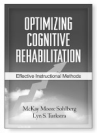
Intervention for adolescents and adults with mild traumatic brain injury: A guide for Speech-Language Pathologists

Lyn S. Turkstra, Ph.D.

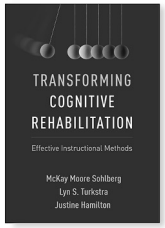
Professor and Assistant Dean – Speech-Language Pathology
School of Rehabilitation Sciences
McMaster University

1

Disclosures



I receive grant US and Canadian federal grant funding for mild TBI intervention studies.



2

Acknowledgements

Supported by funding from U.S. Department of Defense Contract PT170061, Atlas Institute for Veterans and Families, and Patient-Centered Outcomes Research Institute Contract Number ME-1403-14083.

3

Learning Objectives

1. Define mild traumatic brain injury (mTBI) and compare and contrast mTBI with other etiologies of mild cognitive impairment.
2. Summarize current evidence for "restorative" vs. strategy- and skill-based intervention for patients with mTBI.
3. Describe a resource-allocation model for understanding challenges of patients with cognitive and cognitive-communication impairments after mTBI, and patients with other "mild" cognitive-communication impairments.
4. Identify a clinically useful assessment and treatment approach for your practice setting.
5. Critique your own therapy practice to identify active ingredients, categories of targets, and intervention aims, and determine if these are consistent with current evidence.

4

TBI Definition
U.S. Centers for Disease Control and Prevention

- A disruption in the normal function of the brain that can be caused by a bump, blow, or jolt to the head or a penetrating head injury (Marr and Coronado, CDC 2004). Damage is via applied force:
  - gravity (e.g., deceleration)
  - missiles (e.g., bullets, baseball bats)

5

TBI Definition
U.S. Centers for Disease Control and Prevention

- Observing **one of the following** clinical signs constitutes an alteration in brain function (Menon, Schwab, Wright, and Maas, 2010):
  a. Any period of loss of or decreased consciousness;
  b. Any loss of memory for events immediately before (retrograde amnesia) or after the injury (post-traumatic amnesia);
  c. Neurologic deficits such as muscle weakness, loss of balance and coordination, disruption of vision, change in speech and language, or sensory loss;
  d. Any alteration in mental state at the time of the injury such as confusion, disorientation, slowed thinking, or difficulty with concentration.

6

Mild TBI Definition

- Concussion = mild TBI
- mTBI is a traumatic brain injury at the beginning of the brain injury spectrum ranging from mild to severe brain injury.

GUIDELINE FOR CONCUSSION/MILD TRAUMATIC BRAIN INJURY & PROLONGED SYMPTOMS
3RD EDITION, FOR ADULTS OVER 18 YEARS OF AGE

Ontario Neurotrauma Foundation
https://braininjuryguidelines.org/concussion/

7

Mild TBI Definition

- Concussion/mTBI denotes the acute neurophysiological event related to blunt impact or other mechanical energy applied to the head, neck or body (with transmitting forces to the brain), such as from sudden acceleration, deceleration or rotational forces. Concussion can be sustained from a motor vehicle crash, sport or recreational injury, falls, workplace injury, assault or incident in the community.
- Clinical signs of concussion immediately following the injury include **any of the following**:
  - Any period of loss of or a decreased level of consciousness less than 30 min.
  - Any lack of memory for events immediately before or after the injury (post-traumatic amnesia) less than 24 hours.
  - Any alteration in mental state at the time of the injury (e.g., confusion, disorientation, slowed thinking, alteration of consciousness/mental state).
  - Physical Symptoms (e.g., vestibular, headache, weakness, loss of balance, change in vision, auditory sensitivity, dizziness).
  - No evidence of Intracranial lesion on standard imaging (if present, suggestive of more severe brain injury)

https://braininjuryguidelines.org/concussion/

8

Table A. Common Symptoms of Concussion/mTBI

Physical	Behavioural/Emotional	Cognitive
Headache	Drowsiness	Feeling "slowed down"
Nausea	Fatigue/lethargy	Feeling "in a fog" or "dazed"
Vomiting	Irritability	Difficulty concentrating
Blurred or double vision	Depression	Difficulty remembering
Seeing stars or lights	Anxiety	
Balance problems	Sleeping more than usual	
Dizziness	Difficulty falling asleep	
Sensitivity to light or noise		
Tinnitus		
Vertigo		

Adapted from Willer B, Leddy JJ. Management of concussion and post-concussion syndrome. Current Treatment Options in Neurology. 2006;8:415-426, with kind permission from Springer Science and Business Media.

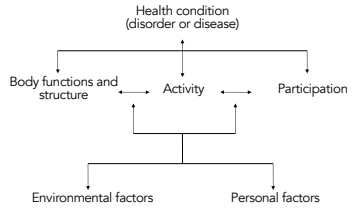
https://braininjuryguidelines.org/concussion/

9

How do we define severity?

10

WHO International Classification of Functioning, Disability, and Health (2000)



11

Principle #1

- Assessment is problem-focused

12

Example Intake Measures

13

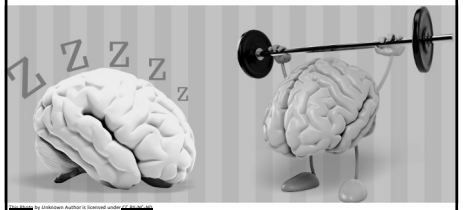
Principle #2

It is not helpful (and sometimes counterproductive) to say "restorative" vs. "compensatory"

https://www.mcminnlaw.com/assets/brain-injury-photo.jpg

14

Repercussions



"Zzzz" by Unknown Author is licensed under CC BY-NC-ND

15

Principle #3

- Our intervention is based on a **resource allocation model**
  - Our aim is to maximize efficiency of use of cognitive resources

16

A bit of history

- Attention problems have been documented after TBI for almost a century (e.g., Conkey, 1938)
- Attention problems have been documented after mTBI for more than 30 years (e.g., Parasuraman et al., 1991)
- Attention problems can be viewed as symptoms of a problem of cognitive resource allocation or "mental bandwidth" (Bhargava, 2020), a term that came into metaphorical use in the 1990s

17

Overview: The Science of Mental Bandwidth

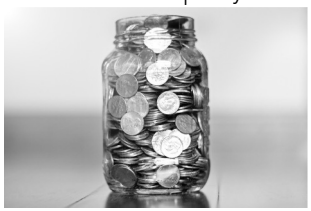
Tina D. Bhargava, Kent State University

https://www.everydaybandwidth.com/about-bandwidth.html

Bandwidth is more like the physiological limit of how much "thinking" we can do in one moment.

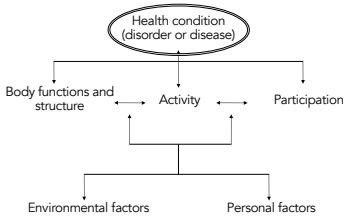
18

"Bandwidth" implies that cognitive resources have a limited capacity



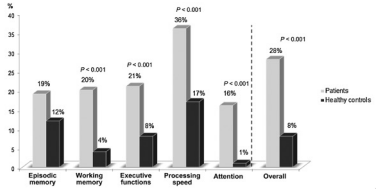
19

What factors affect our amount of cognitive resources?



20

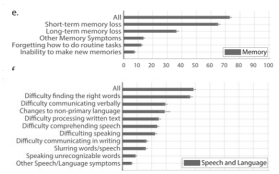
Cancer-Related Cognitive Impairment (CRCI)



Lange et al. (2020)

21

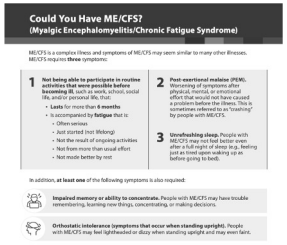
Long COVID



Davis et al. (2021)

22

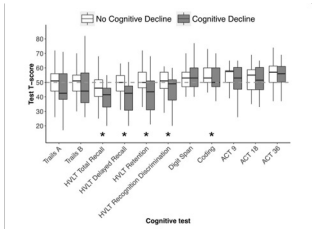
Chronic Fatigue Syndrome/Myalgic Encephalomyelitis (CFS/ME)



https://www.cdc.gov/me-cfs/about/

23

Post-treatment Lyme Disease Syndrome (PTLDS)



Touradji et al. (2019)

24

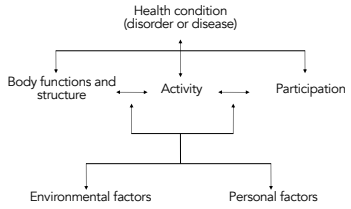
Almost anything can affect cognitive resources

25

Principle #4
It takes a team

26

What factors affect our allocation of cognitive resources?



27

What factors affect our allocation of cognitive resources?

- Impairments in body functions and structures
- Activity Demands
- Personal Factors
  - The "brain you bring"
  - Health factors (e.g., sleep)
  - Motivation
    - Proximal motivation – determine our engagement while doing a task
    - Distal motivation – determined our perceptions of how useful task performance will be, how much effort we believe is required, and "whether the amount of effort is worth the usefulness of the performance of the task" (Bhargava, 2020)
- Environmental Factors

28

Automatic vs. Controlled Information Processing

(1) performance differs to the degree that automatic or controlled processing determines performance;
(2) performance improves with extensive consistent practice;
(3) automatic processes are difficult to control; and
(4) capacity reductions primarily harm controlled processing

Schneider et al. (1984)

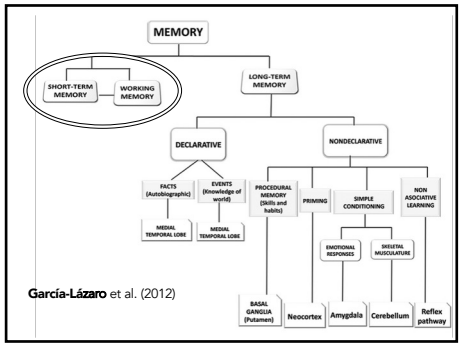
29

What cognitive functions are affected?

- Working Memory
- Executive functions

Turkstra/UAB/September 9, 2022

30



31

Eleanor hears about Tabitha's love affair with the builder and that the builder's sister is the woman Harper betrayed with Billy's doctor.

Hilderbrand, E. *The Identicals*. Little, Brown and Company, 2017, p. 360.
In: *New Sentences* by Sam Anderson. NY Times Sunday Magazine 8.13.17

32

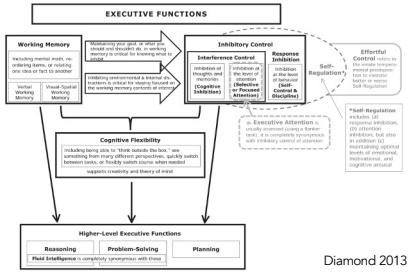
Executive Functions

- Flexibility
- Control
- Working Memory
  - mental workspace for executive functions

Diamond 2013

33

Executive Functions



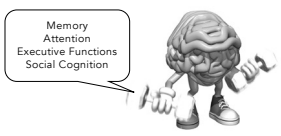
34

Current Recommended Practices in ~~Cognitive~~ Rehabilitation^

of people with cognitive impairments

35

Current Recommended Practices in Cognitive Rehabilitation



Unimpressive

36

Current Recommended Practices in Cognitive Rehabilitation

Fantastic, if the patient has sufficient awareness to identify when the strategy is needed

Still requires habit learning

37

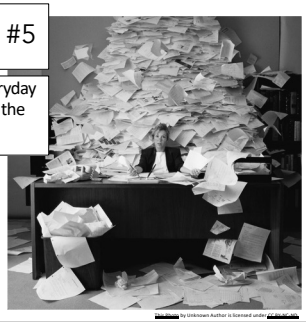
Current Recommended Practices in Cognitive Rehabilitation

Amazing, with the caveat that learning is probabilistic and context specific

38

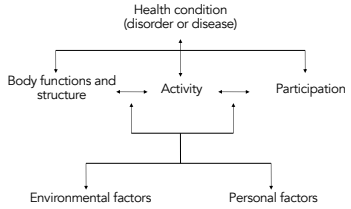
Principle #5

- Treat the everyday problem, not the impairment



39

How do we choose our therapy targets?



40

What do we do in therapy?

41

Rehabilitation Treatment Specification System:
A way to describe cognitive (and all) rehabilitation

A Theory-Driven System for the Specification of Rehabilitation Treatments (Hart et al., 2019)

Knowing What We're Doing: Why Specification of Treatment Methods Is Critical for Evidence-Based Practice in Speech-Language Pathology (Turkstra et al., 2016)

42

RTSS Team

John Whyte, MD, PhD (PI)
Marcel Dijkers, PhD, Tessa Hart, PhD
Christine Chen, PhD, Mary Ferraro, PhD
Andy Packel, MSPT, Jeanne Zanca, PhD
Lyn Turkstra, PhD, Jarrad Van Stan, PhD

Financial Disclosure and Acknowledgements

This work was partially supported through a Patient-Centered Outcomes Research Institute Award (ME-1403-14083) and National Institute on Disability and Rehabilitation Research (now NIDILRR) Cooperative Agreement H133A080053. All statements in this presentation, including its findings and conclusions, are solely those of the presenter and do not necessarily represent the views of NIDILRR and PCORI or its Board of Governors or Methodology Committee. The presenter has no other financial relationships or nonfinancial relationships to disclose.

43

The aim of the RTSS Project is to open the "black box":

What are we actually doing in rehabilitation?

pcori

44

Scope of the RTSS

SYSTEM OF CARE

Rehabilitation Program
(structure, process, etc.)

Care of an Individual Patient

Assessment

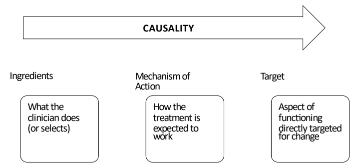
Treatment ingredients

Immediate outcome
(target)

Indirect outcome
(aim)

45

How Do We Plan Intervention?



Hart et al. (2014)

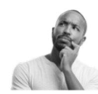
46

All rehabilitation targets are in one of these three categories:

Organ Functions

Skills & Habits

Representations



47

All rehabilitation targets are in one of these three categories:

Name of Group	Typical Targets
Organ Functions	Change or replace organ functions
Skills & Habits	Improve ability to perform (at both ICF function and activity/participation levels, and both mental and physical tasks); instill new habits
Representations	Enhance knowledge, modify attitudes/emotional responses; change probability of specific behaviors

48

Clinician Actions or Objects the Clinician Provides are Ingredients

Examples of Organ Function Treatments

Ingredients		Mechanism of Action		Targets
Provide a hearing aid	→	Amplification	→	Improved hearing
Provide repeated exposure to stimulus	→	Passive learning (habituation)	→	Reduced sensitivity to stimulus

49

Examples of Skills & Habits Treatments
Aim: Have a response when someone asks me to give information "on the spot" in meetings

Ingredients		Mechanism of Action		Targets
Provide opportunities for practice, modeling, cueing, stimuli that are similar to work	→	Learning by doing	→	Increase accuracy of production of response
Provide opportunities for repeated practice with varying cues, homework to practice at work	→		→	Increased number of times strategy used at work

50

Examples of Representation Group Treatments

Ingredients		Mechanism of Action		Targets
Explain meaning of social cognition terms (e.g., theory of mind)	→	Cognitive/affective information processing	→	Increased knowledge about social cognition
Show video of typical speakers to normalize use of strategy in communication	→		→	Increased willingness to use strategy in communication
Client selects home practice frequency	→		→	Increased motivation to practice at home

51

The RTSS Has a Tripartite Structure

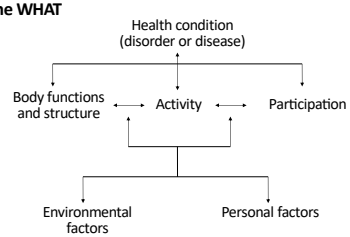
52

Summary of RTSS Basics

1. **Tripartite structure:** Ingredients, mechanisms of action, targets
2. **Targets:** Organ functions, skills and habits, representations
3. **Ingredients:** Clinician actions and objects provided by the clinician

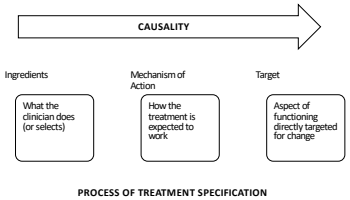
53

The WHAT



54

The HOW



55

If You're Interested in More Details…

Rehabilitation Treatment Specification Manual
(Version 6.2)

January, 2018

Produced as part of a project entitled:
Better Rehabilitation Through Better Characterization of Treatments: Development of the Manual for Rehabilitation Treatment Specification

Supported by contract # ME-1403-14803 from the Patient Centered Outcomes Research Institute

http://pmri.org/innovations/manual-for-rehabilitation-treatment-specification/

56

Let's try it!

57

Principle #6
Be internally consistent

- Check that
  - Your targets are what you are working toward in that session
  - Your targets are measurable (in principle)
  - Your ingredients match your targets
  - Your outcome measure matches your target

58

Summary of Principles of SLP Intervention for Adolescents and Adults with mTBI

1. Assessment is **problem-focused**
2. It is not helpful (and sometimes counterproductive) to say "restorative" vs. "compensatory"
3. Our intervention is based on a **resource allocation model**
   - Our aim is to maximize efficiency of use of cognitive resources
4. It takes a **team**
5. Treat the **everyday problem**, not the impairment
6. Be **internally consistent** with targets, ingredients, and outcome measures

59

Du kan klare det!
Vi kan hjælpe!

60