



Weill Cornell Brain and Spine Center

# Cognitive Remediation of Brain Injury

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# Purpose

1. Outline possible cognitive deficits resulting from brain injury
2. Explain the role of cognitive remediation in treating post brain injury attention and emotional difficulties



# Why Cognitive Remediation Treatment?

- Research reveals that most sports related head trauma resolves within 2 weeks
- Therefore, many individuals can return to work or school without treatment
- Individuals with persistent neurocognitive and psychological symptoms do require treatment
- Risk factors for prolonged recovery include:
  - More severe concussion
  - Repetitive mTBI
  - Pre-existing psychological and cognitive difficulties





# Post Brain Injury Cognitive Functioning



Brain injury can affect many areas of cognitive function:

- **Attention & Processing Speed** ← Most commonly affected
- **Memory & Learning:** Acquisition and recall of new information
- **Executive Function:** Planning, organization and sequencing



# Attention & Processing Speed Deficits

## Attention

- Reduced attention span
- Heightened distractibility
- Inability to shift attention between task demands

## Processing Speed

- Slow reaction time
- Slow thinking
- Slow reading
- Slow verbal and written responses

Impact All Cognitive Functions



**Attention**

Poor attention  
interrupts  
maintaining  
information “online”  
to carry out tasks

Poor attention  
interrupts the process  
of organizing and  
rehearsing information

**Executive  
Functioning**

**Memory &  
Learning**



“I can’t focus”

“I have trouble concentrating on conversations”

## What Patients Say When Experiencing Attention Problems Post Brain Injury

“I sit down to read and can’t focus”

“I get easily distracted”

“I can’t keep my mind on what I’m doing”



“I forget what I’m supposed to do throughout the day”

“I forget important things”

“I can’t find the right word”

## What Patients Say When Experiencing Attention/Processing Speed Difficulties and Label them Memory & Language Problems

“I can’t recall parts of a conversation I had recently”

“I forget where I put things”





# Treatment of Post Brain Injury Cognitive Dysfunction:

Cognitive Remediation  
Attention Training



# Cognitive Remediation & Neuroplasticity

Cognitive Remediation + Neuroplasticity =  
Recovery of Function

- Brain is a “plastic” organ: Capacity to change and alter neural pathways and synapses in response to injury
- Enhanced recovery of neurocognitive function is associated with organized stimulation (i.e. cognitive remediation)



# What is Attention?

- A multi-dimensional process related to becoming receptive to and processing information
  - Limited capacity: only so much processing can take place at one time
- 
- Bottom up control of attention: Reticular Activating System in the brainstem (involuntary)
  - Top Down executive control of attention: Frontal Lobes (voluntary) **Target of Remediation**

# Frontal Lobe Projections

- The frontal lobe is involved in top down control of attention
- Frontal lobe and it's projections can be thought of as the “supervisory system” that controls cognitive processes
- Cognitive remediation works on this “supervisory system” to enhance control of attention



# Types of Attention

Disorders in...	Lead to...
<b>Focused or Selective Attention</b>	Distractibility, drawn off task
<b>Sustained Attention</b>	Desire to end tasks early, “bored”
<b>Alternating Attention</b>	Can’t shift focus
<b>Working Memory/Complex Attention:</b>	Can’t maintain information long enough to rehearse and organize it



# What Do Attention Problems Look Like?

Focused or Selective Attention	A football player is overwhelmed by 80,000 screaming fans, misses the snap count, and is flagged for false start
Sustained Attention	During a classroom presentation of stunts the offensive lineman drifts off and does not retain the information
Alternating Attention	The QB calls the play in the huddle. After coming up to the line, he looks at the defense and calls an audible changing the weak side wide receiver route. He gets confused between the two plays.
Working Memory/ Complex Attention	A guard tries to follow the offensive line coach explaining a complex stunt play with multiple steps.



# Attention Training

- Learn to allocate and control attention
- Hierarchically organized, repetitive drills with increasing attentional demands



# Real life Applicability of Attention Training

- What components of attention is the individual having difficulty with in everyday functioning?
- Which type of attention drills will stimulate those types of attention difficulties?





# Working Memory Task

**Series I. Start at 0 +8 -6 +1**

0	8	2	3	11	5	6	14	8	9
17	11	12	20	14	15	23	17	18	26
20	21	29	23	24	32	26	27	35	29
30	38	32	33	41	35	36	44	38	39
47	41	42	50	44	45	53	47	48	56

Number Sequence	Ascending	Descending	Reverse	Every Other
23 34 98 76 8	8 23 34 76 98	98 76 34 23 8	8 76 98 34 23	23 96 8
67 89 0 32 14	0 14 32 67 89	89 67 32 14 0	14 32 0 89 67	67 0 14



## Attention Training:

### *Improves Other Cognitive Domains*

- Hold on to information longer to process it in deeper way increasing likelihood of retention of information
  - *In this way, attention training helps with memory & learning*
- Hold on to a step while performing it without distractibility
  - *In this way, attention training helps with sequencing and carrying out tasks without error*
- Increase the ability to self-monitor attention lapses and to re-engage attention
- Improved attention leads to:
  - Control over cognitive abilities
  - Confidence in cognitive abilities



“I just don’t care”

“I don’t feel like myself”

“I used to be sharp”

“I feel like I can’t control my emotions”

## Psychological Aspects of Remediation

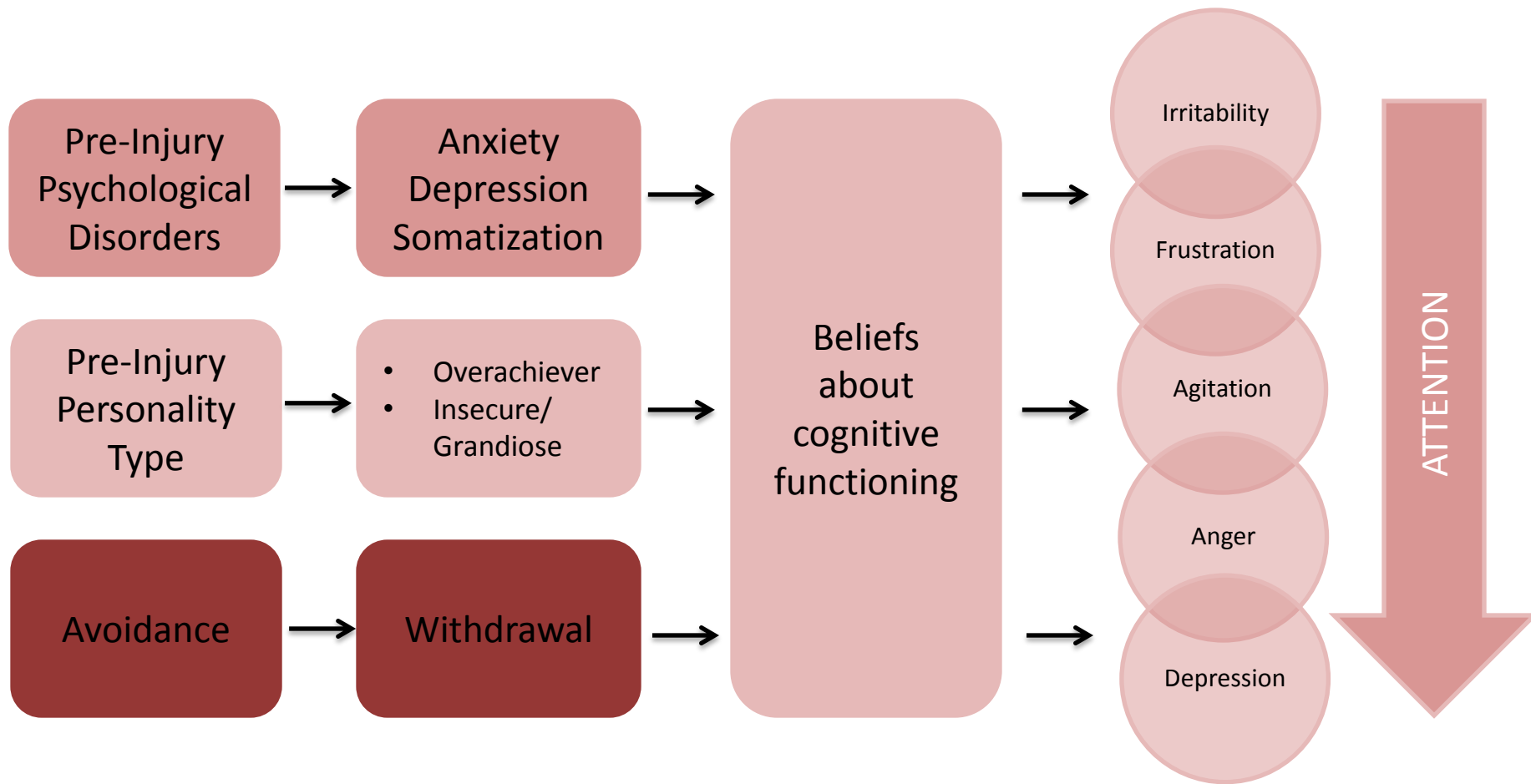
“I feel isolated”

“I don’t have the same abilities as I used to”

“I am easily irritated”



# Emotion + Neurocognitive Symptoms



# Treatment of Psychological Aspects of Brain Injury

Awareness and Hope

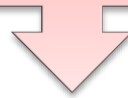


- Awareness of psychological issues on the perception of neurocognitive functioning
- Impact of ruminations of depression and anxiety on attention functioning
- Concussion/brain injury is an evolving picture, improvement can occur



# Treatment of Psychological Aspects of Brain Injury

Empowerment & Functional Sense of Self



- Taught to self monitor improvement in neurocognitive functioning both outside and within treatment session
- Helps to build a functional sense of self



# Treatment of Psychological Aspects of Brain Injury

Avoid Avoidance



- Engage in activity until symptoms reoccur rather than avoiding all activity for fear of symptom occurrence
- Derive a reintegration schedule



# The Bottom Line

- Most concussions resolve spontaneously within 2 weeks
- Some individuals with more severe concussion and pre-existing psych/cog issues may experience a longer recovery time
- Cognitive remediation plays a role in long-term cognitive and emotional recovery (specifically attention and anxiety) after brain injury





# Basically:

- Patients are ***complex***: Many have pre-injury cognitive and emotional difficulties
- Even after optimal concussion outcomes, cognitive and emotional changes can occur
- Cognitive remediation ***helps*** with both cognitive and emotional difficulties independent of origin

