When Movement is More Than Muscles: Impact of Cognition on Function

Developed by: Carolyn Tassini, PT, DPT, NCS

Claire McGrath PhD, ABPP

Kim Miczak PT, NCS, MossRehab

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Disclosures

- Carolyn Tassini PT, DPT, NCS, CBIS - nothing to disclose
- Claire McGrath, PhD, ABPP, CBIS- nothing to disclose
- Kim Miczak PT, NCS, MossRehab - nothing to disclose

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Objectives

1. Identify signs of cognitive dysfunction based on patient behavioral and functional presentation.
2. Integrate knowledge of cognitive deficits into treatment interventions for an individual with a TBI.
3. Develop strategies and treatment interventions to maximize outcomes related to functional mobility and cognitive deficits.

What Does it Take To Balance? To Walk?

- Muscle strength
- Muscle endurance
- Range of motion
- Sensation
- Cardiopulmonary function
- Visual/perceptual awareness

ATTENTION – ENVIRONMENTAL AWARENESS – EXECUTIVE FUNCTIONING

What is Executive Function?

- Processes that help us regulate and adapt behavior to act efficiently
  - Attention
  - Cognitive inhibition
  - Memory
  - Cognitive flexibility / set shifting
  - Fluency

Rabinovici et al 2015

Neuromuscular Control of Balance

- Ankle strategies
- Hip strategies
- Stepping strategies
- Protective/rescue strategies

- Visual
- Vestibular
- Somatosensory

How Does Cognition Impact Mobility?

- Impaired attentional resources
- Executive dysfunction (complex problem solving, abstract reasoning, divided/alternating/sustained attention)
  - In community dwelling older adults executive dysfunction
    - Doubled the risk of future falls
    - Increased risk of serious injury by 40% (Montero-Odasso 2018, Tinetti 1988)

The Impact of Cognition on Falls and Mobility

- Individuals with moderate to severe cognitive impairment present with higher prevalence of falls
  - Annual incidence ~70% (twice the rate of cognitively normal adults) Montero-Odasso 2018

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The Impact of Cognition on Falls and Mobility

- Gait impairments and falls are more prevalent in those with dementia than normal cognitive aging
  - This increases with severity of cognitive impairment
- mTBI (Alsalaheen 2016)
  - 65% of adolescents (median 46 d post concussion) presented with at least 1 cognitive domain deficit
  - Cog scores correlated to lower ABC and clinical performance measures

The Impact of Emotions on Function and Mobility

- Feelings of anxiety or emotional distress effect:
  - Attention
  - Executive functioning

… Leading to increased risk for falls

What is a Neuropsychological Evaluation?

- Assessment of cognition, mood and behavior: diagnostic interview and standardized measures
- Documents cognitive functioning in relation to normative sample of similar age, education and ethnicity
- Neuropsychological data are compared with known patterns of brain functioning as related to neurologic injury, illness, or neurodevelopmental disorders
- Provides written report that includes diagnoses and treatment recommendations for client, physician, and other members of treatment team

Cognitive Deficits Are Only Seen in Neuro Clinics….

WRONG!

- Consider your patient who comes in for rehab following his rotator cuff repair. He can't remember his home exercises.
- The Teenager who attends therapy after her concussion. She is distracted by others in the room.
- The patient who is in cardiac rehab who can't recall what his precautions are.

Cognitive deficits are not unique to neuro services or clinics!

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Case Examples

Case Example

- 55 y/o college educated gentleman s/p severe TBI 12 years ago following an assault. Currently residing in a community residential program in an apartment setting
- Bilateral temporal bone fx
- Hemorrhage: B temporal lobe, L thalamic, B scattered SAH
- Subdural hygroma R frontal lobe
- Axonal injury L parietal lobe
- PMHx:
  - Exposure to combat during USMC service
  - Limited social support outside of residential setting

Primary Functional Deficits

- Difficulty with community activities (attributes to environmental and social factors)
- Social isolation, avoidance behaviors
- Impaired endurance
- Impaired balance – unilateral stance, compliant surfaces, vision compromised
- Impaired gait speed and quality →WC→ uses rollator functionally
- Impaired carryover of strategies

Neuropsychological Evaluation 2019

- Stable compared to 2017
- Estimated average premorbid intellectual abilities
- Strengths
  - Expressive language
  - Immediate and delayed visual memory
  - Financial knowledge

Neuropsychological Evaluation 2019

- Weaknesses:
  - Comprehension of complex verbal information
  - Processing speed
  - Sustained and divided attention
  - Verbal memory
  - Executive functioning (abstract thinking, cognitive flexibility)
- Poor frustration tolerance/emotional reactivity
- Symptoms of anxiety & anger

How Do Neuropsychology Data Compare To Observations?

- Intact expressive language can mask cognitive difficulties
- Distractibility, poor divided attention, slowed processing speed
  - Quickly overwhelmed in busy environments
  - Temper outbursts when overwhelmed
- Difficulty incorporating new information into action/behaviors
  - Continues to share thoughts, regardless of input from therapist
  - Agrees to recommendations/instruction but has limited implementation

Treatment Framework: Neuropsychology

- Share information in brief segments
- Ask client to repeat information
- Create written document with client summarizing conversation
- Review recommendations multiple times across multiple domains
- Provide rest breaks with gradual increase in cognitive demands
- Implement anxiety management strategies

Treatment Framework: Physical Therapy

- Seek input from neuropsychology to adapt their recs to PT interventions
- Provide structure of expectations within sessions
- Review patients personal stated goals
- Point out differences in function when the person is on vs off task
  - Emphasizes need for team collaboration/communication
- Progress environment from quiet to more busy
- Educate family or staff so they can understand behaviors

Summary of Case

- Executive dysfunction and anxiety hinder him from achieving his maximum potential
- Critical to get “buy in” from client to help him take risks
- Environmental modifications address attention and executive function difficulties and provide support to emotional reactivity and reduce anxiety
- Team collaboration to support client with carryover and practice

Review of Concepts & Strategies

Key Concepts

- **Observation** of performance is paramount
  - Consider the physical AND cognitive demands of task
  - Multiple variable may influence performance
- Integrate knowledge of medical condition, examination and performance
  - Often, not “just their personality” or “just being stubborn”
  - Research indicates that therapists under-detect cognitive deficits (Blackwood 2017)
- Develop a hypothesis and systematically assess it
  - How does performance change if task is changed?
    - Instructions/cues, complexity, environment

Clinical Yellow Flags

Observed Behaviors	Possible Etiology/Deficits
Repeating him/herself	Memory, auditory processing
Difficulty answering questions (esp medical or complex)	Comprehension, processing, memory
Difficulty staying on topic of conversation	Working memory, divided attention
Poor attendance to therapy	Planning/organization, prospective memory, insight
“Non-compliance” with home ex. program/recommendations	Comprehension, planning, organization, memory, initiation, insight, generalization

Application: Training Beyond the Clinic

- Consider the structure of the clinic compared to home/community
- Consider the role of care providers
  - Cuing/prompts
    - How does the presence of the therapist influence performance?
    - Do family members realize how much help they are providing?
  - ”Supervision”
    - Why is this needed? What is precluding “Mod I” performance?

Application: Training Beyond The Clinic

- Generalization from the clinic to other environments
  - Therapist can start with structured practice to improve performance
    - Need to move towards variable practice to improve learning
  - Telehealth can be utilized to train outside of the clinic setting
  - Therapist will need to facilitate generalization to other situations/environments
    - Specific activities to be performed
    - Environmental or task set-up
    - Family/care supports can monitor & report back to therapist re. performance
    - Education to family/care supports about specific tasks AND general principles
      - (Cannot foresee or practice every scenario)

Clinical Resources

- Occupational therapists
- Speech therapists
- Neuropsychologists
- Neurologist
- Screening/evaluation tools

Clinical Take Home

- A single test or observation is not enough to gain a full appreciation of the clients cognitive & physical function
  - Inconsistencies are common
  - Cognitive deficits often emerge with repeated interactions or exposures
- A patient may only have one therapist and it's important for the therapist to understand how cognition and mood impact functioning and alerts the team

Clinical Take Home

- Be aware that the movement you are seeing may be a result of more than just the muscles!

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Thank You!

Dave
Bancroft NeuroRehab
Canine-Assisted Therapy Dog

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