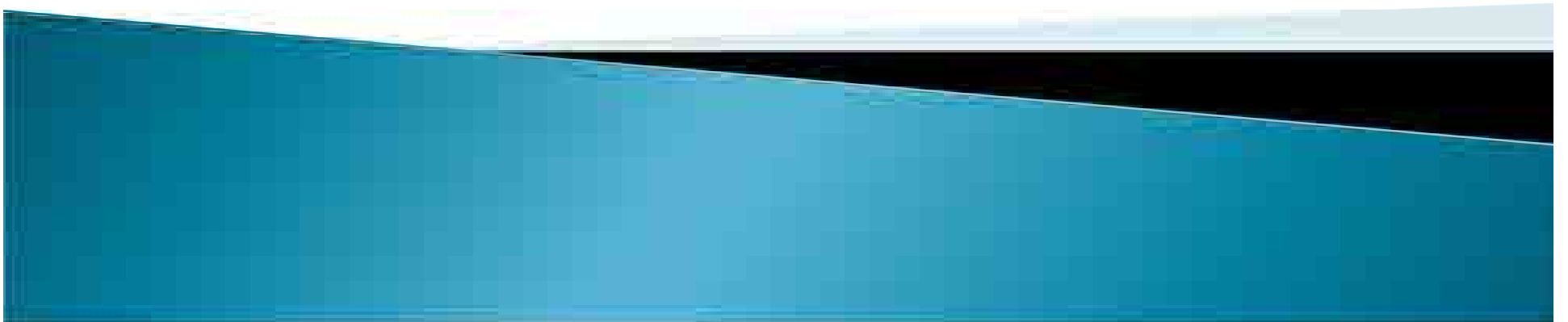


# Executive Functioning & ADHD: Keeping the Balls in the Air

Dr. Megan Smith, C. Psych.



# Overview

- ▶ What is executive functioning (EF)?
- ▶ Where do EF skills come from?
- ▶ How is EF related to ADHD?
- ▶ A closer look at specific EF skills:
  - What they are
  - What deficits look like
  - What helps
- ▶ Resources



# EF and ADHD

»» What is executive functioning?

# What is Executive Functioning?



Group of neurological processes that allow us to engage in goal-directed behaviour

## Executive Functioning

Self-  
Regulation

Inhibition  
Emotion  
Regulation  
Motivation

Cognitive

Attention  
Shifting  
Working  
Memory

Meta-  
cognitive

Planning  
Organization  
Self-  
Monitoring

Consider the EF skills required by a student writing an essay...



Plan (topic, points, conclusion)



Initiate (start research)



Monitor (time, progress)



Maintain arousal



Shift





# Other analogies...



Air-traffic controller



Conductor



# EF and ADHD

- »» Where does executive functioning come from?



# Where DO EF Skills Come From?

- ▶ Highly genetic – 99% heritability
- ▶ Develop slowly, over time, through our early-to-mid twenties
- ▶ Directly related to the structure and functioning of specific parts of the brain, including specific pathways, networks, neurotransmitters, etc.



**FRONTAL LOBE:**

Self-regulation, attention, working memory, self-monitoring, inhibition, planning...

**LIMBIC SYSTEM:**

Emotions, motivation, reactivity (e.g. fight/flight)...

**PARIETAL LOBE:**

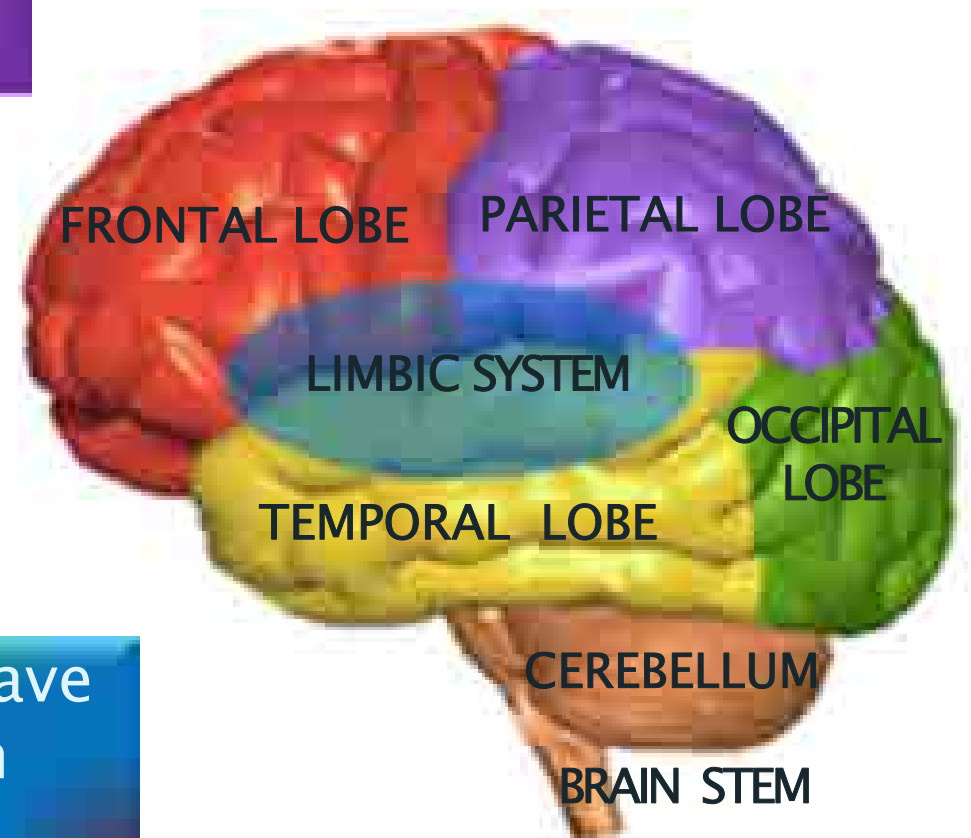
Attention

**BRAIN STEM:**

Arousal, alertness



These parts of the brain have  
all been associated with  
ADHD!



# EF and ADHD

»» How is EF related to ADHD?

# EF and ADHD:

How are they related?

- ▶ Both associated with a number of specific brain structures, neuropathways, etc.
- ▶ Many of these structures develop more slowly in people with ADHD
  - Not coincidentally, development of EF skills is also delayed
- ▶ Each ADHD symptom is related to one or more executive functions!



# HI Symptoms and EF

1. Fidgets with or taps hands or squirms in seat
2. Leaves seat in situations when remaining seated is expected
3. Runs about or climbs in situations where it is inappropriate feeling restless
4. Unable to play or engage in leisure activities quietly
5. "On the go" acting as if "driven by a motor"
6. Talks excessively
7. Blurts out answers before questions have been completed
8. Has difficulty awaiting turn (e.g., while waiting in line)
9. Interrupts or intrudes on others

*Regulation of...*



*Motor  
Activity*



*Speech*



*(Other)  
Impulses*

# IA Symptoms and EF:



## EF and ADHD...

- ▶ Like ADHD itself, EF deficits will likely be life-long
  - Long-term scaffolding is critical for children and adolescents with ADHD
  - With support, practice, and lots of strategies in place, people can be highly successful and independent, as adults
    - Some adults will continue to need support



Please use extreme caution if you find yourself thinking: “but they’re going to have to learn...sooner or later.”



# Vicious Cycle

## Problem Area of EF:

- Inhibitory control
- Emotional regulation
- Shifting
- Working Memory

## Possible Outcomes:

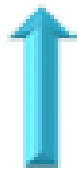
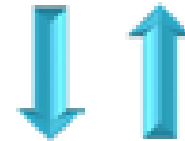
- Behavioral dysregulation
- Emotional dysregulation
- Rigidity; “stubbornness”
- Problems following rules, routines independently

## Long-Term Outcomes:

- Anxiety
- Depression
- Anger
- Poor relationships

## Environmental Responses:

- Punishment
- Punishment and coercion
- Failure
- Punishment and constant reminders (aka nagging)





# EF and ADHD

»» A closer look at specific EF skills

# A Closer Look at EF Skills

We will look at each EF skill, and consider:



What the skill is



What deficits in the skill might look like



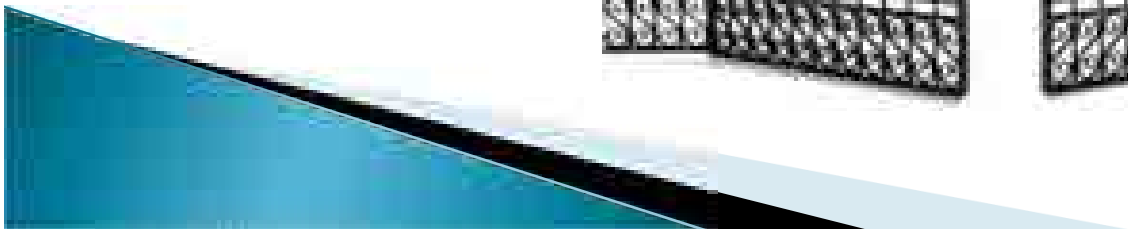
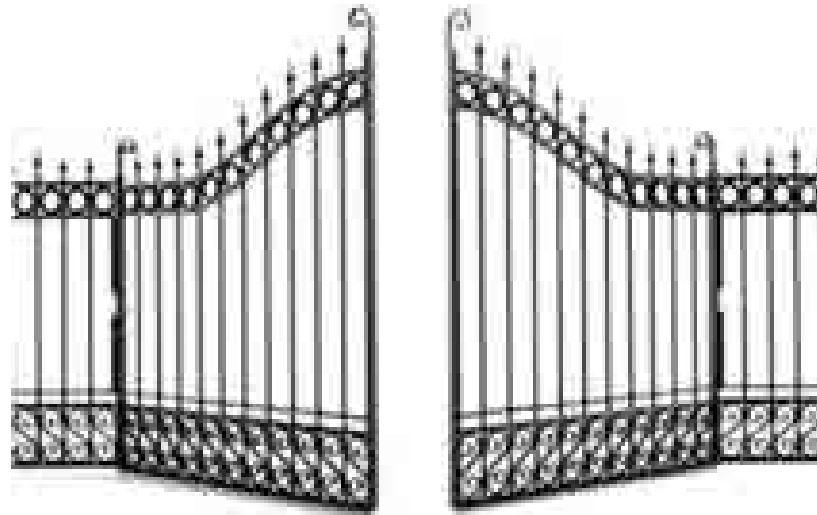
Strategies to support deficits in that skill



# A Closer Look at EF Skills

## I. SELF-REGULATION

- Mental functions required to regulation actions, emotions, and drive
- Gateway EF skills
  - Without these skills, difficult or impossible to access other EF skills.



## A Closer Look at EF Skills

### I. Self-Regulation

## Inhibition

### ▶ What is it?

- Ability to *not* act on impulse
  - Ability to think before acting
  - Ability to resist a conscious (i.e. recognized) impulse
- Test
- Essentially, inhibition is like having good brakes on your car!
  - Allow you to stop or slow down, as needed



## A Closer Look at EF Skills

### I. Self-Regulation

## Inhibition...

- ▶ What do problems look like?
  - Think: car with malfunctioning brakes!
    - No matter how hard you slam on them, you can't stop in time
  - Inconsistent control over actions
  - Acting without awareness/conscious intent
  - Saying and doing the wrong thing at the wrong time
  - Difficulty resisting impulses; associated with compulsions
  - Difficulty following rules and social norms
  - Difficulty adapting behaviour to context
  - Often seen as annoying, inconsiderate, unempathetic, out-of-control, attention-seeking...



## A Closer Look at EF Skills

### I. Self-Regulation

## Inhibition...

### ▶ What helps?

- Very challenging to address
- Imagine what would help if your brakes weren't working
- Predict and prevent (collaboratively)
- Use priming: review context-specific expectations immediately prior to entering specific situations (e.g. recess)
- Reduce stressors
- Teach strategies for addressing problems that arise from impulsive actions
- Over-practice rules, routines, strategies
  - Remember that many skills are non-transferrable
- Do not punish impulsive actions; increase supports



## A Closer Look at EF Skills

### I. Self-Regulation

## Emotion Regulation

- ▶ What is it?
  - Ability to influence the intensity of emotions
  - Prevent limbic system from hijacking EF processes
    - [Flip Your Lid](#) by Dan Siegel
- ▶ What might problems look like?
  - Quick, strong emotional reactions
  - Difficulty using effective strategies to manage emotions
  - Poor response to attempts to help (esp. logic)
  - May escalate in response to attempts to control them
  - Difficulty coping with environmental demands (e.g. transitions, requests, frustrations, challenges)
  - Tendency to go into “freeze, flight, or fight” mode
  - Often viewed as: sensitive, dramatic, aggressive, immature, manipulative, moody, spoiled, etc.



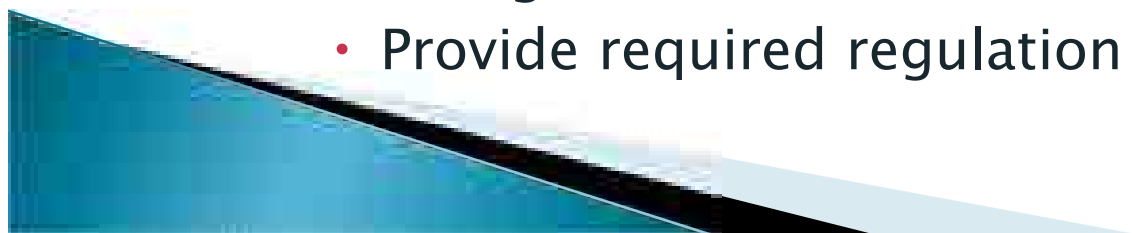
## A Closer Look at EF Skills

### I. Self-Regulation

## Emotion Regulation...

### ▶ What helps?

- Work with the person to identify situations that are most likely to trigger intense emotions, and generate potential ways to cope with or avoid those triggers (collaboratively)
- Help them practice strategies in 3 key areas:
  1. Self-care
  2. Distress tolerance (e.g. self-soothing)
  3. Effective communication/relationships
- Provide co-regulation
  - Recognize stress
  - Provide required regulation support





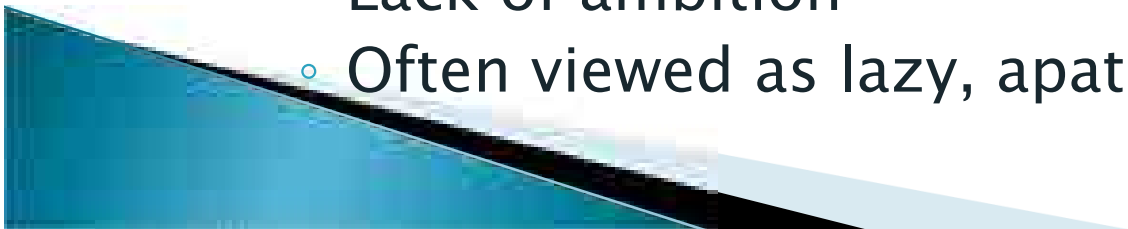
## A Closer Look at EF Skills

### I. Self-Regulation



## Motivation

- ▶ What is it?
  - Our sense of drive
  - Strongly mediated by reward pathways and neurotransmitters; can only manipulate for so long
- ▶ What do problems look like?
  - Difficulty getting started and maintaining effort
  - Difficulty attempting challenges
  - Reduced sense of reward when goals are met
  - Easily side-tracked by short-term desires
  - Lack of ambition
  - Often viewed as lazy, apathetic, unconcerned, etc.



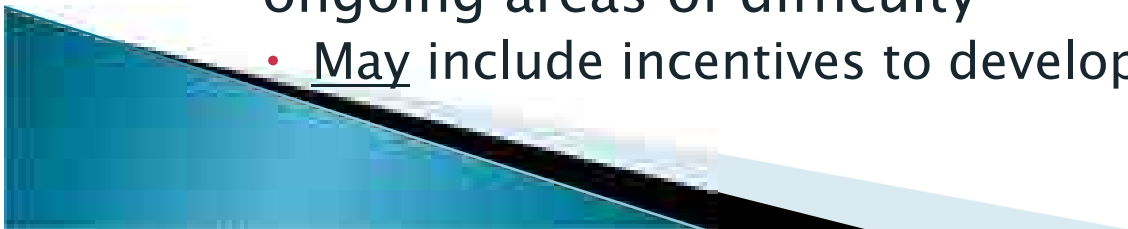
# A Closer Look at EF Skills

## I. Self-Regulation

### Motivation...

#### ▶ What helps?

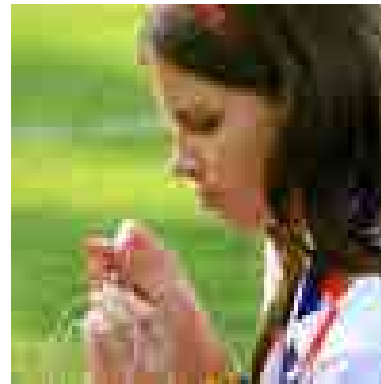
- Make use of areas of interest\*
- Make things into games, wherever possible
- Alter the environment to get dopamine pumping
  - Motivating music
  - Frequent breaks, especially for exercise (also needs to be fun)
  - Build in physical releases (e.g. exercise bike–desk)
- Alter environment to reduce other stressors
  - Think of the 5 senses (unpleasant sounds, sights, smells, etc.)
- Build self-awareness and goal-focussed thinking:
  - Have person rate stress (i) thinking about task; (ii) doing task; (iii) after task is complete
- Make use of collaborative problem-solving to address ongoing areas of difficulty
  - May include incentives to develop habits



# A Closer Look at EF Skills

## II. COGNITIVE SKILLS

- Mental functions required for thinking, learning, remembering, reasoning, etc.

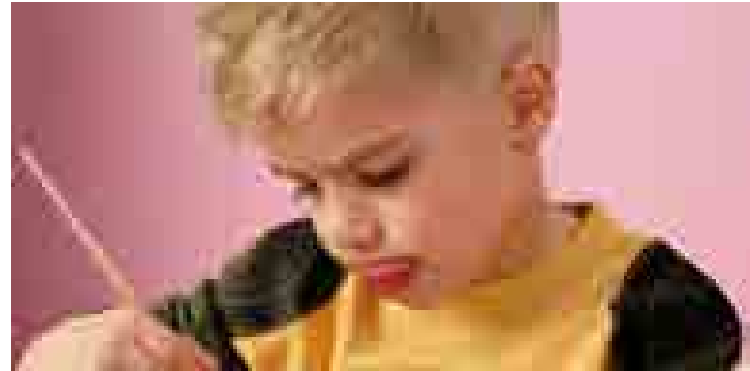


## A Closer Look at EF Skills

### II. Cognitive Skills...

# Attention

- ▶ What is it?
  - Different types
    - Selective: focussing on something, to exclusion of other things
    - Sustained: maintaining selective attention over time
    - Divided: focussing on more than one thing (e.g. listening and taking notes)
    - Alternating: will be covered separately, as shifting
  - Gateway to learning
- ▶ Test your attention skills:
  - Test



## A Closer Look at EF Skills

### II. Cognitive Skills...

## Attention ...

- ▶ What do problems look like?
  - Easily distracted by: irrelevant stimuli , irrelevant details, thoughts, sensations, emotions...almost anything
  - Difficulty focussing on unengaging tasks\*
  - Increased effort leads to decreased focus
  - Difficulty maintaining focus over time
  - Miss important details; can interfere with understanding
  - Frequent oversight errors
  - May miss non-verbal cues
  - May forget important rules/customs
  - May be slow to learn new concepts
  - May frequently lose or misplace things
  - May appear unmotivated, unfocussed, inconsiderate, careless

❖ Attention task



## A Closer Look at EF Skills

### II. Cognitive Skills...



## Attention...

### ▶ What helps?

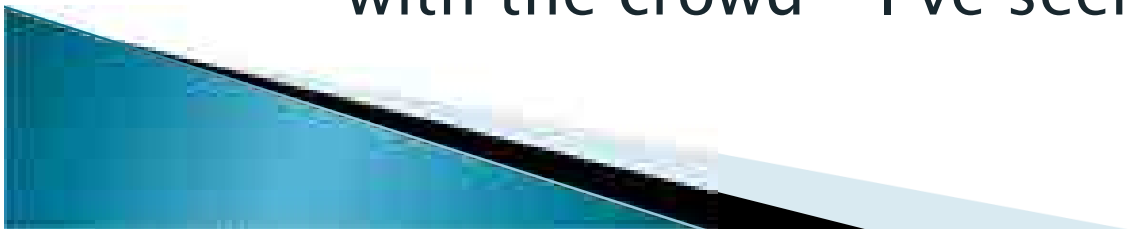
- Post clear, visible reminders of expectations, strategies, steps, etc.
- Make sure person is attending to you when you speak
  - Learn to recognize the “blank stare”
  - Ask them to tell you what you said in their own words
  - Check on them to make sure they are following instructions
- Foster independence
  - E.g. have person choose an app for reminders
  - Provide checklists for transitions and routines
- Manage your frustration when problems re-occur

## A Closer Look at EF Skills

### II. Cognitive Skills...

## Shifting

- ▶ What is it?
  - Ability to shift focus or change course of action
  - Allows us to adapt, be flexible, multi-task
- ▶ Verbal set-shifting task:
  - Starting with A-1, recite letters and numbers sequentially, alternating between letters and numbers
  - But...when I say “backwards,” keep going, but go in reverse order (e.g. B-2 → A-1), and when I say “forwards,” return to doing it in forward sequence
  - Also, try not to cheat by just going along with the crowd – I’ve seen that backfire!



## A Closer Look at EF Skills

### II. Cognitive Skills...

#### Shifting

- ▶ What do problems look like?
  - Difficulty tolerating change and adapting to new routines
  - Difficulty with transitions
  - Resistant to trying new things
  - Gets stuck on details; may be obsessive
  - Tendency to hyper-focus on engaging tasks; difficulty stopping
  - Tendency towards “black and white” or literal thinking
  - Argumentative and/or tenacious (for better or worse)
  - Difficulty coming up with alternatives
  - Difficulty managing multiple demands
  - Distressed when expectations aren’t met
  - Difficulty seeing others’ perspectives
  - May appear stubborn, controlling, manipulative, cheeky...





## A Closer Look at EF Skills

### II. Cognitive Skills...

#### Shifting...

##### ▶ What helps?

- Warn person of changes to routine
  - Not too far in advance, but with enough warning to adapt
- Use visual schedules, discuss week/day in advance
- Use visual timers and provide ample warning before transitions (e.g. 10 more minutes; 5 more minutes...)
- Teach strategies to improve shifting and flexibility
  - Pressing pause
  - Do-the-opposite
  - Brainstorm alternatives
- Play games that require frequent shifting
- Start small! Increase challenge slowly; track & celebrate success



## A Closer Look at EF Skills

### II. Cognitive Skills...

## Working Memory

- ▶ What is it?
  - Ability to hold and manipulate multiple pieces of information in short-term memory
  - Critical to learning, problem-solving, social skills & decision-making
- ▶ Working memory task:

Now say the numbers in reverse order (i.e. backwards)



## A Closer Look at EF Skills

### II. Cognitive Skills...

#### Working Memory...

##### ▶ What do problems look like?

- Difficulty following multiple directions
- Difficulty performing tasks with multiple steps
  - E.g. writing; multi-step math problems; tidying
  - Frequently gets lost/confused
  - Performs tasks more slowly, because constantly having to stop and figure out where they are in a problem/tasks
- Can't hold multiple ideas in mind simultaneously
  - Their own thoughts/feelings, and those of someone else
  - Multiple possible solutions to a problem
- Difficulty prioritizing, sequencing and organizing ideas
- Difficulty comparing and contrasting ideas
- Forgets important details (vs. never having noticed them)



## A Closer Look at EF Skills

### II. Cognitive Skills...

## Working Memory...

- ▶ What helps?
  - Reduce working memory load by using checklists (audio or pictorial for younger kids)
  - Watch for signs of WM overload
    - Increased hyperactivity, restlessness, frustration
  - Decrease demands
    - Base expectations on developmental age and actual outcomes, rather than chronological age
    - Scaffold independence for component skills!
  - Work with person to identify parts of tasks that are most challenging and identify helpful strategies



# A Closer Look at EF Skills

## III. Meta-Cognitive Skills

- Essentially thinking about thinking, knowing about knowing, and being aware of awareness
- Cognitive skills that service an overall plan (vs. each, individual step)

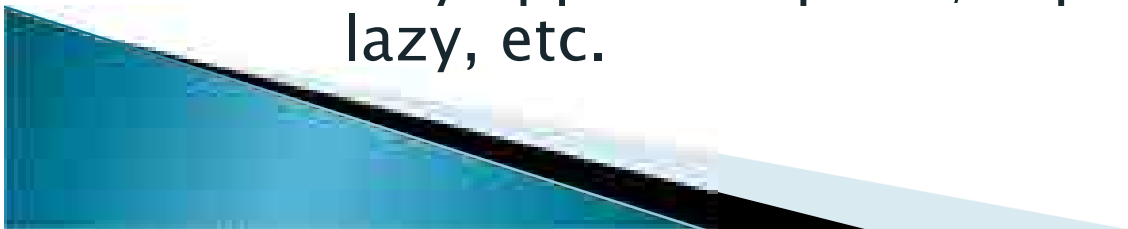


## A Closer Look at EF Skills

### III. Meta-cognitive skills...

## Planning

- ▶ What is it?
  - Figuring out the steps you need to take to reach a goal (e.g. complete a task)
- ▶ What do problems look like?
  - Difficulty deciding on/prioritizing goals
  - Difficulty breaking tasks down into steps
  - Difficulty knowing what to do, and in what order
  - Difficulty getting started (procrastination)
  - Difficulty getting things done on time
  - Frequently asking for help
  - Needing frequent prompting
  - May appear helpless/dependent, irresponsible, lazy, etc.



## A Closer Look at EF Skills

### III. Meta-cognitive skills...



## Planning...

### ▶ What helps?

- Teach/scaffold component skills
  - Breaking task into small parts; sequencing steps; scheduling steps
  - Start by doing all steps; slowly reduce support one step at a time
- Provide tools
  - Checklists, reminders (e.g. phone alarms)
- Do not penalize for poor planning
  - Engage in collaborative problem-solving, if problem is reoccurring
- Teach/scaffold time management
  - Predicting time required; creating and managing schedules; remembering to use a schedule



## A Closer Look at EF Skills

### III. Meta-cognitive skills...

## Organization

- ▶ What is it?
  - Two types:
    - Organizing materials (e.g. knowing where to put specific things)
    - Organizing thoughts/ideas (e.g. having a running list of things you need to bring home after school)
- ▶ What do problems look like?
  - Don't know where to put things or find them
  - Misplace or loses things
  - Messy personal space (including binder, locker, bedroom, etc.)
  - Thoughts are often jumbled
  - Frequently confused and overwhelmed
  - Difficulty organizing written work
  - Class notes are difficult to follow
  - May appear irresponsible, dependent, immature, lazy, unmotivated





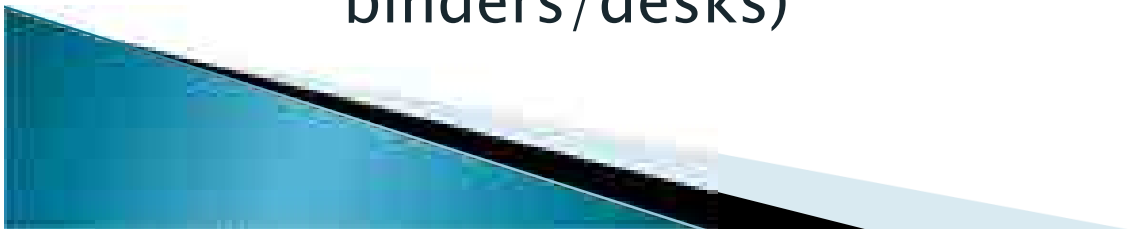
## A Closer Look at EF Skills

### III. Meta-cognitive skills...

## Organization...

### ▶ What helps?

- Provide organizational tools (e.g. boxes, folders, bins, labels)
- Help person create a system that works for them; experiment with different approaches
- Use checklists to help person know where to put things
- Label drawers, shelves, bins
- Use colour to help aid organization
- Teach organizational strategies for note-taking
- Provide direct support for tasks that require organization (e.g. tidying room, cleaning out binders/desks)



## A Closer Look at EF Skills

### III. Meta-cognitive skills...

#### Self-Monitoring

- ▶ What is it?
  - Essentially: self-directed attention
    - Awareness of where you are in relation to a goal
    - Awareness of impact of actions on others
- ▶ What do problems look like?
  - May not realize when they're upsetting people
  - Problems adapting to demands of specific situations
  - Poor awareness of accuracy, speed, progress
  - Tendency to over or under-estimate understanding, ability to remember things later, etc.
  - May appear disorganized, inconsiderate, unempathetic, careless, slow, etc.



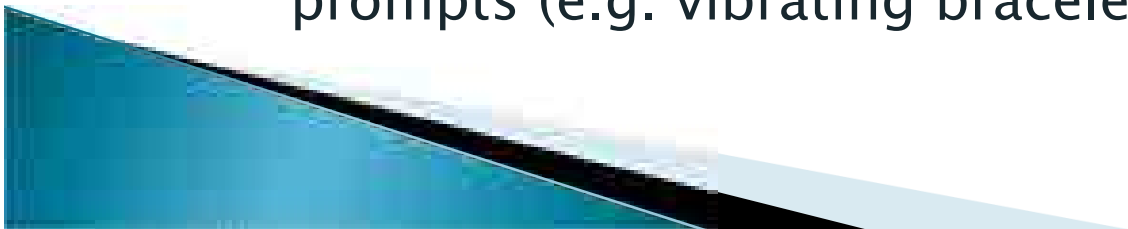
## A Closer Look at EF Skills

### III. Meta-cognitive skills...

## Self-Monitoring...

### ▶ What helps?

- Gentle communication of information they are unaware of (e.g. after trusting relationship has been established and person doesn't feel defensive)
- Direct support
  - Daily self-reflections; first by person themselves, and then reviewed with support of caring adult
  - Reminders of target skills prior to entering specific situations (e.g. remember to match the volume of your voice to that of those around you)
  - Tracking/recording with support (e.g. graphing)
- Tools such as visual timers, checklists, non-verbal prompts (e.g. vibrating bracelets, touch on shoulder)



# EF Problems: Quiz

## Observed Behaviours

Reckless, aggressive behaviour  
Frequently annoying others  
Frequently breaking rules

Stubborn/inflexible  
Black-and-white thinker  
Obsessive

Day-dreamy  
Slow to learn  
Clumsy

Backpack, locker and desk messy  
Always late  
Doesn't hand in homework  
Forgets important dates, forms, etc.

## EF Deficits Areas

Emotion regulation  
Inhibition  
Attention/self-monitoring

Shifting  
Working memory  
Emotion regulation

Attention  
Self-monitoring

Organization  
Planning  
Attention  
Self-monitoring



# EF Problems: Quiz

Observed Behaviours	EF Deficits Areas
Lies frequently Doesn't do as asked Doesn't stop preferred activities when necessary	Inhibition Emotion regulation Shifting
Frequent arguments with peers Bossy Acts without considering others	Attention Self-monitoring Working memory Shifting
Over-reactive Sensitive Moody	Emotion regulation Shifting Inhibition
Avoids challenges Rarely finishes assignments Procrastinates	Emotion regulation Motivation (i.e. drive) Attention Planning/Organization

# Other Resources

- Stuart Shanker's books (Self-Reg and Calm, Alert and Learning)
- Demos to illustrate experiences of children with various learning-related difficulties, including attention and organization: <http://www.understood.org/en/tools/through-your-childs-eyes>
- Tips on addressing EF in secondary classrooms (all areas covered):  
[http://www.ecragroup.com/sites/default/files/images/White%20paper%20-%20Addressing%20executive%20education%20at%20the%20Secondary%20Level%2008.11\\_1.pdf](http://www.ecragroup.com/sites/default/files/images/White%20paper%20-%20Addressing%20executive%20education%20at%20the%20Secondary%20Level%2008.11_1.pdf)
- Lost at School website - tons of resources on helping children with skills deficits that are causing problems. Although it is geared towards kids whose deficits are impacting behaviour, it is a collaborative problem-solving strategy, therefore it will work well for any struggling child, including those with underlying EF problems - <http://www.livesinthebalance.org/>

