



Weill Cornell Brain and Spine Center

Adult Neuropsychological Issues: Impact on Intellectual Functioning and Return to Work

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Disclosures

I receive compensation from the New York Jets
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Neuropsychological Consultation



Child vs. Adult Concussion

- Mechanism of impact usually different
 - Children: Sports most common
 - Adults: Motor vehicle accidents most common
- Neurophysiological effects similar
- Symptoms and recovery can differ
 - Children have more behavioral symptoms, longer recovery
 - Adults show more physical and cognitive symptoms
- Associated factors differ
 - Children: school, peers, family
 - Adults: work, family, responsibilities, activities, litigation





CONCUSSION

LOOK ON THE BRIGHT SIDE. FOR ONE BRIEF, GLORIOUS
MOMENT, YOU FORGOT YOU WERE ON THE CUBS.



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Reminder of Concussion Definition

1. Direct blow to the head, face, neck or elsewhere with an ‘impulsive’ force transmitted to the head.
2. Rapid onset of short-lived neurological impairment that resolves spontaneously. Sometimes, symptoms and signs may evolve over minutes to hours.
3. May result in neuropathological changes, but acute symptoms reflect a **functional** disturbance rather than **structural**— usually normal neuroimaging studies
4. May or may not involve loss of consciousness. Resolution of the symptoms typically follows a sequential course. However, in some cases symptoms may be prolonged.



Signs and Symptoms

Physical	Cognitive	Emotional	Sleep/Arousal
Headache	Feels “in a fog”	Irritability	Fatigue
Nausea/Vomiting	Attention/Concentration	Sadness	Drowsiness
Balance problems	Memory	Nervous/Anxious	Onset insomnia
Visual problems	Slow responses	More emotional	Sleeping more/less
Sensitivity to light and/or sound	Confused about recent events		
Looks “dazed”	Repeats questions		



Concussion Modifiers

Prolonged (>1 min.) LOC, amnesia

Number, severity, duration of symptoms

Convulsions (very rare)

Recent concussion(s)

Concussion from less impact than prior concussion

Co-morbidities of migraine or mental health disorders, ADHD, learning disabilities, sleep disorders

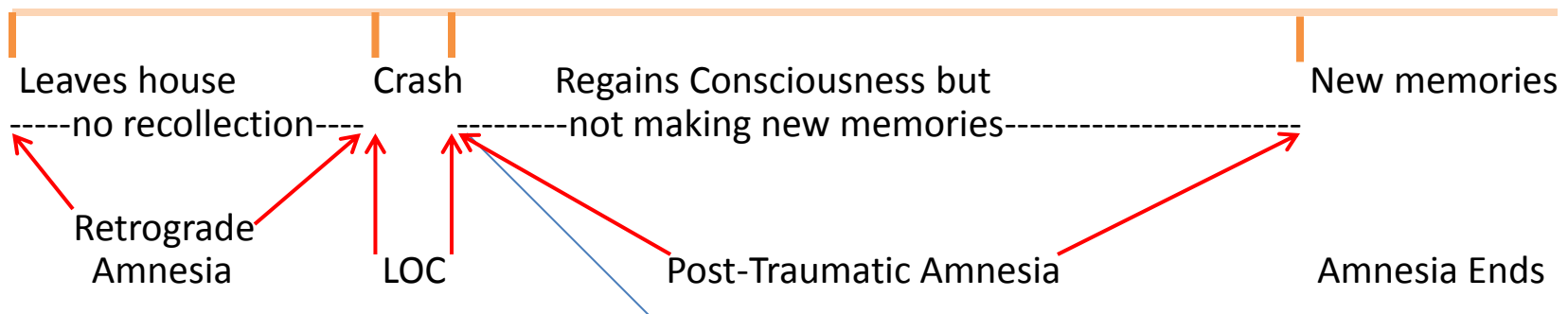
Use of psychoactive drugs or anti-coagulants

Dangerous, high-risk activity



Typical Associated Features

- Retrograde Amnesia (forgetting events prior to the injury)
- Loss of Consciousness
- Post-traumatic Amnesia (forgetting events after regaining consciousness)
- Timeline:



Cognitive Changes: Typical Domains Assessed in Neuropsychological Evaluation

- Intelligence
- Attention
- Sustained concentration
- Verbal and Non-Verbal Memory
- Language, speech, reading, writing
- Cognitive speed
- Sensory & motor abilities
- Visuo-perceptual
- Visuo-motor speed and accuracy
- Personality



Cognitive Abilities Most Affected by Concussion in Adults

- Attention & sustained concentration
- Visuo-motor speed and accuracy
- Cognitive speed
- Verbal and Non-Verbal Memory



Neuropsychological Testing: Computerized Batteries

- Reliability is very poor
- Confusion over instructions
- Wrong buttons
- Accidentally moving screen to screen
- No way to monitor effort
- “Sandbagging” at baseline
- Computer glitches– screen savers, backups
- No measure of delayed recall memory



Paper-and-Pencil, Face-Face Testing: <30'

- Post-Concussion Scale (21 signs/symptoms)
- Verbal learning
- Non-verbal learning
- Visuo-motor sequencing/speed
- Visuo-motor learning
- Attention/concentration
- Frontal executive/cognitive speed
- Review of balance Errors Scoring System (BESS)
- Review of ImPACT computerized battery and SCAT-3



Verbal Learning

Read to patient who recalls; 3 trials

Fork

Rum

Pan

Pistol

Sword

Spatula

Bourbon

Vodka

Pot

Bomb

Rifle

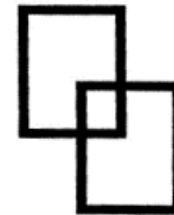
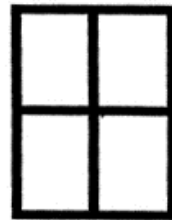
Wine



Non-Verbal Learning

Show to patient for 10", draws shape & position

Repeat over 3 trials



Attention and Concentration

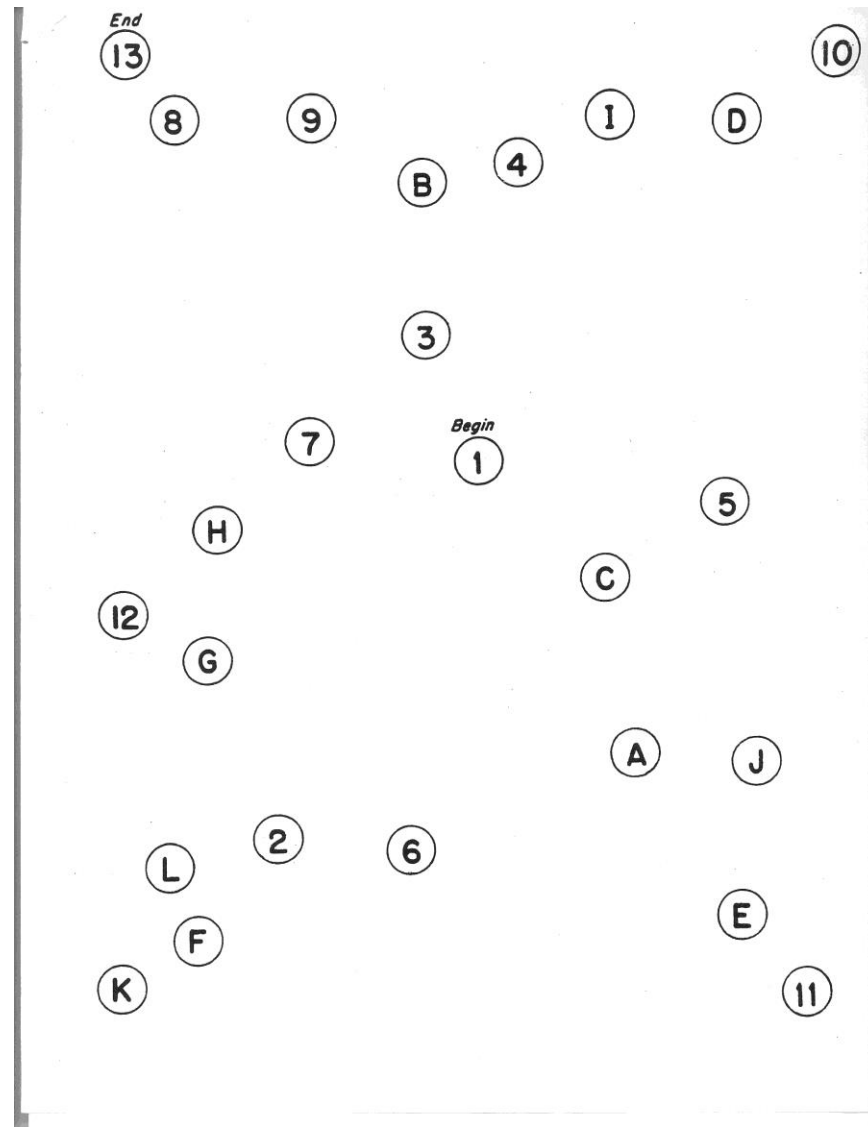
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|----------------|--------------|
| <u>Trial 1</u> | <u>5 - 9</u> |
| <u>Trial 2</u> | <u>8 - 3</u> |

The first time the patient repeats in order.
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|----------------|------------------|
| <u>Trial 1</u> | <u>4 - 1 - 5</u> |
| <u>Trial 2</u> | <u>6 - 9 - 4</u> |

The second time they are repeated backwards.
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|----------------|----------------------|
| <u>Trial 1</u> | <u>6 - 4 - 3 - 9</u> |
| <u>Trial 2</u> | <u>7 - 2 - 8 - 6</u> |
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|----------------|--------------------------|
| <u>Trial 1</u> | <u>4 - 2 - 7 - 3 - 1</u> |
| <u>Trial 2</u> | <u>7 - 5 - 8 - 3 - 6</u> |
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|----------------|------------------------------|
| <u>Trial 1</u> | <u>6 - 1 - 9 - 4 - 7 - 3</u> |
| <u>Trial 1</u> | <u>6 - 1 - 9 - 4 - 7 - 3</u> |
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|----------------|----------------------------------|
| <u>Trial 1</u> | <u>5 - 9 - 1 - 7 - 4 - 2 - 8</u> |
| <u>Trial 2</u> | <u>4 - 1 - 7 - 9 - 3 - 8 - 6</u> |
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|----------------|--------------------------------------|
| <u>Trial 1</u> | <u>5 - 8 - 1 - 9 - 2 - 6 - 4 - 7</u> |
| <u>Trial 2</u> | <u>3 - 8 - 2 - 9 - 5 - 1 - 7 - 4</u> |
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|----------------|--|
| <u>Trial 1</u> | <u>2 - 7 - 5 - 8 - 6 - 2 - 5 - 8 - 4</u> |
| <u>Trial 1</u> | <u>1 - 6 - 4 - 7 - 5 - 3 - 9 - 8 - 2</u> |



Visuo-motor speed, accuracy, shifting gears mentally



Visuo-motor perception, speed, memory

KEY

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Cognitive Speed, Cognitive Flexibility: Stroop Test

BLUE	XXXX	RED
RED	XXXX	GREEN
GREEN	XXXX	BLUE
RED	XXXX	GREEN
BLUE	XXXX	RED
RED	XXXX	BLUE
GREEN	XXXX	RED
RED	XXXX	GREEN
BLUE	XXXX	RED



Delayed Recall

- Free recall of word list
- Recognition of word list from larger list
- Free recall of non-verbal shapes and position



Recovery

- Most uncomplicated concussions resolve in 1-2 weeks, perhaps up to 6 weeks
- If more than a few symptoms, or some severe, consider evaluation at a concussion clinic
- COMPLETE cognitive and physical rest is no longer considered appropriate— no “cocoon”
- Tailor rest to symptoms— if activity produces/exacerbates symptoms, back off
- As recovery progresses, increase activity



Gradual Escalation of Exercise for Most Sports

- Stationary bicycle
- Running
- Weight lifting
- Position-specific drills (e.g., wide receiver runs routes)
- Non-contact practice
- Practice with contact
- Play

If any exercise produces symptoms, back off to prior



Same Exercise Escalation for Adults

- Exercise is good gauge of recovery
- Facilitates neuroplasticity and neurogenesis
- Promotes neurotransmitter recovery
- Improves mood
- Reduces stress
- Better sleep
- Improves self-esteem
- Only need to omit position drills and contact



Gradual Escalation at Work

Similar escalation can be done with work tasks:

- Using computer for increasing lengths of time or increasing complexity
- Attending meetings
- Writing reports
- Staying on feet if in retail sales
- Telephone work



Best Model for Work

- Interview patient about occupation
- Outline specific duties, responsibilities
- Discuss supervisors and supervisees
- Identify potential areas where concussion symptoms could interfere
- Construct plan for escalating duties within each area, and how to back off if needed
- Rest breaks, extended time for tasks
- Consider taking a FEW sick days, and then perhaps part-time days as recovering



Other Factors

- Education and reassurance
- Address stressors
 - Personal
 - Family
 - Work
 - Financial
 - Other responsibilities
- Anxiety and stress management
- Executive functions
 - Planning, organization, sequencing, prioritizing

