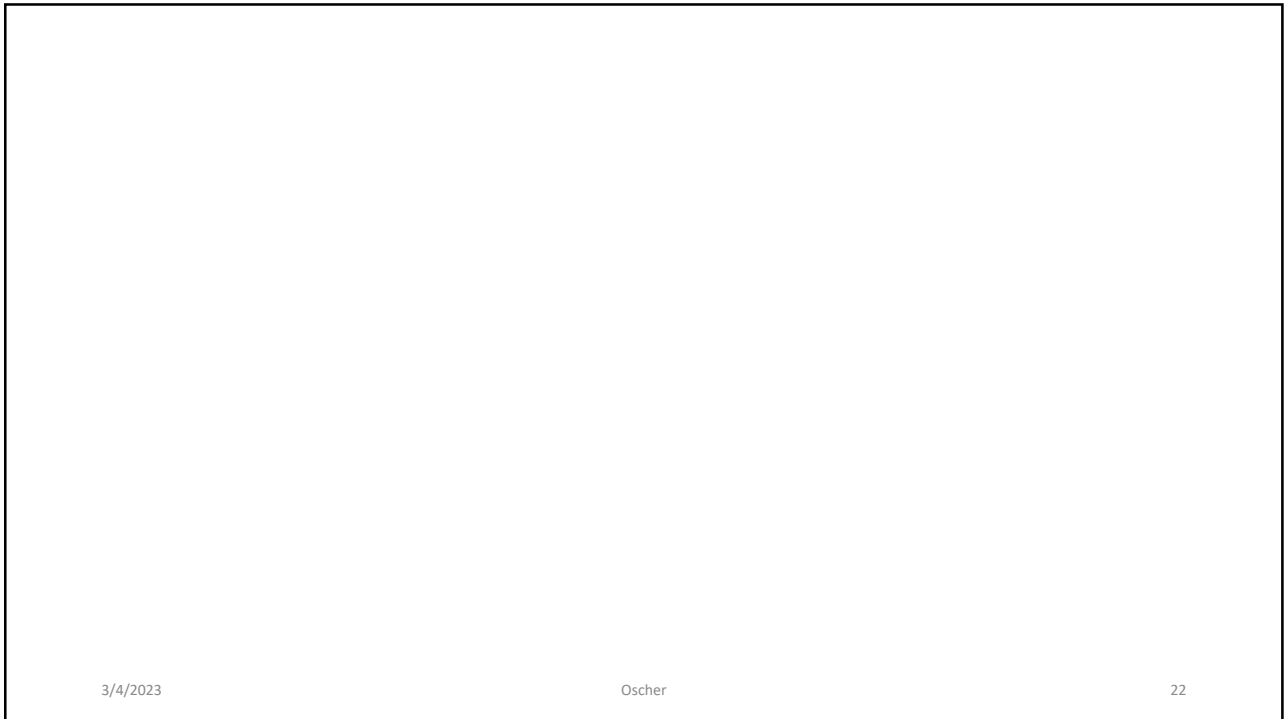
A photograph of a green tray containing several objects: a blue glue stick, a ball of colorful string, a round button with text, a red fish-shaped calculator, a playing card (10 of hearts), a blue marker, and a small white object.

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Typical assessment for working memory

- Chair
- Penny
- Lamp

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## Working Memory Capacity

- 3 years – 1 bit
- 5 years – 2 bits
- 7 years – 3 bits
- 9 years – 4 bits
- 11 years – 5 bits
- 13 years – 6 bits
- 15 years – 7 bits
- 40 – 60 - 6 bits
- 60 plus - depends on health

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## What were the three words?

- Chair
- Penny
- Lamp

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# Where did I put .....?

## Aunt Ethel's Rule

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### Your Brain Loves Routines



- Building on Aunt Ethel's Rule....
- When you come in from the car
- When you leave the house
- When you get ready for bed

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## Support your memory!

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## As we mature... when to be concerned

- Memory loss that disrupts daily life....**
- Challenges in planning or solving problems....**
- Difficulty completing familiar tasks...**
- Consistent confusion with time or place....**
- Forgetting the names of familiar people**

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Why do we need to pay attention?



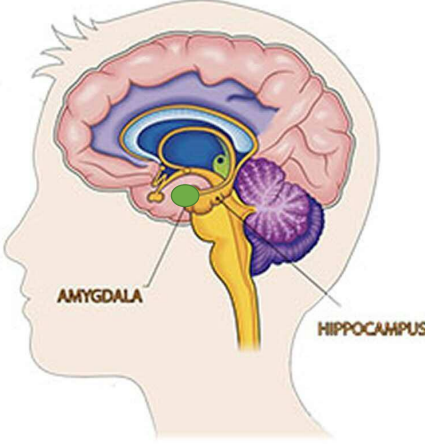
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This slide features a dark grey rectangular area on the left containing the text "Why do we need to pay attention?". To the right is a cartoon illustration of a cavewoman with a worried expression running away from a large, aggressive saber-toothed cat. The scene is set against a plain white background.

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How do we pay attention?



AMYGDALA

HIPPOCAMPUS

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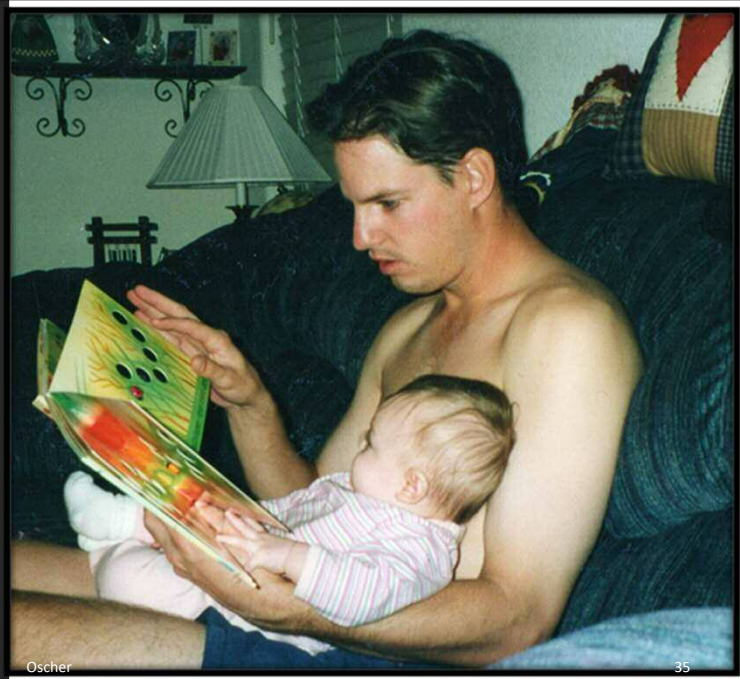
This slide contains an anatomical diagram of a human head in profile, showing the brain. Two specific regions are highlighted and labeled: the amygdala, shown as a small green structure, and the hippocampus, shown as a purple, seahorse-shaped structure. The rest of the brain is rendered in shades of pink and blue.

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**Joint Attention:**

Initially, joint/shared attention with an adult is essential in vocabulary development for young children.

As an adult, joint attention is critical to learning new information.



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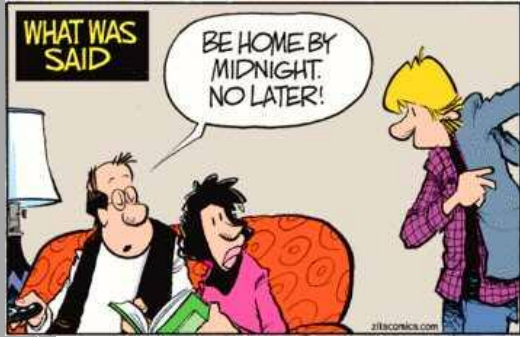
## Selective Attention

Paying attention to something while screening out competing information.

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### Selective Listening:

Paying attention to something while screening out competing or unwanted information.



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### Selective Listening:

Paying attention to something while screening out competing or unwanted information.

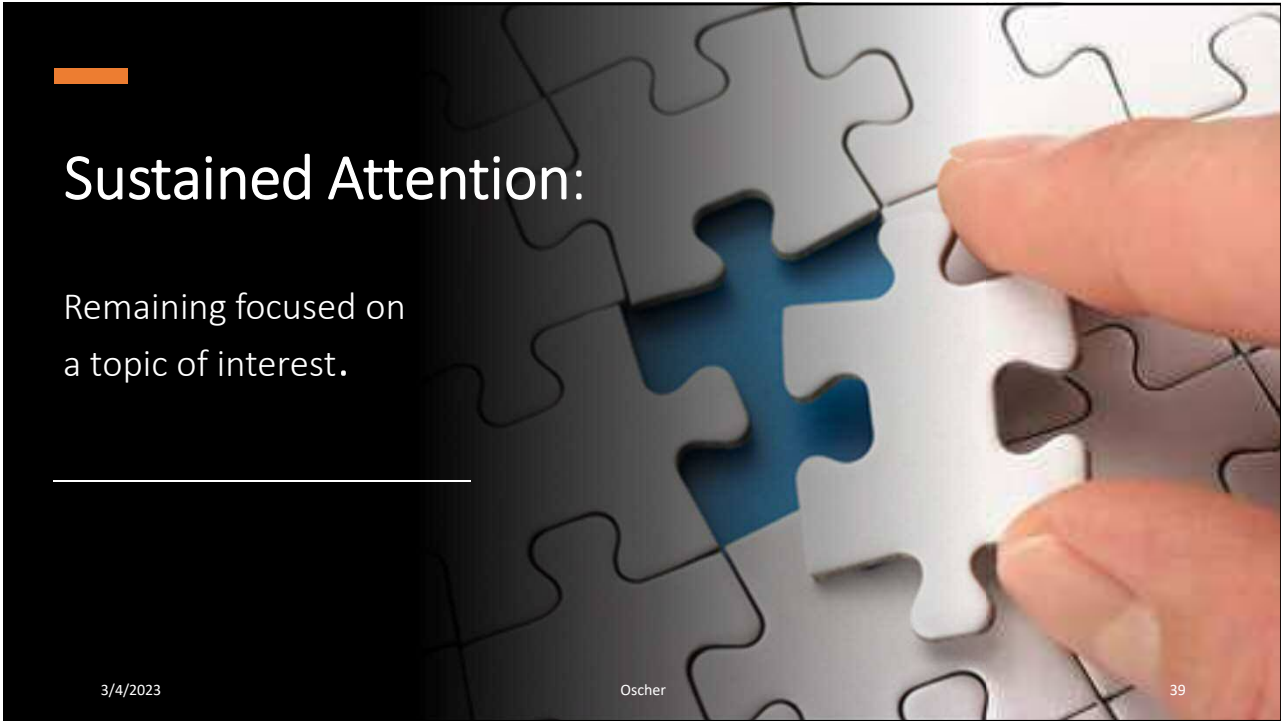


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**Sustained Attention:**

Remaining focused on a topic of interest.

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**Response Inhibition**

Staying focused through environmental distractions

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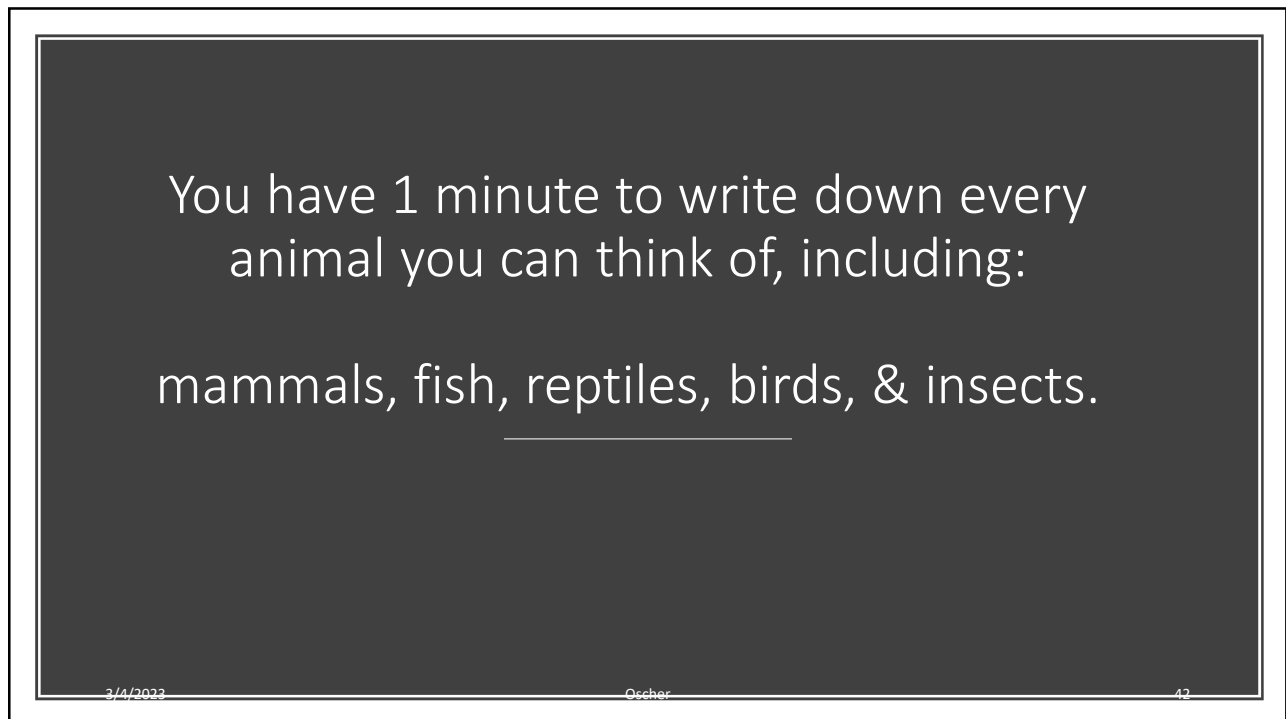
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How is  
focus & attention  
assessed?

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You have 1 minute to write down every  
animal you can think of, including:  
mammals, fish, reptiles, birds, & insects.

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A score below 15 is reason for secondary screening.

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## Executive Function Quiz

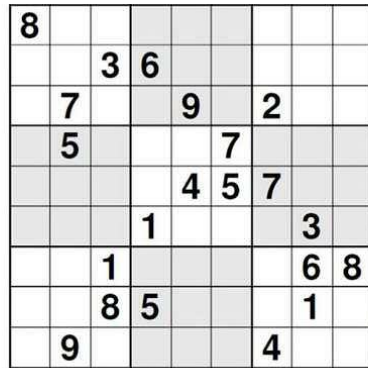
Executive Function Quiz						
Trait - Attention and Focus – The ability to remain alert and concentrating for periods of time	Exactly like you	Very much like you	Somewhat like you	Not too much like you	Not at all like you	Total Score
I typically get so absorbed in what I'm doing that I stay with it for a long time	5	4	3	2	1	
I'm easily distracted	1	2	3	4	5	
I have a hard time keeping my mind on things	1	2	3	4	5	
I can keep my energy at just the right level so that I can concentrate when I need to	5	4	3	2	1	
20 – 15 You rate high on the skill		14 – 9 You could use some work on this skill		8 and below You could improve this skill		
Suggestions						
Create checklists and "to do" lists, estimating how long tasks will take.						
<ul style="list-style-type: none"> <li>• Break long assignments into chunks and assign time frames for completing each chunk.</li> <li>• When you are working on a task, play music in the background</li> <li>• Be sure to get adequate sleep and nutrition</li> </ul>						

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# Lengthen & Strengthen Focus & Attention

- Sudoku
- Crossword puzzles
- Chess
- Jigsaw puzzles
- Word searches or scrambles
- Memory games
- Video game training
- Playing card games with others



☆☆☆☆☆☆☆☆

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<b>Emotional Control Self Regulation</b>	<ul style="list-style-type: none"> <li>• Managing frustration - regulation of emotions,</li> <li>• Interpreting other's emotions and intentions,</li> <li>• Perspective taking</li> </ul>
<b>Initiative &amp; Problem Solving</b>	<ul style="list-style-type: none"> <li>• <b>Initiating:</b> Starting to do something,</li> <li>• <b>Planning:</b> Thinking ahead about how to do something,</li> <li>• <b>Pacing and managing time,</b></li> <li>• <b>Problem solving:</b> Using strategy to solve a problem,</li> </ul>
<b>Goal Setting / Creativity</b>	<ul style="list-style-type: none"> <li>• Organizing, initiating planning,</li> <li>• Cognitive flexibility,</li> <li>• Predicting and strategizing,</li> <li>• Prioritizing and sequencing</li> </ul>

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## Emotions & Self Regulation

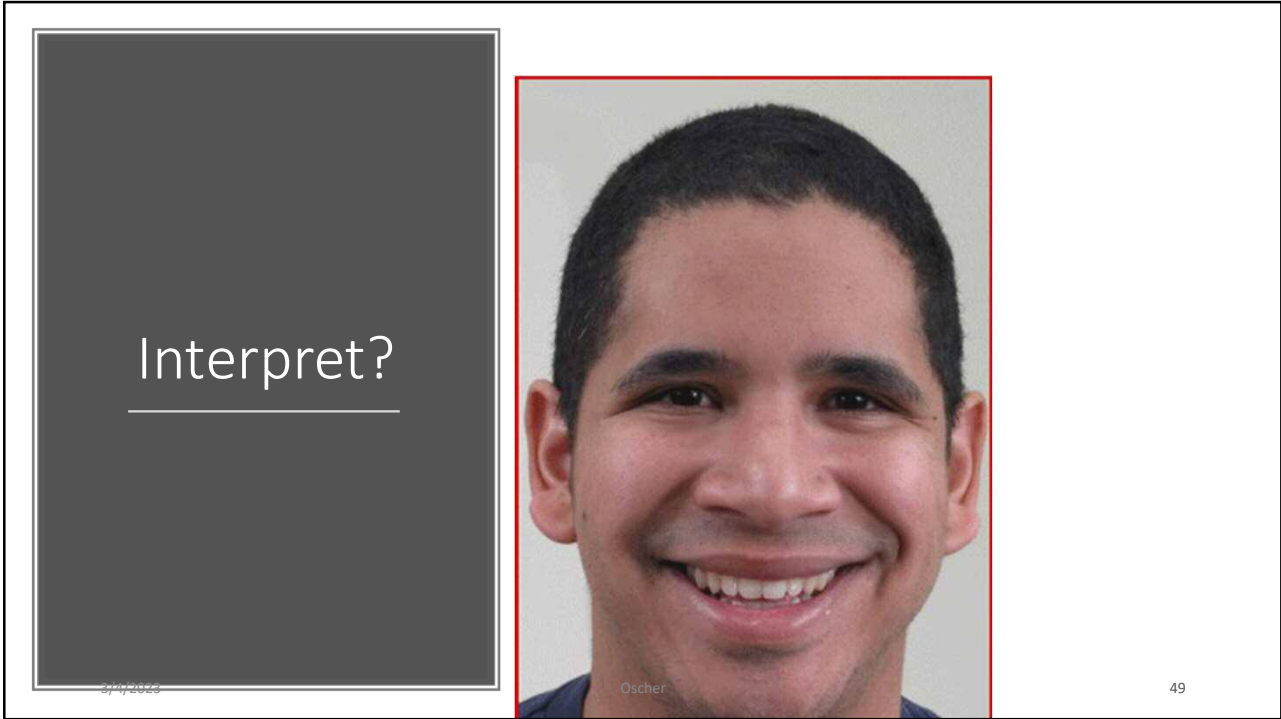
- Self-Awareness
- Regulating emotions
- Interpreting other's emotions/intentions
- Perspective taking

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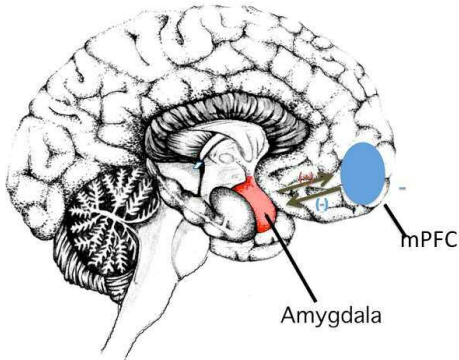


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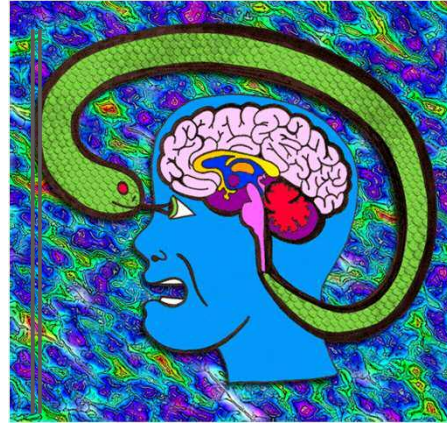


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# Emotions + Logic = Decisions



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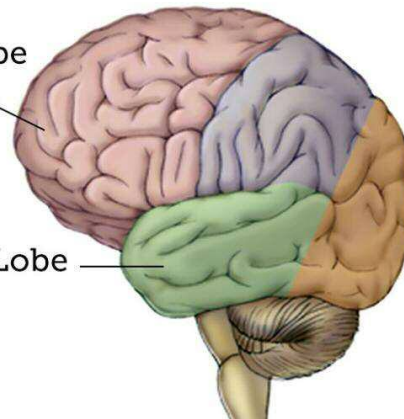
## As we mature...

- Good news.... Most older adults have strong self regulatory skills!
  - And, generally, as we age, we have a positive outlook.
- However, individual who have (FTLD) frontotemporal lobar degeneration have significant difficulties regulating emotions.

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Frontal Lobe

Temporal Lobe



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Emotional regulation =  
Socialize regularly

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# Planning and Doing



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No, you can't say you are going out to dinner, or your daughter does it.....

Take 2 minutes

# Planning Thanksgiving

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## Did you?

- Plan a menu?
- Hunt for recipes?
- Write a grocery list?
- Shop?
- Set your table?
- Clean your house?
- Make space in frig?
- Defrost the turkey?
- Plan the budget?
- Invite guests?
- Time the meal?

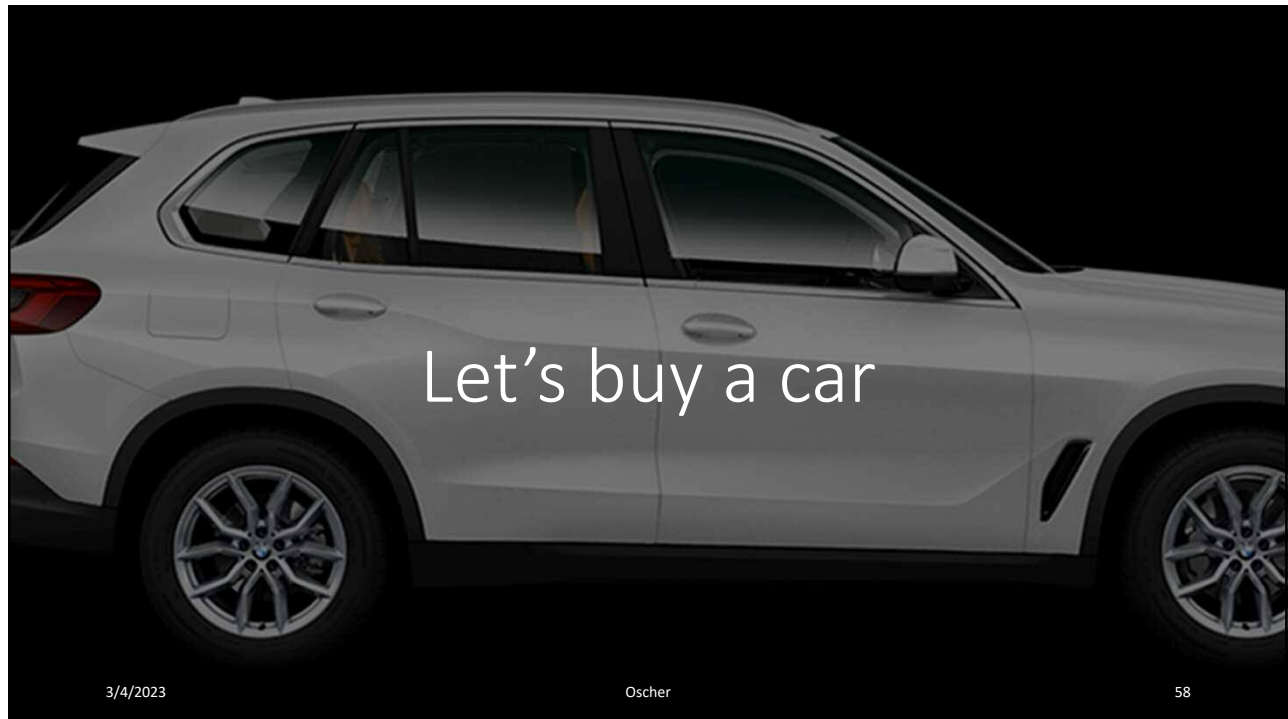
PS this list was generated by Billie's kindergarten students

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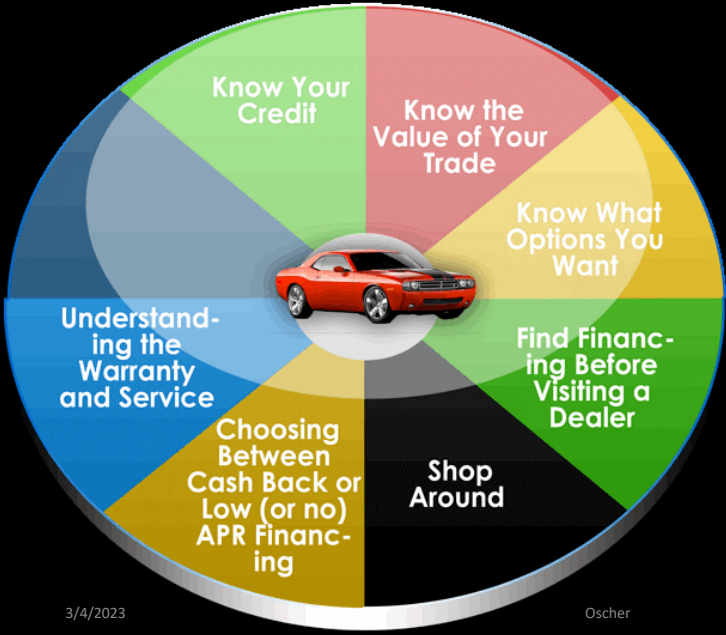


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**Mother's Rule**

- What you need
- What you want
- What you can get

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Assessing Planning



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# Clock drawing test

- 10 minutes past 10:00

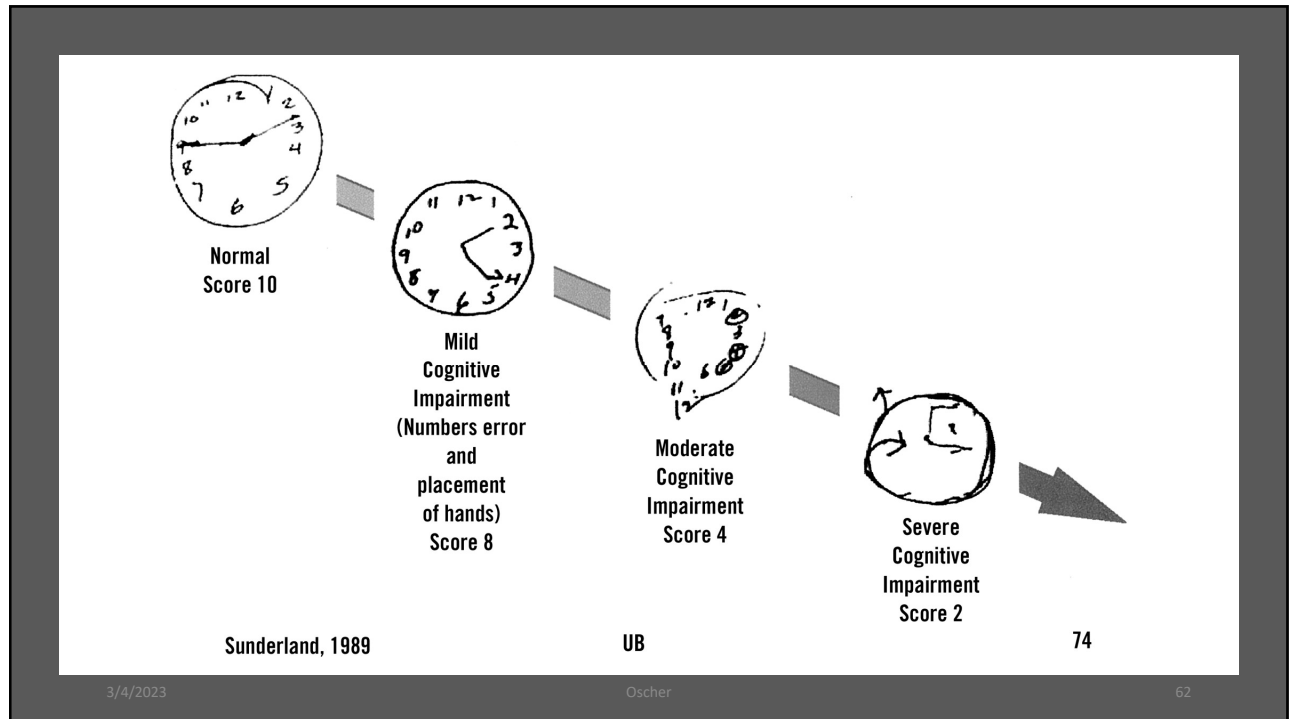


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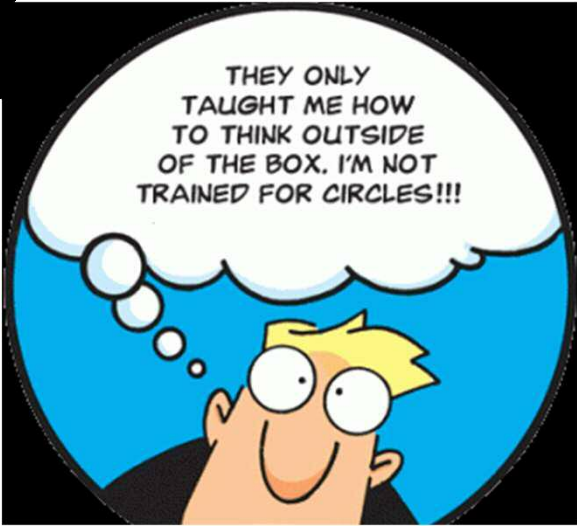
Trait – Planning and Achieving Goals	Exactly like you	Very much like you	Somewhat like you	Not too much like you	Not at all like you	Total Score
The ability to set and accomplish realistic goals.						
I can identify <u>realistic</u> goals for myself.	5	4	3	2	1	
I can organize a set of sequential steps to accomplish my goals	5	4	3	2	1	
I am usually motivated to accomplish my goals.	5	4	3	2	1	
I find it difficult to achieve my goals and/or daily tasks.	1	2	3	4	5	
20 – 15 You rate high on this skill		14 – 9 You could use some work on this skill		8 and below You could improve this skill		
Suggestions						
<ul style="list-style-type: none"> <li>• Write down goals. – Analyze: Are your goals achievable/realistic?</li> <li>• Establish daily to-do list. Check back in with your list throughout the day to help you stay focused on completing tasks.</li> <li>• Mentally and verbally encourage yourself and commend yourself on task completion.</li> <li>• Share your goals and progress with a friend!</li> </ul>						

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## Cognitive Flexibility

- Initiative & Problem Solving
  
- Goal Setting & Creativity



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1. ALTER YOUR EVERYDAY ROUTINE

2. SEEK OUT NEW EXPERIENCES

3. PRACTICE THINKING CREATIVELY

4. DON'T ALWAYS TAKE THE EASY WAY.

5. GO OUT OF YOUR WAY TO MEET NEW PEOPLE

6. TRANSFER YOUR LEARNING

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- Start and complete projects in a timely manner
- Change/adapt as new information arises
- Change/adapt as mistakes are made
- Stay focused yet shift attention quickly

On-going Life Skills

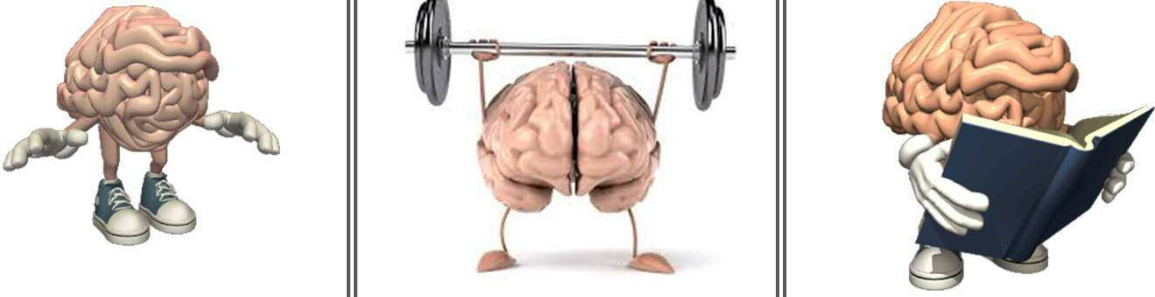
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Brain Health

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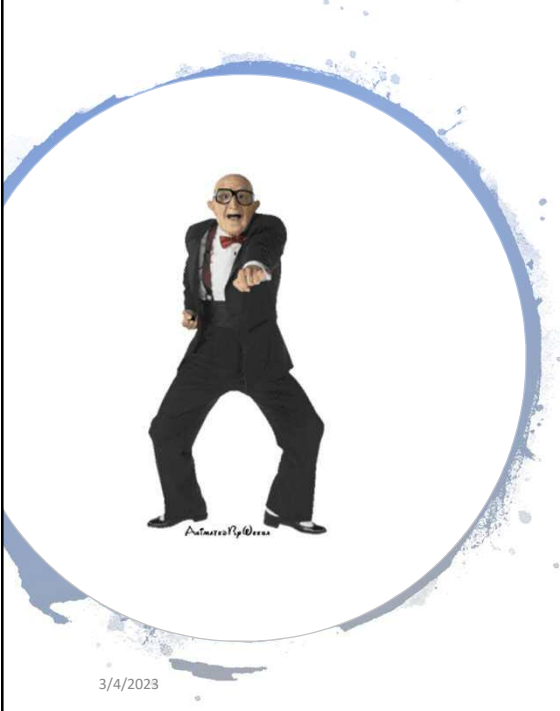
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Learn new skills

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# Physical Activity

- Physical activity increases blood flow to your whole body including your brain!!!
- **20-30 minutes per day!**
  - Swimming
  - Golfing
  - Walking
  - Yoga, Pilates, Tai Chi
  - Gardening – Yard work – House Keeping
  - Lifting light weights


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# Let's Dance!



•Published: 13 April 2019  
 Effects of dance intervention on global cognition, executive function and memory of older adults: a meta-analysis and systematic review  
[Aging Clinical and Experimental Research](#) volume 32, pages7–19 (2020)

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## Eat Well

**HEALTHY OILS**

Use healthy oils (like olive and canola oil) for cooking, on salad, and at the table. Limit butter. Avoid trans fat.

The more veggies – and the greater the variety – the better. Potatoes and French fries don't count.

Eat plenty of fruits of all colors.

**STAY ACTIVE!**

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Harvard T.H. Chan School of Public Health  
The Nutrition Source  
[www.hsph.harvard.edu/nutritionsource](http://www.hsph.harvard.edu/nutritionsource)

**WATER**

Drink water, tea, or coffee (with little or no sugar). Limit milk/dairy (1-2 servings/day) and juice (1 small glass/day). Avoid sugary drinks.

Eat a variety of whole grains (like whole-wheat bread, whole-grain pasta, and brown rice). Limit refined grains (like white rice and white bread).

Choose fish, poultry, beans, and nuts; limit red meat and cheese; avoid bacon, cold cuts, and other processed meats.

Harvard Medical School  
Harvard Health Publications  
[www.health.harvard.edu](http://www.health.harvard.edu)

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## Sleep well

**Do**

- Exercise earlier in the day can promote good sleep.
- Ensure adequate exposure to natural light.
- Establish a regular relaxing bedtime routine.
- Associate your bed with sleep.

**Don't**

- Nap during the day.
- Consume stimulants – caffeine, nicotine, alcohol.
- Use computers (blue-light) in the evening.

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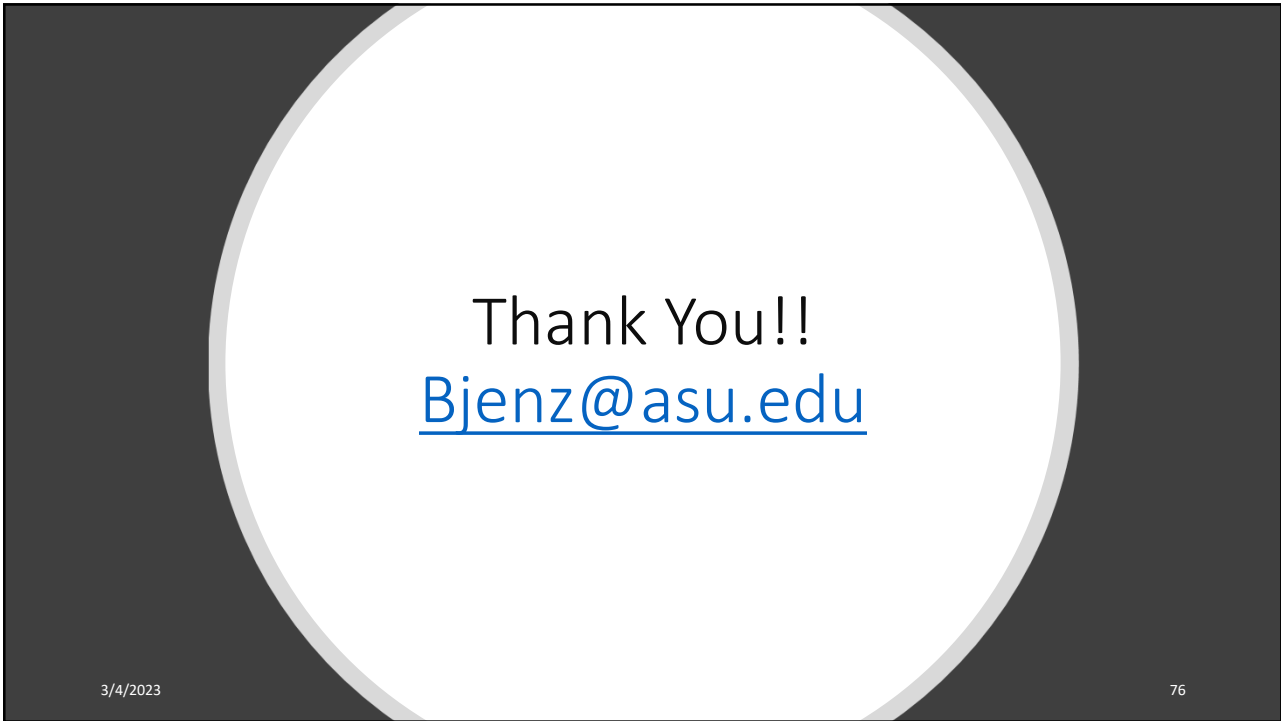
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Keep attending classes

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Thank You!!  
[Bjenz@asu.edu](mailto:Bjenz@asu.edu)

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