Thinking Differently
Executive Functioning and Learning Styles of Students with Autism Spectrum Disorders

Take a minute…

• How did you get here today on time?
• How did you know how to get here?
• What would have happened if North Avenue was closed due to construction?
• Your family wants to eat dinner at 7 and you are the cook. How do you get the food on the table in time?
• Someone cuts you off in a traffic lane. What keeps you from yelling “#*!*%#”?
• You walk into a funeral service and immediately begin speaking in a whisper? Why?
• You accidently bump into someone and apologize. Why?

Lisa A Perkins, Westport Public Schools

Executive what?

“An umbrella term that captures a set of brain functions that help students regulate their behavior and carry out goal-directed behavior.” — Unstuck and On Target

“What to do” skills: starting tasks, paying attention, persevering, and remembering.

“How to do” skills: planning, organizing, shifting strategies, and managing time. They also help people manage their perceptions, thoughts, actions, and social interactions.

“The brain’s CEO, or the orchestra conductor of all of our cognitive skills” — Executive Skills in Children and Adolescents

Executive Functioning
Inhibition and Emotion Regulation

- Response Inhibition (Self-Control)
  - The ability to stop or delay an action rather than display impulsive behavior
  - The ability to think before one acts
- Regulation of Affect
  - The ability to manage one’s feelings effectively for decision-making, task completion, to achieve goals, or to control and direct behavior

Inhibition and Emotion Regulation
- Starts by demonstrating the ability to delay a preferred item or object
- Requires child to inhibit one response and produce an alternative response
  - Knock Tap Task
- Difficulty may result in inability to control thoughts and emotions → maladaptive behavior
- Especially challenging when rules are arbitrary AND must be verbally encoded

Knock Tap Task

HOT
(involves doing)
- Inhibition
- Emotion Regulation
- Set Shifting
- Flexibility

COOL
(involves thinking)
- Working Memory
- Fluency
- Planning
- Organization
Shifting and Flexibility

• The ability to be adaptable, to improvise, and shift strategies upon a new demand.
• The ability to revise plans in the face of obstacles, setbacks, new information, or mistakes
• Involves adaptability to changing conditions

Shifting and Flexibility

• Becomes necessary when solving problems and understanding other’s POV
• Difficulties may contribute to perseverative behavior and trouble with change
  – Sheldon’s sitting spot from Big Bang Theory
• Children with ASD are highly likely to use one approach to a situation or problem

Sheldon’s Sitting Spot
HOT (involves doing)
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Working Memory

- The ability to follow instructions involving multiple steps, and in the right order.
- Allows us to hold information in mind while performing and completing a complex task
- The ability to draw on past experiences in order to complete a task at hand.

Diamon, 2010

The Process of Working Memory

http://www.learnnc.org/lp/editions/every-learner-2010
Illustration by Sarah Riazati & Mike Bamford
Working Memory

- Is useful when confronted with a problem, similar to one you have solved before.
- Research on working memory impairments in children with autism is “complex and inconsistent”
  - May depend on the complexity of the materials (Best & Miller, 2010)
  - Deficits may be due to difficulty processing language (Eigsti, 2011)
  - Trouble paying attention may contribute to poor working memory (http://www.learnnc.org/editions/edweek/professional-learning/4600)

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Fluency

- The ability to use skills effortlessly, automatically, and “without thinking”.
- Must be able to demonstrate the following:
  - Retention
  - Application
  - Stability
  - Endurance
- Allows individual to generate new and creative responses

Fabrizio, 2003
How Fluent Are You?

1. ___ Sharpen a pencil.
2. ___ Pronounce the French word *manger*.
3. ___ Select an appropriate product for a customer.
4. ___ Respond to a complaint.
5. ___ Place the gym equipment in the supply closet.
6. ___ Erase the board.

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Fluency

- Is necessary for generalization of learned skills
- Critical outcome of instruction for learners with autism
- Fluency problems may include
  - Effortful responses
  - Long durations of responses
  - Long latencies in responding
- Deficits can lead to missed opportunities to participate in instruction/social exchanges

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HOT (involves doing)
Inhibition
Emotion Regulation
Set Shifting
Flexibility

COOL (involves thinking)
Working Memory
Fluency
Planning
Organization

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Planning and Organization

• Planning
  – The key thinking skill in allowing a student to set strategies, prioritize actions, and accomplish goals in an efficient manner
  – Involves the ability to focus on what is most important

• Organization
  – The ability to arrange or place things according to a system (create order out of disorder)

Planning and Organization

• Becomes increasingly important as a student enters MS/HS
• Children with autism tend to be disorganized regarding school materials, homework, and personal articles and space at home
• Trouble seeing the forest for the trees
Central Coherence

Local

• Preference for processing detailed information
• Poor at seeing the big picture
• Can extract the gist from a long speech (if required)
• May be overrepresented by individuals with ASD's
• May explain areas of talent, super-acute perception, and lack of generalization

Global

• Gestalt processing is a strength
• May be terrible at proof reading
• Can turn attention towards details (when prompted)

(Happe & Frith, 2006)

Uta Frith: Central Coherence

Gestalt Processing

http://aaronkonopka.wordpress.com/2009/03/11/the-gestalt-rule/
Information Processing

• Autism – a disorder of complex information processing?
  – Intact or superior performance on tasks that require simple information processing
  – Difficulty with tasks that require the processing of more complex information
    • Impaired due to difficulty or time constraint
    • Poor organizational strategies

Williams et al (2006)

Minshew & Goldstein (1998)

Information Processing

• Memory
  – Intact abilities: tests of simple associative processes
  – Impaired abilities: delayed recall measures

• Language
  – Intact abilities: word fluency, reading decoding, spelling
  – Impaired abilities: comprehension of idioms, metaphors, and ambiguous sentences

Minshew & Goldstein (1998)
Impact of Executive Functioning, Central Coherence, and Complex Cognitive Processing

- Learning styles or preferences may differ from typically-developing students
- Includes strengths as well as challenges or areas of difficulty
- Affects academic, social, adaptive areas of functioning
- Variability among students with ASD just as there is in the general population

Learning Preferences

Non-Visual | Visual

Visual Learning Style Strengths

- Visual discrimination
  - Recognizes classmate by glasses he wears
- Visual spatial processing
  - Creates highly detailed, accurate "flour & salt" relief map for Social Studies project
- Capacity to focus or sustain attention for static visual information
  - Follows a task organizer to get dressed in the morning
Visual Learning Style Strengths

- Ability to immediately recall information of a rote nature
- Recall of discrete information vs. more complex or conceptual nature

Can recite names of all U.S. Presidents in order
Quickly answers a social studies question about dates of important events

Visual Learning Style Strengths

- Associative learning (e.g. stimulus-response learning, paired learning)
- Procedural learning (calculations, reproduction of music, and drawings)

Understands you must stop at red light and go at green light
Quickly and accurately completes math worksheet

Visual Learning Style Challenges

Expressive and receptive language
Asking teacher for assistance with an assignment
Visual Learning Style Challenges

- Disengaging and/or shifting attention (between auditory to visual)
- Making rapid changes to task expectations
- Coping with new information due to cognitive inflexibility, incomplete understanding of implicit concepts, or problems in strategy generation

Has difficulty sustaining back and forth of conversation
Becomes upset during game in P.E. class when ball is thrown at him/her
Failed to turn in homework at beginning of school term because new teacher had a different procedure for homework collection

Rarely is able to relate to parents what happened during the school day
Can’t identify theme of a social studies passage moments after reading material
Frequently forgets to pack needed materials for homework or class

Variations in Learning Styles

- What about students who don’t seem to be visual learners?
- Learners with strong verbal abilities…how are their strengths and challenges different?
Non-Visual Learning Style - Strengths

- Expressive and receptive language
- Lexical knowledge and vocabulary; verbal expressiveness
- Verbal problem-solving skills
- Verbal memory
- Ability to shift conceptual set when aided by verbal modality

- Talkative, attempts to verbally connect with peers
- Has large vocabulary for expressing him/herself
- Is good at verbal guessing games (e.g. 20 Questions)
- Initiates discussion in class of fact-gathering/sharing nature
- Can change focus when aided by written cues

Non-Visual Learning Style - Challenges

- Visual spatial processing, particularly more complex visual information (e.g. nonverbal social cues)
- Visual working memory
- Visual motor memory

- Monopolizes class discussions with dialogue or questions, unaware that others (including teacher) are reacting negatively to this behavior
- Despite having homework written on board, student often leaves without essential materials
- Still has difficulty tying shoes at age 12
- Spotty use of Agenda to log assignments
- Struggles to think of what behavior “paying attention” looks like (where are my eyes, hands, feet, etc)
- Can’t seem to use his/her words to reason through social situations
Strategies

Three Ways to Address Executive Weaknesses

• Modify the environment
  - Adopt a “cognitive thinking” lifestyle
• Teach and build cognitive processes
  - Connect challenges to appropriate cognitive skill domain
• Motivational strategies

Building/Classroom/Home Interventions

• Simplify/clarify and pair with visuals
• Emphasize method/steps
• Point out tools used for organization
  – Strategy a Week Board (Bridges4kids.org)
• Priming
• Post a daily schedule
  – Oops Board (sharonscreativecorner.com)
• Organized, consistent environment
STRATEGY OF THE WEEK BOARD

+ Teach one EF strategy per week
+ Post that strategy on the board
+ Encourage students to post their favorite or most used strategy
+ Turn it into a game or classroom motivator
+ Use as discussion springboard

Oops Board

- Place board in close proximity to target student
- Explain purpose of board
- Inform student of change, why changed happened, and consequences of change
- Place notice on board
- Reinforce student for responding appropriately to change in schedule

Individual Interventions

Creating a Cognitive GPS

[http://teacherweb.stcharles.k12.mo.us/sped/autism_files/exfunctaut.pdf]
Flexibility

Open-Ended Tasks and Flexibility

- Any task with multiple correct answers, different ways to solve it, no clear indication of completion such as:
  - Using spelling words in a sentence
  - Showing your work in a complex word problem
  - Most social dilemmas
  - Answering “why” questions
  - Cleaning tasks
  - Written assignments of any type

Flexibility Strategies

- Make the task more “closed ended”
  - Talk student through task and “think aloud”
  - Student writes task down in own words and underline key words
  - Show/discuss an example of what “completion” looks like
  - Give student choices to choose from or limit the choices given initially
  - Provide templates or task analysis of the steps to complete the task
  - Provide a scoring rubric for successful completion

Adapted from Smart But Scattered

Smart But Scattered
Edward and Guare

Unstuck & On Target
Lynn Cannon, Lauren Kenworthy, Kate Alexander,
Monica Werner and Laura Anthony
Rubric for Self-Monitoring

Task Analysis - Essay

Title
1. First Paragraph
   - Introduction – Restate title in own words
   - Capture reader’s interest
   - Summary statement of topic
2. Second Paragraph (additional paragraphs as needed)
   - Introduce
   - Support
3. Conclusion
   - Summarize main point
   - Restate topic
   - Revisit introduction or tie ideas together

Flexibility Requires Coping

• The ability to make alternate choices is not enough – must be able to live with it
  - Acknowledge and identify feelings
  - Develop and understand coping strategies to match individual needs
  - Practice strategies without stressful situation
  - Prompt strategies in stressful situation

Unstuck and On Target: An Executive Function Curriculum to Improve Flexibility for Children with ASD
Coping Strategies

- Cognitive Behavior Modification
- Relaxation Techniques

Choice Boards
When you start to feel FRUSTRATED:

Relaxation Wheel

- anti-septic
- home base
- bounce
- ask for help

Self-calming Techniques


Koning, Magill-Evans, Volden, Dick

Texas Autism Resource Guide For Effective Teaching
Goals

- What is a goal?
  - The purpose toward which an effort is directed
  - Something you want or need
  - Something that requires that you take action
  - Setting a goal is not the same as achieving a goal

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**I can write my name!**

- B
- l
- i
- a
- n
- c
- y

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**I can count by 10s.**

- Practice with mom
- Bounce a ball
- Whisper
- Sing
- Roll again!
- Draw a picture
- Clap
- Yell
- Write practice with mom
- Mirror

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**Go!**
Goal-Plan-Do-Check
Unstuck & On Target
Goal/Plan/Do/Check
1. **GOAL** - What do I want/need to do?

2. **Plan A** – How am I going to do it?

3. **Plan B** – How am I going to do it if "Plan A" doesn’t work?

4. **Do** – When am I going to start my plan?

5. **Check** – How did my plan work? (circle one)
   1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10

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**Problem Solving**

- Similar to process to achieve goals
  - Understand problem or task
  - Make a plan to solve the problem
  - Act on the problem
  - Look back and check results to see if you got the desired outcome
- Use visual organizers to teach and practice process

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**Daily Homework Planner**

<table>
<thead>
<tr>
<th>Assignment</th>
<th>I have a plan?</th>
<th>I need help?</th>
<th>Who will help?</th>
<th>How long will it take?</th>
<th>When will I start?</th>
<th>Remind in</th>
<th>Reminder has been turned in</th>
<th>Assignment is done</th>
</tr>
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<tbody>
<tr>
<td>English</td>
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Adapted from nasponline.org
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Visual by Pat Mirenda, Ph.D., January, 2008

Contingency Map
Classwork Problem

Caution about Problem Solving Visuals

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Classwork Problem

Caution about Problem Solving Visuals
Organization

- Environment – materials, rules, routines
- Time
- Working Memory

Organization

- Environment -
  - Keep it simple
    - Rules, routines, language
  - Use visuals
    - Labels, boundaries, expectations, cues
- Establish a weekly organization time
- Use structured work systems
  - Autism Internet Modules
  - Autisminternetmodules.org

Structured Work Systems

WORK ROUTINELY FLOWS IN A LEFT TO RIGHT DIRECTION
Try to stay with after work is finished

Tasks to be completed

Student

Finished Basket

Teacher

Shoeboxtasks.com
Organization

Time

- Provide a visual schedule with prompts
- Teach how to develop and use checklists, “to do” lists and prioritizing
- Teach estimating time to complete a task
- Break long assignments into chunks with time frames for each chunk
- Write due date on top of each assignment
**Working Memory**

Reduce working memory load
- Break information into small chunks
- Write instruction in different color
- Repeat crucial information/instructions
- Be brief with verbal/written directions
- Have student repeat direction back
- Have student read directions before and after doing an assignment

Lake, List and Ungar (2018)
Cooper-Kahn, J. and Dietzel, J.
Build Self-Management Skills

- Activate background knowledge
- Discuss strategy to use
- Provide ample amounts of guided practice with fading support
- Chaining
- Cue to Know What to Do

Don’t Cue to Do – Cue to Know What to Do

- What do you want it to look like?
- How are you going to decide what to do first?
- How did you know how to do that?
- Have you done anything like this before?

Practice

<table>
<thead>
<tr>
<th>Situation</th>
<th>Instead of...</th>
<th>Try...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student wants to watch American Idol at 8:00pm but never does homework.</td>
<td>If you don't get your homework done, you can't watch!</td>
<td>At 8:00, if everything goes your way, how do you see yourself?</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>Situation</th>
<th>Instead of...</th>
<th>Try...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student needs to get off the computer and keeps saying “Just one more level, just one more level!”</td>
<td>There is always one more level! You have to get off now! I am tired of telling you, I need the computer! You’ve been on too long.</td>
<td>What does a reasonable stop plan look like? What will we both see on the screen? After dinner how do you see yourself?</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>Situation</th>
<th>Instead of...</th>
<th>Try...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child is going around downstairs and not brushing their teeth.</td>
<td>Go upstairs and brush your teeth. Rinse with mouthwash. Your friends will think your breath is horrible!</td>
<td>If you were on the timeline, what do you see yourself doing right now? What do you look like? Where are you? Match the picture.</td>
</tr>
</tbody>
</table>

http://www.ashpac.org/EF_lecture_parentshandouts.pdf
### Technology

**Cognitive Skill Development**

- Helps learners perform sub-skills automatically
- Supports different learning styles
- Supports development of process skills
- Learning from technology vs. learning with technology
  - Technology supports and scaffolds learning

*Jessica Trybus – New Media Institute*

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### Game-Based Learning

<table>
<thead>
<tr>
<th>Condition Testing</th>
<th>Results on Testing</th>
<th>Game-Based Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost-effective</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Low physical risk</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Standardized success allowing equal opportunities</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Highly engaging</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Learning pace aligned to match ideal content</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Immediate feedback in response to student actions</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Student can apply computer learning to real-world environment</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Learner is actively involved</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

*Game-Based Learning by Jessica Trybus*
APPS and Organization Tools

- Portable
- Facilitate communication opportunities
- Provide practice of skills
- Provide imagery
- Meet different learning styles and interests
- Entertain (reinforce, motivate)
- Enhance learning process
- Provide information management
Technology Resources
Handout Available
http://www.albany.edu/autism/handouts_pdps.php

“Education is not the filling of a pail, but the lighting of a fire”
William Butler Yeats

CARD Albany is now on Facebook
http://www.facebook.com/cardalbany

Required Coursework for Special Education Professionals now online – “Responding to the Needs of Students with ASD”
http://www.albany.edu/autism/NYSEDpage.shtml

Online Distance Learning Training
http://www.albany.edu/training.php

Questions?

Center for Autism and Related Disabilities
Phone: (518) 442-2574 or toll free 1+(866) 442-2574
Email: card@albany.edu
Website: http://www.albany.edu/autism