

EXECUTIVE FUNCTIONS ADHD & DYSLEXIA

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The Purpose of EF

- Decision making
 - ▣ Goal setting
 - ▣ Prioritizing
 - ▣ Organizing
 - ▣ Shifting flexibly
 - ▣ Holding and manipulating information
- **How** we think and **how** we learn

Executive Functions

- Collection of processes
- Capacity to engage in behaviors that are
 - ▣ Independent
 - ▣ Purposeful
 - ▣ Goal-directed
- Incorporates feedback in order to adjust behavior

Executive Functions

- Allows for self-regulation and self-direction of day-to-day and long-term functioning
- Purposely managing thinking or behavior to attain a goal or desired outcome
- Elements of cognition that allow us to stop and think
 - ▣ Restrain
 - ▣ Initiate
 - ▣ Order
- Executive processes ultimately has to be fluent

Two Cores Strands of Executive Functions

Metacognitive

- Goal setting
- Planning/strategizing
- Organization of materials
- Time management
- Task initiation
- Goal-directed attention
- Task persistence
- Working memory
- Set shifting

Social/Emotional

- Response inhibition - impulse control
- Emotional control
- Adaptability

EF: Developmental perspective

- Interface between the child and environment
 - ▣ The anatomical infrastructure (i.e., white matter) is sensitive to extrinsic factors
- Flexible organization of attention (sensory input) and thought (memory and processing)
- Bidirectional interaction between the control systems and the functions it controls
 - ▣ Context matters

EF: Developmental perspective

- Maturation results from experience
 - Child
 - Self directed learning from activities – problem solving
 - Adult
 - External structure – cues, limits, prompts, scripts
- Critical for success in school
- Leads to self regulation of learning and behavior

Elements Executive Functions

- Attention
- Planning
- Organization
- Initiation
- Monitoring
- Inhibition
- Problem Solving
- Working memory
- Shift
- Emotional control

Attention

- The inability to regulate attention
- Difficulty paying attention
 - ▣ To the right thing
 - ▣ At the right time
 - ▣ For the appropriate amount of time
 - ▣ As in depth as needed

Attention

- Alertness
- Awareness/Focus
- Selective attention
- Sustained attention
- Alternating attention
- Awake
- Focal activation –
Selecting a stimulus
- Freedom from
distractibility –
Blocking competitive
stimuli
- Vigilance – duration
- Shifting focus

Inhibition

- Delay, wait, stop
 - ▣ Leads to planning
 - Anticipation of future events
 - Setting goals
 - Developing plans
 - Impacts time concepts
- Space between thought and action
- Being reflective
- Impulse control
 - ▣ Deficits lead to symptoms of ADHD

Working Memory

- Memory for intermediate results that must be held during thinking.¹
- Memory system used for holding and manipulating information while various mental tasks are carried out.²
- A system for temporarily storing and managing the information required to carry out complex cognitive tasks such as learning, reasoning, and comprehension.³

Working Memory

- **Executive** and **attentional** aspect of short-term memory
- Interim integration, processing, disposal, and retrieval of information.
- Active monitoring or manipulation of information or behaviors.¹

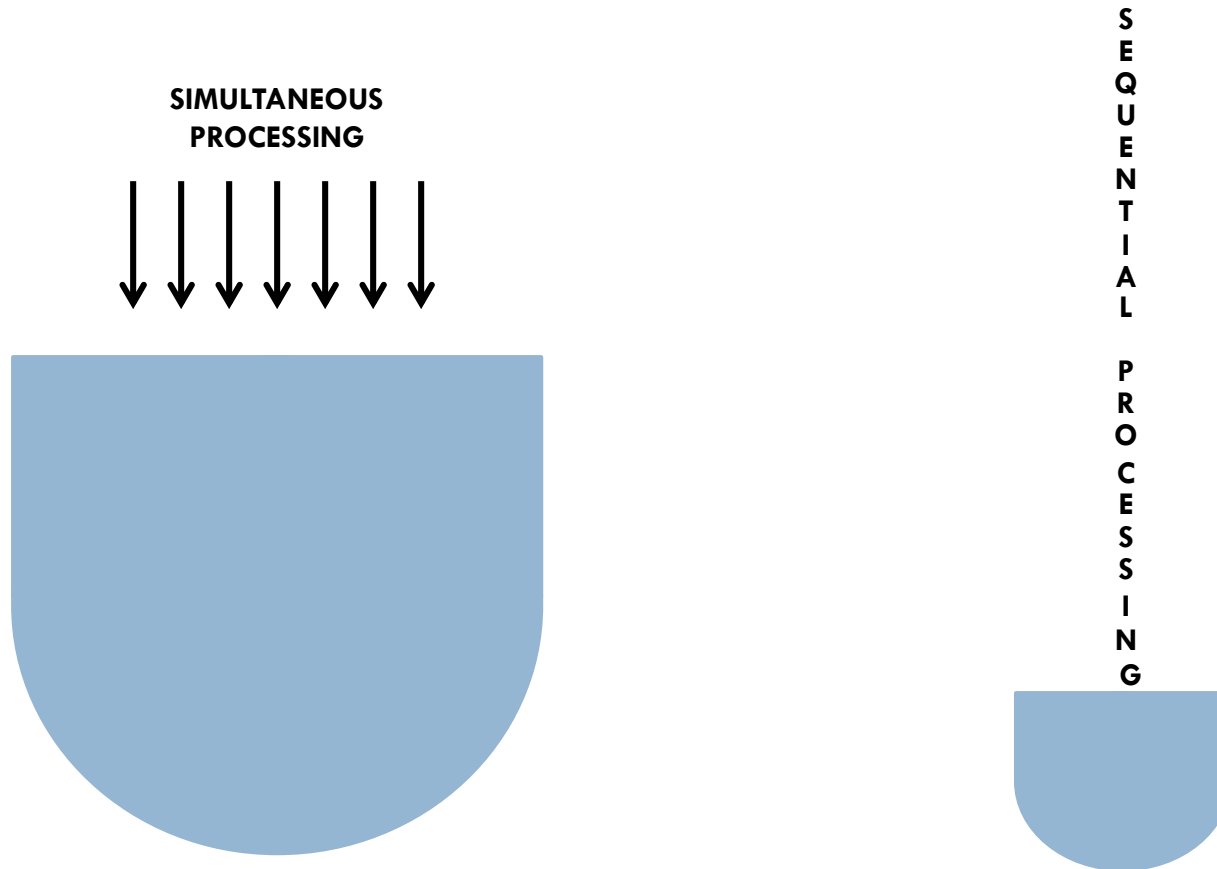
Working Memory

□ Requirements

▣ Simultaneous storage and processing of information.

- Goal orientated
- Active monitoring or manipulation of information or behaviors
- In the face of interfering processes and distractions.

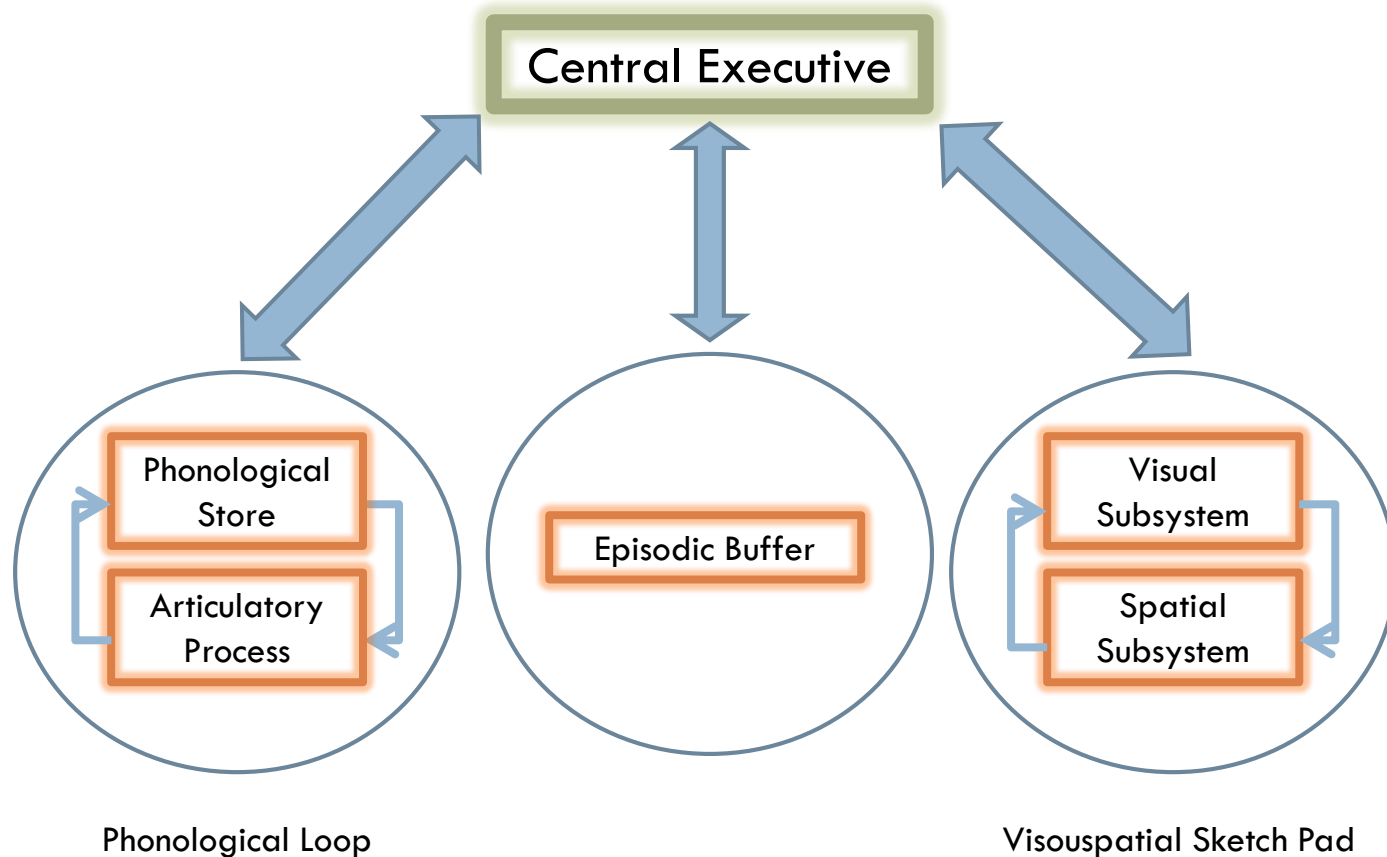
Working Memory: Size Matters



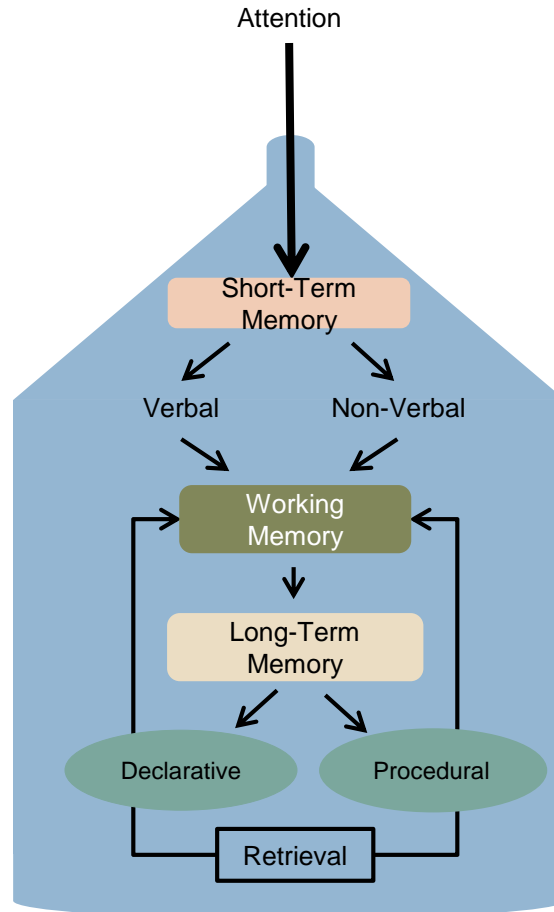
Working Memory

- Four subcomponents:
 - ▣ Central executive
 - Attentionally-limited control system
 - Regulates the two other components
 - ▣ Visuospatial sketch pad
 - ▣ Phonological loop
 - Necessary for the acquisition of both native and second-language vocabulary.
 - ▣ Episodic Buffer
 - Integrates visual, spatial and auditory information in a time sequence (e.g., memory of a story or a scene)

Working Memory



Memory: Short, Working, Long-Term



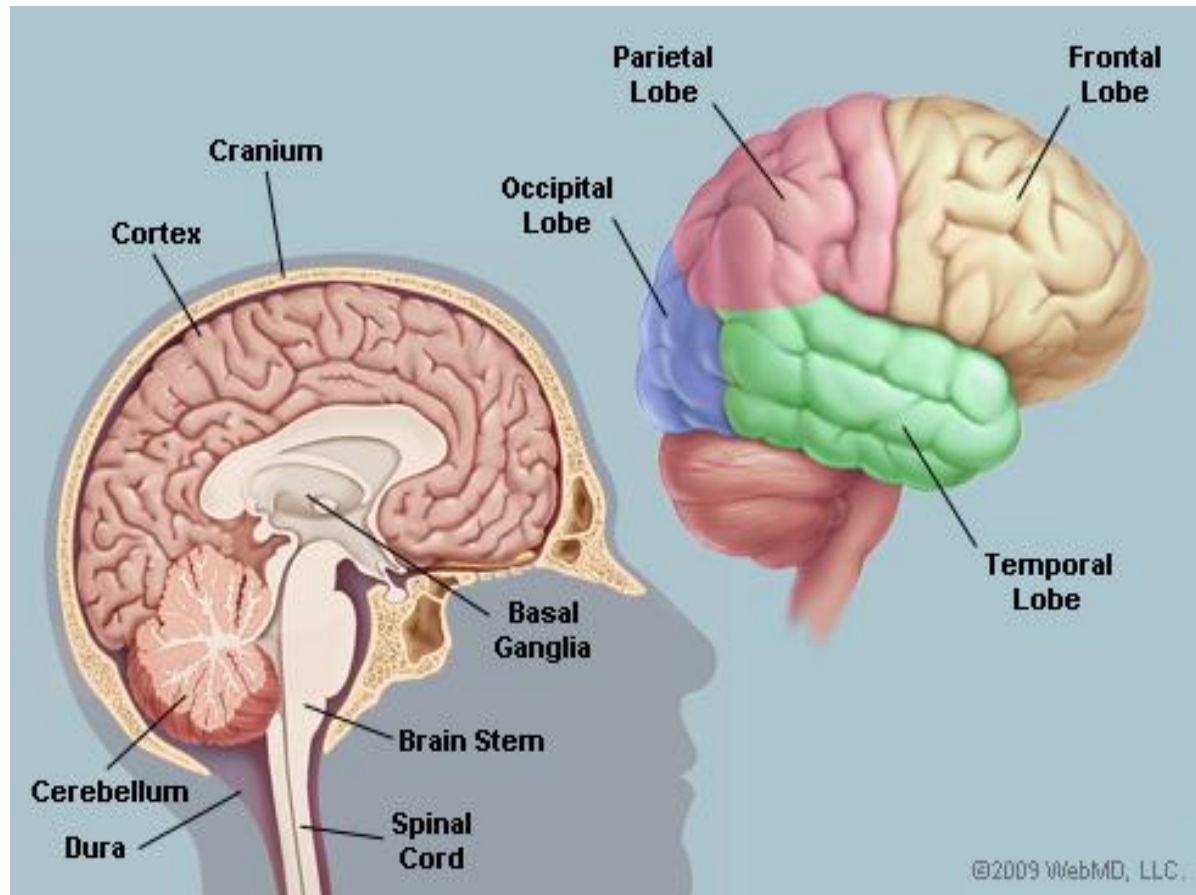
Shift

- Cognitive flexibility
- Shifting attention
- Transitioning



The Neurology of Executive Functions

The Anatomy of the brain



The Interactions of Frontal Lobe

- Frontal Lobe
 - ▣ Action and direction – Output
- Other Lobes
 - ▣ Sensory Processing – Input

Frontal Lobe

- Center of self directed action and output
 - ▣ Initiate movement
 - ▣ Problem solving
 - ▣ Goal directed behavior
- Prefrontal Cortex
 - ▣ Most specialized for metacognition and self regulation
- Coordinates the sensory input received, process and stored by the other lobes (temporal, parietal and occipital)

Dorsolateral Prefrontal Cortex

- Upper portion of frontal lobe – Work production
- Responsible for metacognitive strand
 - ▣ Planning
 - ▣ Strategizing
 - ▣ Sustained Attention
 - ▣ Flexibility
 - ▣ Self-Monitoring
- Weaknesses may lead to common ADHD symptoms
 - ▣ Inattention
 - ▣ Planning and organization problems
 - ▣ Limited working memory

Orbital Prefrontal Cortex

- Lower portion of frontal lobe - Behavior
- Responsible for social/emotional regulation strand
 - ▣ Impulse Control (Behavioral Inhibition)
 - ▣ Emotional Modulation
- Weaknesses may lead to ADHD symptoms
 - ▣ High levels of verbal and physical impulsivity
 - ▣ Poor emotional control

How the PFC Works

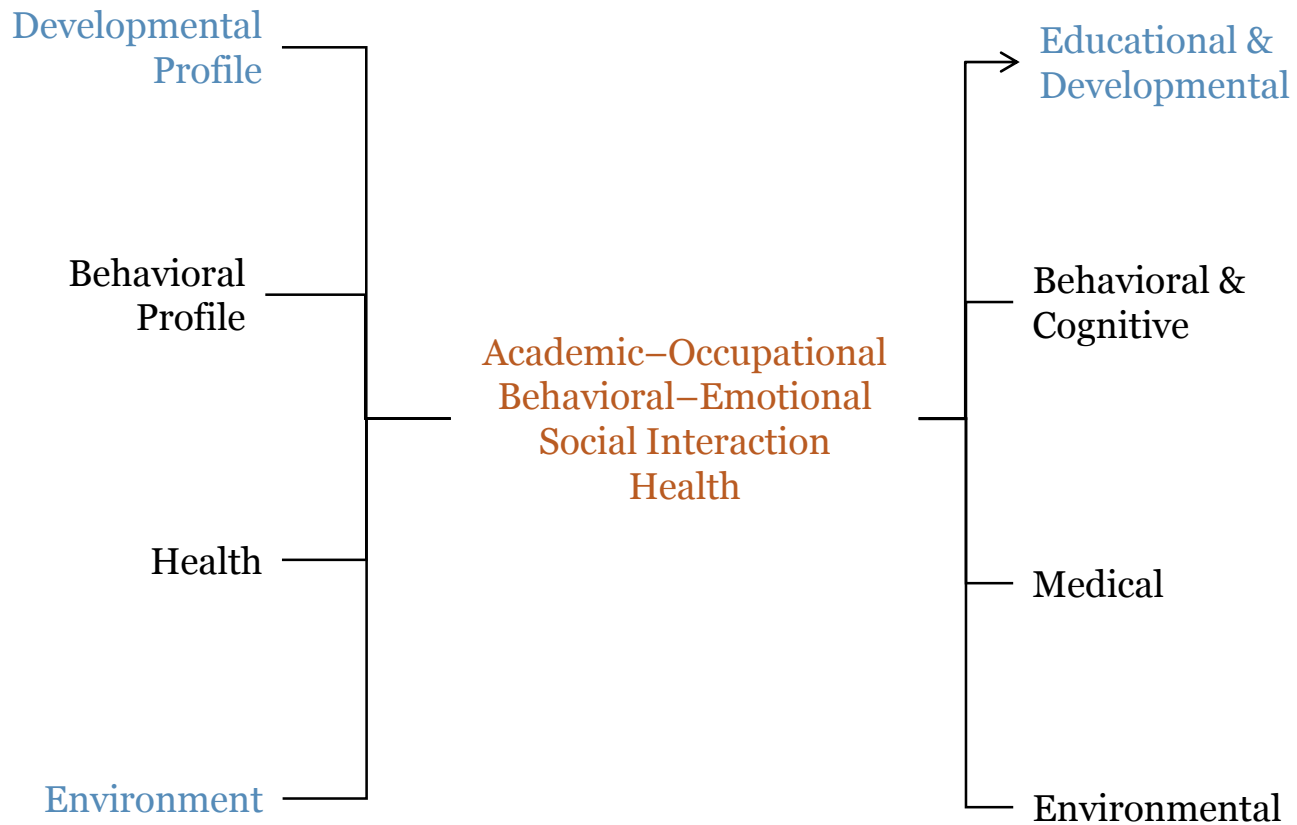
- Top-down regulation of cognition and behavior
- Neural connections guides the flow of activity between
 - ▣ Sensory input
 - ▣ Internal states
 - ▣ Output
- It affects memory
- The PFC is well connected to all the other regions of the brain



The Developmental Web

Putting it all together

The Developmental Web

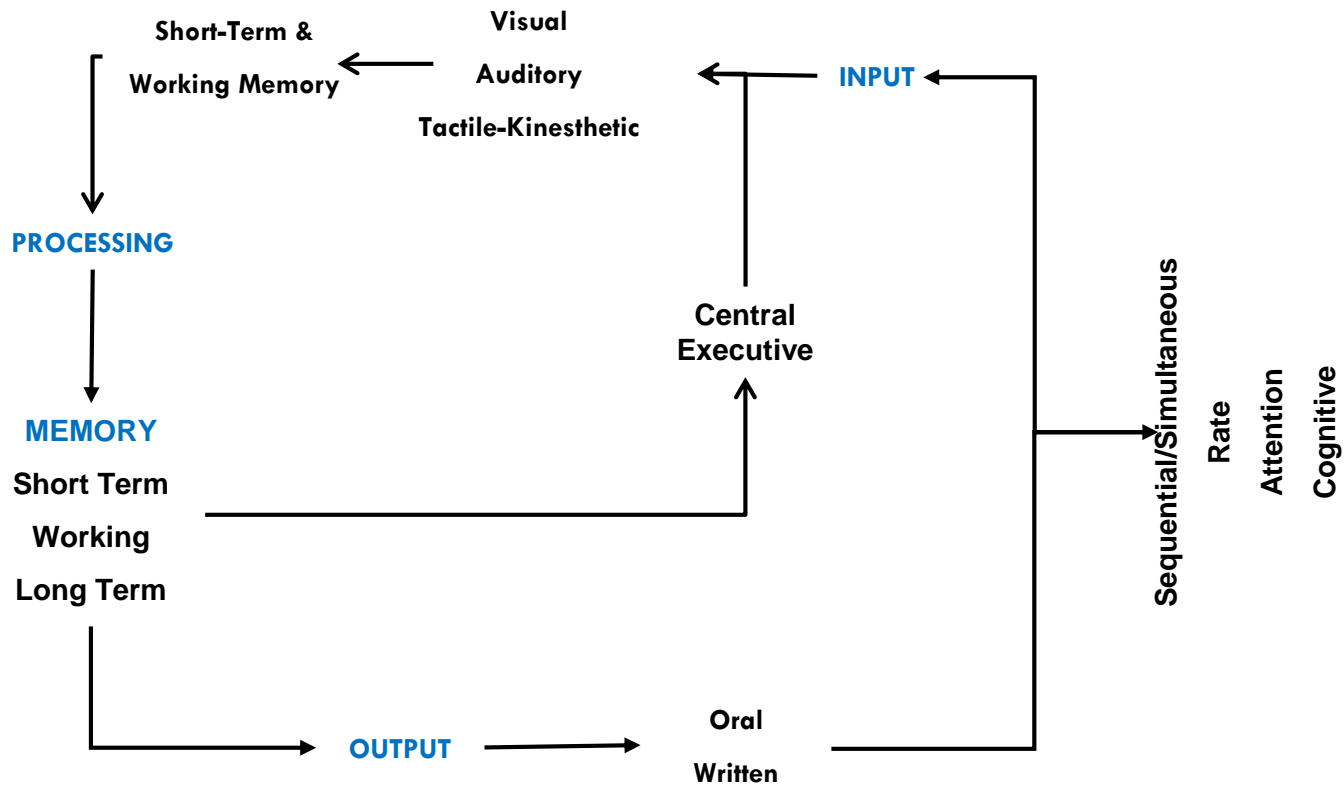




Developmental Profile

Factors affecting input

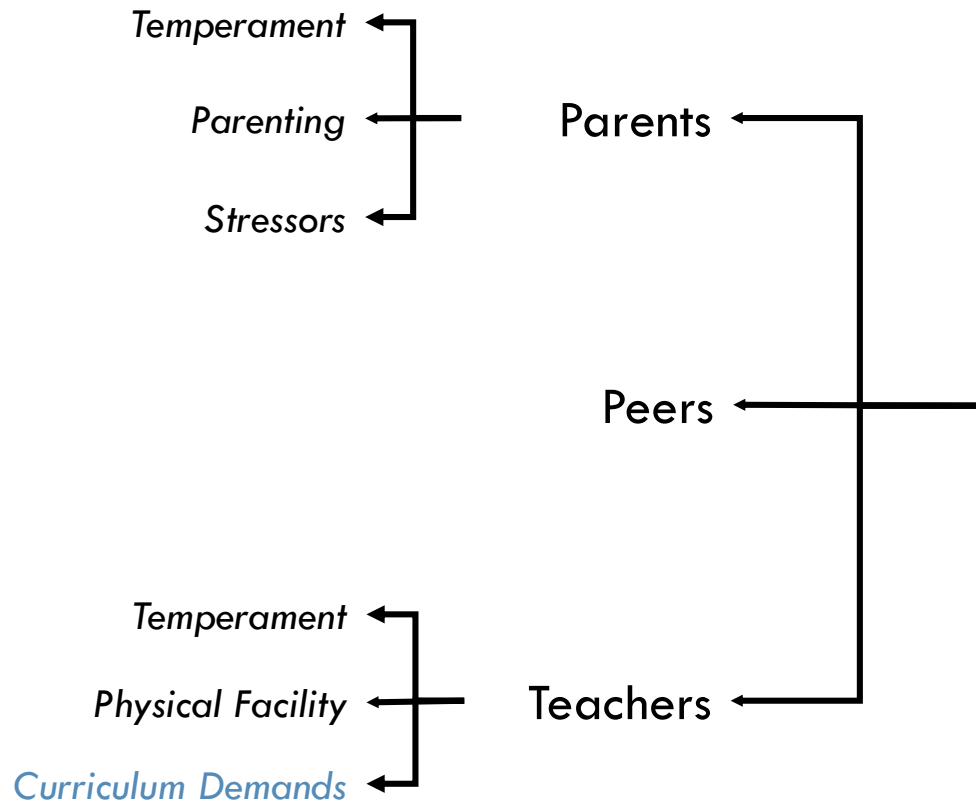
Developmental Profile





Environmental Factors

Environmental Factors



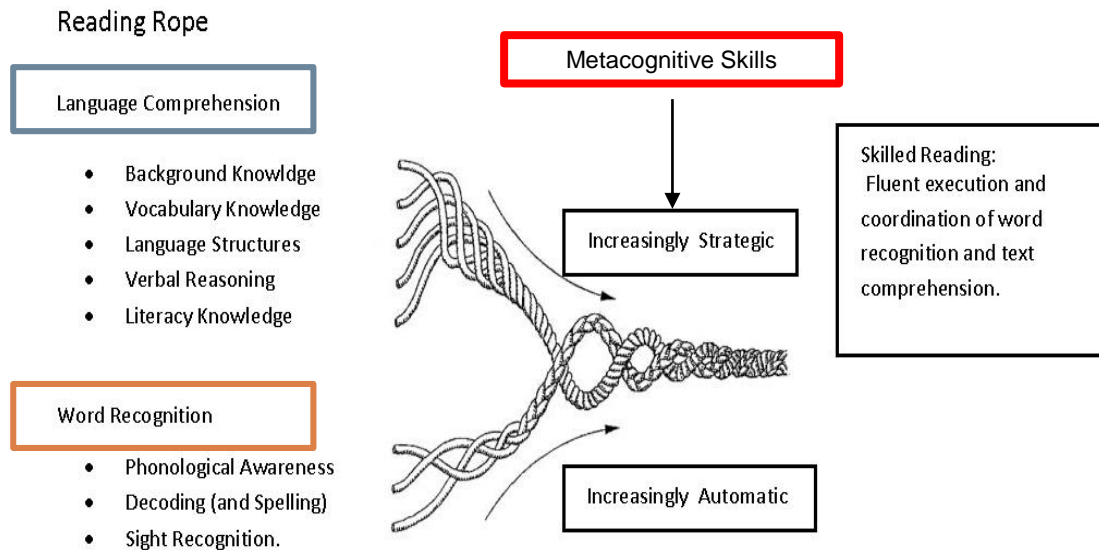
Curriculum Demands

- Based on curriculum goals
 - K – 3: Literacy
 - Basic academic skills
 - Reading
 - Writing
 - Arithmetic
 - 4th – 8th: General Education
 - Content
 - Executive Functions
 - 9th – 12th: Preparation for Higher Ed, Vocational Ed, Trade



EF and Reading

EF and the Reading Rope Model



Reading is a multifaceted skill, gradually acquired over years of instruction and practice.

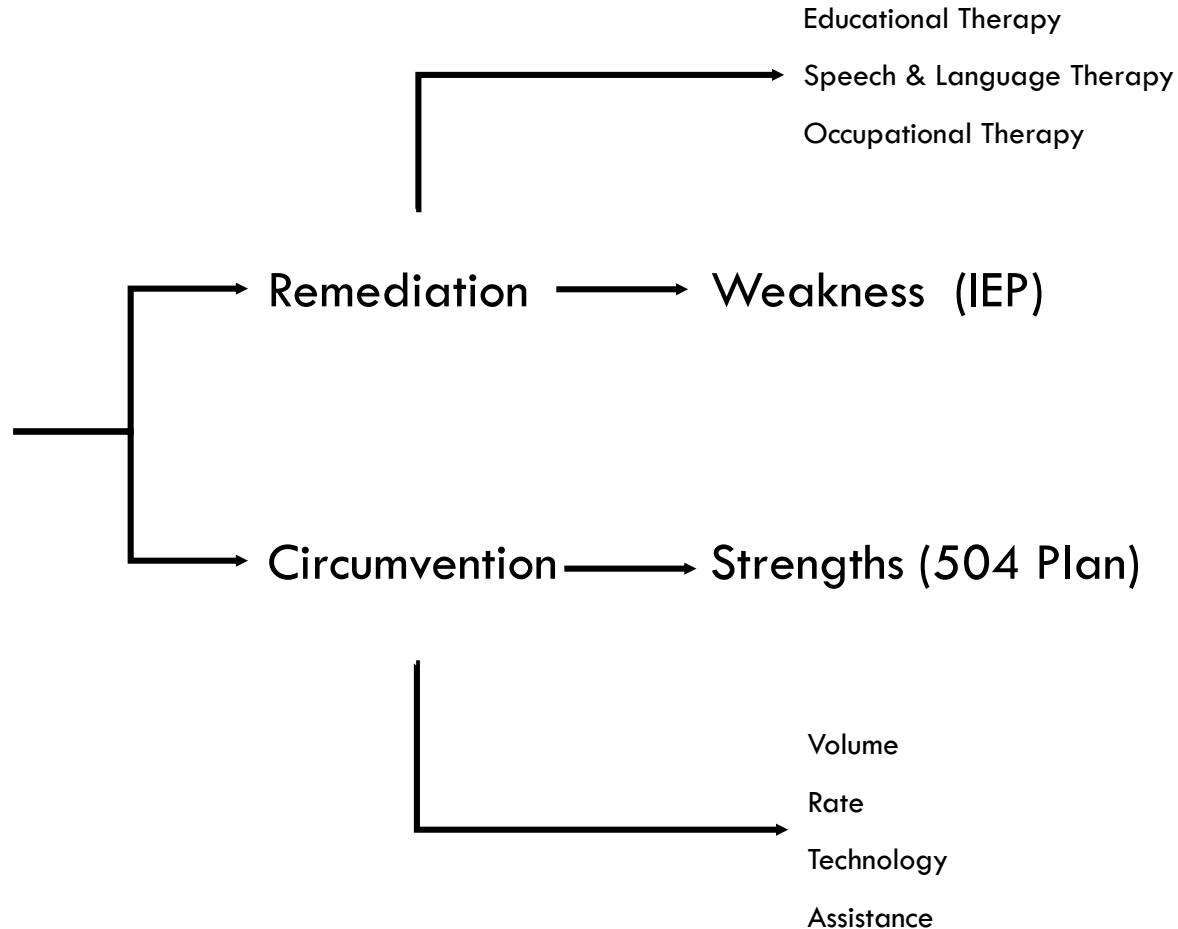
Scarborough (2001)



Management

Developmental Web

Educational Management



The Cure for EF Dysfunction

Marry them well!!!