

# Executive Functioning Across the Lifespan: Older Adults

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## Agenda

- Review of the construct of executive functioning
  - Applying conceptualizations to older adults
- Potential causes of impairment
- Common signs of need for evaluation
- Executive functioning assessment
- Interventions

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## The Construct of Executive Functioning

- **Executive Functioning:** The ability to think abstractly and to plan, initiate, sequence, monitor, and stop complex behavior.
- Higher-level cognitive skills used to control and coordinate other cognitive processes.

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### Components of Executive abilities

- **Lezak 1995** - Suggests there are 4 components of Executive function:
  - Volition
  - Planning
  - Purposeful behaviour
  - Effective performance
- **Stuss 1987** - Several skills necessary for goal-directed behaviour
  - Ability to shift from one concept to another
  - Ability to modify behaviour in light of new info
  - Ability to synthesise & integrate isolated details into coherent whole
  - Ability to manage multiple sources of information
  - Ability to make use of relevant acquired knowledge

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### Cognitive Processes involved in EF

- Initiation
- Planning
- Sequencing
- Monitoring self-directed behavior
- Insight
- Abstract thinking
- Judgment
- Regulation of behavior
- Attention
- Working memory
- Problem-solving
- Verbal reasoning
- Inhibition
- Mental flexibility

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### Dimensional Aspects of EF

- Can be divided into organizational and regulatory abilities:
- Organizational – attention, planning, sequencing, problem solving, working memory, cognitive flexibility, abstract thinking, rule acquisition, selecting relevant sensory information.
- Regulation – initiation of action, self-control, emotional regulation, monitoring internal and external stimuli, initiating and inhibiting context-specific behavior, moral reasoning, decision-making.

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## Executive Functioning

- Self-awareness of strengths and limitations (what's hard to do; what's easy to do)
- Goal setting
- Planning/organizing
- Initiating
- Inhibiting
- Self-monitoring and evaluating
- Strategic thinking
- Flexible shifting, adjusting, benefiting from feedback

(Feeney, 2005)

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## Activities Involving Executive Functioning

- Remembering a list of errands without writing it down
- Reading a book over a period of several days
- Managing a checking account
- Getting appliances fixed
- Organizing important personal papers, such as bills, insurance documents, and tax documents
- Handling an unfamiliar problem
- Planning an activity several days in advance
- Organizing what you want to say
- Checking the accuracy of financial documents
- Doing calculations in your head while shopping
- Planning for and completing regularly scheduled weekly tasks
- Managing time to enable completion of daily activities
- Counting the correct amount of money when making purchases
- Planning what to do in a day
- Learning new tasks or instructions

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## More Activities Involving EF

- Carrying on a conversation in a noisy environment
- Remembering where things were put away
- Using a local street map to locate a new store or physician's office
- Putting words together to form a grammatically correct sentence
- Remembering to take medications at the appropriate time
- Planning for and keeping appointments
- Carrying on a conversation with a small group of people
- Dialing telephone numbers
- Reading and following complex instructions
- Composing a brief note or e-mail to someone
- Understanding pictures that explain how to assemble something
- Looking up a phone number or address in the phone book or on the computer
- Making yourself understood to other people during ordinary conversations
- Understanding other people during ordinary conversations

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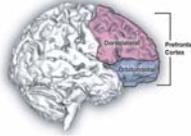
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### Executive Function

- Executive function is reliant on the frontal lobes, the prefrontal cortex, and neuronal circuits
- Reduced EF abilities are associated with frontal lobe dysfunction and damage involving the prefrontal cortex and limbic system.



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### Damage to the Executive System Often Leads to:

- Socially inappropriate behavior
- Inability to apply consequences from past actions
- Difficulty with abstract concepts (the inability to make the leap from the symbolic to the real world)
- Difficulty in planning and initiation (getting started)
- Difficulty with verbal fluency

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### Definition of Dementia

- Memory impairment and at least one of the following:
  - Aphasia
  - Apraxia
  - Agnosia
  - disturbances in **executive functioning**.
- In addition, the cognitive impairments must be severe enough to cause impairment in social and occupational functioning.
- Importantly, the decline must represent a decline from a previously higher level of functioning. Finally, the diagnosis of dementia should NOT be made if the cognitive deficits occur exclusively during the course of a delirium
- ❖ DSM IV TR of the American Psychiatric Association

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### Dysexecutive Syndrome

- impulsiveness
- poor social judgment
- social disinhibition
- Egocentrism
- difficulty interpreting the behavior of others
- Perseveration
- poorly regulated attention
- disorganization (in thinking, talking, and acting)
- weak goal formulation
- ineffective planning
- decreased flexibility/ shifting
- slowed processing
- diminished divergent thinking
- concrete thinking
- immature problem solving
- weak self-monitoring
- inefficient responses to feedback/ consequences
- reduced initiation
- dulled emotional responses

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### Behavior Associated with Deficits in Executive Functions

- Disinhibition-lacks behavioral control, impulsive
- Perseveration-repeats non-functional behavior, inability to change behavior despite corrective feedback, difficulties learning from experience
- Forgetfulness-off-task behaviors, mental errors, loses track of what they were doing
- Anticipatory Behavior-failure to shift to new demands of situation
- Inefficiency-takes more steps to complete task than necessary
- Difficulty understanding consequences and cause-effect relationships

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### Behavior Associated with Deficits in Executive Functions

- Frequently violate rules despite apparent knowledge of the rules
- Apathetic-lacks motivation, does not set goals, engages in behavior only when prodded
- Difficulties accessing knowledge
- Concrete thinking
- Emotional lability
- Poor frustration tolerance
- Disorganized
- Inconsistent performance on tasks within ability range
- Difficulties coping with change
- Poor judgment

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### Adults with Executive dysfunction

- Cannot solve problems
- Cannot learn a new task
- Are disorganized
- Have impaired judgment
- Exhibit concrete thinking, mental inflexibility
- Have no insight
- Cannot incorporate feedback
- Cannot see their mistakes
- Make unsafe decisions when driving, spending, etc.

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### Causes and related conditions

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### Executive Functions and Clinical Diagnoses

- A sampling of conditions involving EF deficits:
  - Autism/Asperger's Syndrome
  - ADHD and ADD
  - Conduct Disorder
  - Oppositional Defiant Disorder
  - Depression and/or Anxiety
  - Obsessive-Compulsive Disorder
  - Fetal Alcohol Syndrome
  - Bipolar Disorder

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**Cognitive Aging by Domain: Executive Functions**

- Aging:
  - Intact:
    - Set shifting for visual information
    - Some abstract verbal reasoning
    - Some cognitive flexibility
  - Some Decline in
    - Some adaptation to new situations
    - Some set shifting for verbal information
    - Divided attention
    - Complex problem solving
    - Inhibition

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**Other Conditions Associated with Executive Dysfunction**

- Cardiovascular disease
- Ischemia
- Heart Failure
- Peripheral Vascular Disease
- COPD, Dialysis,
- Diabetes, Hypertension
- Sleep apnea
- Carotid disease
- HIV
- Cancer
- Lupus
- Dementias

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**Areas affected by Executive Impairments include:**

- Falls
- Hypertension related disability
- Mood
- Behaviors
- Functional Status
- Capacity
- Driving

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## Executive Function and Instrumental Activities of Daily Living (IADL)

- EF impairment is predictive of IADL impairment
- Deficits in EF result in poor IADL scores
  - managing medications
  - using the telephone
  - managing finances
  - shopping and preparing meals
  - transportation
  - housekeeping



(Royall, Palmer, Chiodo, & Polk 2005)

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## Executive Function & IADL's

- IADL impairment corresponds with presence of mild executive dysfunction
- While memory and executive function correlate to current IADL ability, longitudinal studies revealed only EF independently predicted rate of decline in IADL scores
- Level of IADL impairment predicts the incidence of dementia at 5yr follow-up independent of other global test scores for cognition
- Measures of executive function in elderly subjects predict performance in instrumental activities of daily living (IADLs)

(Crowell et al., 2002; Cahn-Weiner et. al., 2007; Cahn-Weiner et al 2000; Royall et al 2004, 2005)

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## Independent Living

- Intact executive functioning is necessary for an adult to remain independent
  - Taking medications appropriately
  - Making and keeping medical appointments
  - Fulfilling financial responsibilities and bill paying
  - Completing self-care tasks
    - Bathing
    - Grooming
    - Hygiene
    - Laundry
    - Meal preparation
    - Housekeeping

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**EF is Relevant to Decision Making Capacity**

- EF associated with frontal systems
- Frontal lesions affect planning, hypothesis testing, judgment and insight
- Frontal impairment can be demonstrated in many medical /psychiatric disorders

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**Skills required for driving:**

- Visual-perceptual skills
- Visual acuity
- Information processing
- Judgment
- Decision-making
- Performance of appropriate motor responses
- Sequencing
- Cognition
- Executive Functioning skills
- Memory
- Attention to detail

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**Common Reasons for Evaluation of Executive Functioning**

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### Core Functions Involved in Executive Functioning

- Controlling acquisition of new memories
- Divergent thinking – choosing different ways of approaching a situation
- Environmental control of behaviour – using cues and information from the environment to direct, control or change personal behaviour.
- Directing interpersonal behaviour

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### Acquisition Deficits

- Impaired working memory
- Poor associative learning – difficulty associating varying facets of memory about facts or events, thus finding it hard to make use of external cues to direct behaviour

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### Divergent Thinking Deficits

- Loss of spontaneous behaviour – e.g. speaking and verbal fluency decreased; decreased ability to produce graphic designs or doodling; reduced behavioural output shown by lethargy, inability to initiate or maintain
- Impaired strategy formulation and planning, especially in response to novel situations
- Poor abstract thinking e.g. concept formation

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**Deficits in Environmental Control of Behaviour**

- Ability to inhibit responses is impaired, so perseverative on tasks
- Breaking rules and taking risks
- Unable to follow instructions
- Gambling
- Poor error perception
- Amotivation and apathy

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**Impaired Interpersonal Behaviours**

- Inappropriate social and sexual behaviour, or altered behaviours in comparison to premorbid patterns.
- Pseudodepression
- Pseudopsychopathy

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**Signs and Symptoms of Impairment**

- Perseveration
- Organic Sameness
- Inflexibility
- Catastrophic Anxiety
- Emotional Dysregulation
- Working Memory Deficits
- Poor judgment
- Low threshold for frustration
- Impulse control difficulties
- Dyspraxia --Speech / motor
- difficulty in postponing gratification
- emotional 'incontinence'

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### Indications of Need for Driver Evaluation

- Confusion about operating the vehicle
- Trouble noticing cars or pedestrians on either side of the road
- Near misses
- Side swipes
- Accidents

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### Assessment Issues

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### Assessment Issues

- Consider screening
  - All patients over 65
  - when planning discharge from medical setting
  - Repeat admissions
  - All patients with Vascular conditions, COPD, dialysis
- In many geriatric medical clinics, EF is one component of a thorough functional evaluation, along with ADLs, IADLs, and gait and balance.
- Occupational therapy can assess function (i.e., perform a “kitchen assessment” or an “apartment weekend”).
- Assess for ability to self administer medications
- Cornerstone is the history

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### Task Assessment

- Planning: finding the exit to a maze
- Decision-making: simulated gambling.
- Working memory: the ability to hold and manipulate a group of items --adding up a list of numbers or repeating a span of numbers or words backwards.
- Feedback/Error correction: rules of a task are determined by whether responses are correct or incorrect—correct to shape for 5 items changes to correct by placement in next 5 items.
- Overriding habits: choosing a more complex and effortful solution to be correct e.g., looking away from the direction indicated by an arrow, naming ink colors of words,
- Mental flexibility: ability to shift between two tasks or response rules, e.g., from verbal to key-press response, from adding numbers to ordering numbers, from ordering by size to ordering by color.

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### Evaluating Executive functions

- Card sort tasks, such as the WCST and the D-KEFS Card Sorting Test
- Insight/judgment
- Tower
- Inhibition
- Clock drawing
- Similarities/proverbs

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### Clinical Assessment Instruments

- Delis-Kaplan Executive Function System
  - Comprehensive 9 subtest system
- WAIS-IV
  - Digit Span
  - Figure Weights
- WAIS-IV/WMS-IV Advanced Clinical Solutions
  - Trail making
  - Verbal Fluency

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### Delis-Kaplan Executive Function System

- D-KEFS was the first nationally standardized set of tests to evaluate executive functions
- Assesses higher level thinking and cognitive flexibility
- Game-like format
  - Does not use the right/wrong paradigm
    - Yet do obtain insight into ability to use feedback
- Extensive normative data
- Verbal and Non-verbal measures in the same test
- Two forms are available to limit practice effects when used for pre- and post-testing.

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### Overview of DKEFS Tests

- Comprehensive battery of tests measuring skills associated with executive functioning
- The battery is composed of 9 independent tests designed to assess unique and overlapping executive functions using verbal and non-verbal stimuli
- Component skills and multiple higher-order functions are assessed in each test enabling the examiner to isolate specific strengths and weaknesses-designed using a process approach

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### Overview of DKEFS Tests

- Trail-Making Test (8-89)
- Verbal Fluency (8-89)
- Design Fluency (8-89)
- Color-Word Interference Test (8-89)
- Card Sort Test (8-89)
- Word Context Test (8-89)
- Twenty-Questions (8-89)
- Tower Test (8-89)
- Proverbs Test (16-89)



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### Integrate All Information

- Results from EF measures should always be integrated with functional information such as that gathered from measures/techniques such as
  - *Texas Functional Living Scale (TFLS)*
    - linked with the WAIS-IV and WMS-IV
    - used to assess activities of daily living (ADLs)
  - Clinical Interviews
    - Caregiver/family information
  - Objective social-emotional/psychiatric
    - Example = Beck Scales
  - Thorough history
    - Medical information
- Remember to check for vision, hearing, motor, medication contributions to performance.

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### Interventions or Considerations

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### Planning Ahead

- After evaluation and diagnosis, education and planning ahead are essential for long-term care management.
- Family matters, such as financial, legal, and health planning should be discussed and organized.
- People with a decline in executive function may be vulnerable to scams.
- Family and other caregivers should try to keep schedule as routine, simple, and safe as possible.

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### Considerations

- Compensation vs. remediation, or both
- Generalization does not 'just happen'
- Client's goals are central
- Self-efficacy, coping, locus of control, and optimism all impact cognition and real-world performance

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**An Evidence-based  
intervention for  
working memory  
training.**



**Working Memory Training**

[www.CogMed.com](http://www.CogMed.com)

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### What is Helpful?

- Medical interventions
- Behavior Therapy
- Environmental
- Caregiver

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### Categories of interventions

- Environmental Modifications
  - Reduce distractions
  - check lists
  - Cueing devices
  - Random alerting tones
- Task-specific training
  - e.g., verbal self-instruction
- Meta-cognitive training
  - e.g., CO-OP
- Process-specific training
  - limited evidence for generalization to daily life

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### Educating Patient, caregiver, staff

- Educating caregiver is critical – they need to understand the nature of the impairment.
  
- Staff who work with patient also needs to understand the impairment and its impact and ramifications.

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### Environmental Modifications

- Reducing background noise
- Overwhelming visual stimuli
- Physical constraints
- Other people
- Posted reminders, reducing clutter
- Arrange items in an orderly, organized fashion
- Place things in strategic locations -- "in their place"
- Keep paper and pen handy by telephones
- Label important items (storage, family photos, boxes, cabinets, drawers)

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## Compensatory Strategies



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## Medication management

Recalling medicine schedule

- Use pill box
- Have a written schedule
- Use watch or PDA/Phone timers
- Take meds at same time each day and pair with timing of a daily meal or other routine (brushing teeth, shaving)
- Put meds in visible location

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May 10, 2012 (2 p.m. CST) Effects of  
Acquired Brain Damage on Adult  
Executive Functioning

Customer Support  
– US: 800-627-7271  
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