Evaluation and Treatment of Executive Functions after Brain Injury

CAROLINE GAMMILL, SLPD, CCC-SLP, CBIS

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Speaker Information

- Certified Brain Injury Specialist
- Assistant Program Director and Assistant Professor, Online Program – Faulkner University
- Writer for The Informed SLP
- Clinical experience in post-acute day-neuro rehab, acute care, inpatient rehab, SNF, home health, and private practice

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Relevant Disclosures

Financial:

- Received an honorarium and travel compensation
- Owner of Caroline Gammill, Neuro SLP, LLC

Non-financial:

- None

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Objectives

01
Summarize neurological bases of executive functions and dysfunction due to stroke or TBI.

02
Outline evidence-based treatment practices for executive dysfunction from both rehabilitative and compensatory approaches.

03
Design treatment plans/goals for case studies based on real patients with executive dysfunction using best practices.

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ASHA Scope of Practice (ASHA, 2007)

- Cognition
  - Attention
  - Memory
  - Sequencing
  - Problem solving
  - Executive functioning

(Tristani & Riquelme, 2015)

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Executive Functions

- Initiation
- Planning
- Sequencing
- Organization
- Regulation

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One of these things IS like the other

- Attention, memory, and executive functions
- Most functional activities involve multiple types of processing
- Completing tasks that engage the neurocircuitry for one process activates other processes
- Prefrontal cortex
  "Temporal organization, integration, formulation and execution of novel behavioral sequences…responsive to both environmental demands…and internal motivations and drive…they contribute to orderly purposive behavior." (Sohlberg & Mateer, 2001)

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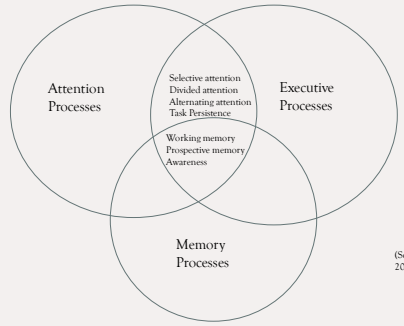

(Sohlberg & Mateer, 2001, Figure 8.3)

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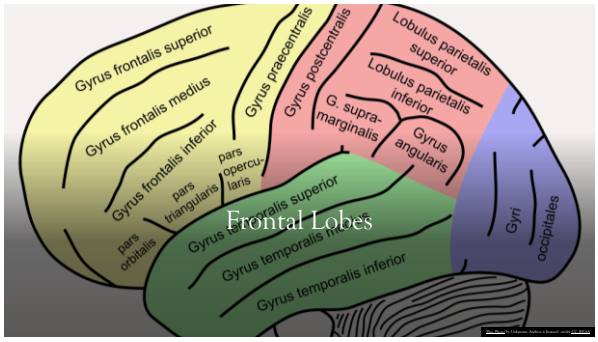

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Other structures

- Cerebellum
- Limbic system
- Prefrontal cortex
  Orbitofrontal
  Dorsolateral
  Ventral medial
- Subcortical structures
- Lobes
- (Hunter et al., 2012b)

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Executive Function Models

- Mode of supervisory system (Norman & Shallice, 1986)
- Clinical model (Mateer, 1999)
  Initiation and drive
  Response inhibition
  Task persistence
  Organization
  Generative thinking
  Awareness

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EF and Development

- Done by 25? (Hunter, Edidin, & Hinkle, 2012)

Infancy/ Toddlerhood	Early Childhood	Middle Childhood	Adolescence	Early Adulthood
Joint and sustained attention	Two-dimensional cognitive flexibility	Three-dimensional cognitive flexibility	Metacognitive engagement	Affective decision-making
Behavioral and affective regulation	Planning	Significant gains in organization and planning	Increased attentional control	Peak: strategy development
Inhibition	Affective decision-making	Inhibitory control fully developed by 10-12 years	Improved flexibility	Peak: working memory
Self-monitoring	Metacognition	Significant gains in processing speed	Improved strategic planning and problem-solving	Peak: goal setting
Working memory	Information processing	Significant gains in verbal fluency	Improved goal-setting	Peak: problem-solving efficiency
Problem-solving			Emotional regulation	

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Why do we care?

- School readiness and success
- Positive teacher-student relations
- Job success and maintenance
- Avoidance of crimes
- Physical health
- Mental health
- Social relations
- Quality of life
- Diamond, 2014

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"Nowhere is the importance of social, emotional, and physical health for cognitive health more evident than with EFs, and nowhere is the importance of social, emotional, and physical health for brain health more evident than with prefrontal cortex."

(Diamond, 2014)

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Stop and Reflect

- What ideas are squaring with you?
- What ideas are still circling in your head?
- What will you take with you to practice?

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EF and Development - Disruptions

- Attachment (Al-Yagon et al., 2017; Bernier et al., 2015)
- ADHD (el Wafa et al., 2020; Yáñez-Téllez et al., 2012; Rosello et al., 2020)
- Learning disabilities (el Wafa et al., 2020; Bishara & Kaplan, 2016))
  Dyslexia (Reiter et al., 2005)
  Developmental language disorder (Kapa & Mettler, 2021; Blom & Boerma, 2020)

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EF and Development - Disruptions

- SES (Micalizzi et al., 2019; Andrews et al., 2021; Lee et al., 2019)
- Household/neighborhood chaos (Micalizzi et al., 2019; Andrews et al., 2021; Roy, McCoy, & Raver, 2014; St. John & Tarullo, 2019)

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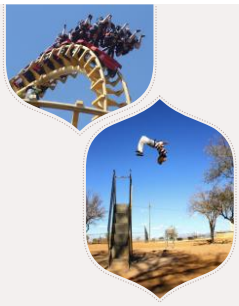

EF and Development

PRIMED FOR THRILLS (BERESIN, 2020)

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Executive Dysfunction (EdF)

- Lack of initiation
- Difficulty planning and organizing
- Poor time management
- Rigid thinking
- Behavior and personality changes
- Impulsivity
- Attention problems
- Poor judgment and decision-making
- Poor problem-solving
- Difficulty in social situations

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Executive Functions and Acquired Brain Injury

- EF predicts occupational functioning and social integration (Struchan et al., 2008); EF and social cognition affect perceptions of supervisors and work colleagues (Yeates et al., 2016)
- 40% of people with ABI return to work within 1-2 years (van Velzen et al., 2009)
  80% within 6 months for mTBI (Bloom et al., 2018)
- 5-year outcomes (Corrigan et al., 2014):
  33% dissatisfied with life
  57% with moderate-severe disability
  55% unemployed at 5 years
- 50% with severe TBI and 75% with moderate TBI function independently at home for 8 hours a day

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Executive Dysfunction (EdF) During Assessments

- Disorganized verbal responses
- Disinhibition
- Trial-and-error approach to problems-solving
- Difficulty with main idea
- Decreased processing speed
- Variable performance over time (attention)
- Difficulty sustaining effort
- No use of strategies
- Miss main idea
- Overwhelmed by complex stimuli
- Limited self-initiation
- Difficulty transitioning tasks
- Difficulty with task persistence
- Takes time to get the "hang" of a test

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Assessment Considerations

Task | Setting | Discrepancy in scores

Weakness vs. deficit | Whole-life functioning

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Consider

- Obsessive-compulsive disorder (Bannon et al., 2006)
  Hoarding disorder (Morein-Zamir et al., 2014)
- Post-traumatic stress disorder (Aupperle, 2012)
- Schizophrenia (Orellana,, & Slachevsky, 2013)
- Personality disorders (Garcia-Villamisar et al., 2017; Domingo et al., 2016)
- Oppositional defiant disorder/conduct disorder (Kenealy & Paltin, 2012)
- Mood and anxiety disorders (Edidin & Hunter, 2012)

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Consider

- Autism (*some* individuals; Geurts et al., 2014; Demetriou et al., 2018; Demetriou et al., 2019)
- Adverse childhood experiences (ACE; DePrince et al., 2009; MacIsaac et al., 2021)
  Nakazawa, 2016 – how ACEs physically change the brain
- Bilingualism? (Cox et al., 2016; Bialystok, 2015)

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Assessments

- Bilinguistics Executive Function Checklist
- Wisconsin Card Sorting Test (Heaton, 1993)
- Consonant Trigrams Test (Kaplan)
- Verbal and nonverbal fluency measures
  Controlled Oral Word Association Test (COWAT; Lezak et a., 2004) Summerall et al., 1997)
  Design Fluency (Jones-Gotman & Milner, 1977)
  Ruff Figural Fluency Test (Ruff, 1996)
- Stroop Color and Word Test
- Porteus Maze Test (Porteus, 1959; Bennett et al., 2005)
- Rey Complex Figure Copy and Recall tests (Rey, 1941; Xiaonan et al., 2021)
- Complete list: Appendix 2, Sparrow & Hunter, 2012 – EBSCO access

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Assessments/Inventories

- Barkley Deficits in Executive Functioning Scale (BDEFS; Barkley, 2011)
- Behavioural Assessment of the Dysexecutive Syndrome (BADS; Wilson et al., 1996)
- Behavior Rating Inventory of Executive Function 2 (BRIEF 2; Giaoia et al., 2015)
- Comprehensive Executive Function Inventory (Naglieri & Goldstein, 2013)
- Functional Assessment of Verbal Reasoning and Executive Strategies (FAVRES; MacDonald, 2005)
- Scales of Cognitive and Communicative Ability for Neurorehabilitation (SCCAN; Milman & Holland)

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Observation

- Profile of the Executive Control System (PRO-EX; Braswell et al., 1992)
- Executive Function Route-Finding Task (EFRT; Boyd et al., 1987)

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Questionnaires

- Dysexecutive Questionnaire (DEX)/Behavioral Assessment of Dysexecutive Syndrome (Burgess et al., 1996)
- Brock Adaptive Functioning Questionnaire (BAFQ; Dywan & Segalowitz, 1996)

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Management of Dysexecutive Symptoms

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Children

- Role of SLPs (ASHA)
- Teacher and mental health professional support in classroom
- M-E-T-A approach (Sucheta Kamethe)

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Management

FUNCTIONAL APPROACH

PROCESS-ORIENTED APPROACH

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Therapeutic Rapport

Empathy

Respect

Trust

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Approaches

EXTERNAL CLIENT FACTORS

- Environmental support
- Teaching task-specific routines

INTERNAL CLIENT FACTORS

- Cognitive plans
- Self-instructional therapies

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Environmental Management

Organization of physical space

Manipulation of physiological factors

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Task-Specific Routines

Task analysis

Checklist

Practice with errorless learning

Reinforcement and motivation

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Cognitive Plans

- Planning scenarios
- Errand completion tasks
- Time management tasks

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Metacognitive Strategies/Self-Instructional Training

- Self-regulation/self-monitoring (Cicerone & Giacino, 1992)
- Problem-solving process (van Cramon & Matthes-van Cramon, 1994)
- WSTC strategy (Lawson and Rice, 1989)
- Task completion process/Goal Management Training (Levine et al., 2000)
  Goal-Plan-Do-Review (Feeny & Ylvisaker, 2006) - http://tres.hcpss.org/sites/default/files/Goal_Plan_Do_Review.pdf
  http://www.buildingbetterprograms.org/wp-content/uploads/2018/08/GPDRR-Manual-August-2018-Version.pdf
  https://www.d181.org/uploaded/Parents/Family_Education_Events/STANDARD_INTERVENTIONS_FOR_EXECUTIVE_FUNCTION.pdf#:~:text=general%20framework%20that%20can%20be%20utilized%20while%20working,of%20these%20areas%20of%20functioning%20are%20as%20follows%3A

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EdF Management

- Strategic Memory Advanced Reasoning Training (summarized in Ostegren, 2018)
- 3 phases:
  Strategic Attention (Filter)
  Integrated Reasoning (Focus/Link)
  Innovation/Cognitive Flexibility (Zoom/Generalize)

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EdF Management

- SWAPS
  Stop
  What is the problem?
  Alternatives?
  Pick a plan
  Satisfied?
- Cantor et al., 2014

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EdF Management

- Attention process training
- External aids
- Prospective memory training
- If-then plans (Gawrilow et al., 2011)
- Awareness intervention
- Behavioral intervention
  Positive behavior supports (Ylvisaker et al., 2005)
- (Sohlberg & Mateer, 2001)

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Stop and Reflect

- What ideas are squaring with you?
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Unawareness

Frontal vs. posterior connections
- Generalized self-awareness
- Modality-specific

3 types of awareness impairments (Crosson et al., 1989)
- Intellectual
- Emergent
- Anticipatory

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Measuring Unawareness

- Client report
- Others' reports (DEX; BAFQ)
  - Self-Awareness of Deficits Interview (Fleming et al., 1996)
- Predict performance

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Systematic Process for Measuring Unawareness

(Sohlberg & Mateer, 2001)
- What do they *know* about their strengths and deficits?
- Is the unawareness a psychoemotional denial, an organically-based unawareness, or both?
- Is the unawareness generalized *or* modality-specific, and are there other cognitive deficits?
- Do they demonstrate conscious or unconscious behaviors suggesting accommodation to changes in functioning?
- What are the consequences of deficits in unawareness?

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Managing Unawareness

- Individual awareness-enhancing program
  - Education
  - Experiential exercises
    - Predict performance (Rebmann & Hannon, 1995; Schlund, 1999)
    - Logs (Cicerone & Giacino, 1992; Sohlberg et al., 1998)
  - (Sohlberg & Mateer, 2001)

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Managing Unawareness

- Caregiver training
- Procedural training and environmental support (PTES; Sohlberg & Mateer, 2001)

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Managing Unawareness

- Constructive Feedback Awareness Training (summarized in Ostegren, 2018)
- 1) Pre-task analysis
- 2) Task feedback
- 3) Post-task reflection

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Managing Unawareness in Adolescents

- Goal of independence
- Positive partnership
- Preserve self-esteem
- (Sohlberg & Mateer, 2001)

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Behavioral Intervention

External approaches:

- Environmental modifications
- Caregiver communication strategies
- External cues
- Task-specific routines

Internal approaches

- Cognitive-behavioral interventions
- Metacognitive strategies
- Compensatory strategies
- Awareness training
- Psychotherapy

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Positive Behavior Intervention and Support (PBIS)

- Feeny & Ylvisaker, 2010
- Key elements:
  - Positive, negotiated, well-understood daily routines
  - Eliminate provocation
  - Positive communication and roles
  - Choice and control
  - Self-regulation is the goal

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Structured Flexibility

- Daily routine: negation and choice
- Escape communication scripts
- Goal-plan-do-review
- Self-regulatory preset and intervention scripts
  - Hard/easy
  - Ready/not ready
  - Big deal/little deal
- Consequence procedures
- (Feeney & Achilich, 2014)

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Goals

- Collaborative
- Meaningful
- Positively-framed
- Functional

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Stop and Reflect

- What ideas are squaring with you?
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Cases

- Carlos – 22-year-old 3 months post MVA; moderate EdF:
  Self-awareness
  Planning
  Time management
  Emotional regulation
  Initiation
- How might these difficulties affect his work at the sandwich shop?
- What are some approaches you could use for him?
- Write 2 goals for Carlos.

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Cases

- Your client
- Assessment?
- Treatment?

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