Neuropsychological Assessment in Sports-Related Concussion: Part of a Complex Puzzle

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Objectives

• Post-Concussion Syndrome
• Multidimensional model of concussion assessment
• Neuropsychological assessment
  – What it is
  – When to refer
  – Information gathered and domains assessed
  – Information gleamed and recommendations
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Concussion: Integrated Recovery Model

PRE-INJURY:
Normal Cerebral Function

Courtesy of Michael McCrea, PhD, ABPP-CN
Post-Concussion Syndrome

• **Somatic** (headache, fatigue, dizziness, sleep disturbance)

• **Cognitive** (inattention, forgetfulness, slowed processing)

• **Affective Symptoms** (irritability, disinhibition, lability, anxiety, depression, apathy)
Post-Concussion Syndrome: A Biopsychosocial Model

Post Injury Factors:
- Neurocognition
- Mental Health
- Social Factors
- Sleep Disturbance
- Vestibular Injury
- Chronic Pain

Pre Injury Factors:
- Personality Characteristics
- Resilience
- Vulnerability
- Preexisting Mental Health
- Substance Abuse
- Prior Brain Injuries
- Prior Medical/Neurological

1 Adapted from Iverson, 2012
Multidimensional Model of Concussion Assessment

Comorbid/Complicating Factors
Concussion History
Symptoms
Balance/Postural Stability
Cognition

Cognitive recovery often follows symptom resolution!  

Neuropsychological Assessment

• Neuropsychology: What is it?
  – Basic scientific discipline that studies how the structure and function of the brain relates to cognition, emotion, and behavior

• What do we do?
  – Examine how changes in brain influence behavior
Neuropsychological Assessment

“Look on the bright side. For one brief, glorious moment, you forgot you were on the Cubs”
Neuropsychological Assessment

Cognitive domains most implicated in concussion

- Attention
- Executive Functioning
- Processing Speed
- Memory
Neuropsychological Assessment

- Brief Screening
  - e.g., Standardized Assessment of Concussion (SAC), SCAT2
- Computerized Testing (e.g., ImPACT)
- Traditional Testing
  - Brief Evaluation
  - Comprehensive Evaluation
Hybrid Approach

Pre Injury

Baseline Computerized Testing

Post Injury

Follow-up Computerized Testing

Traditional Testing

... Neuropsychologist are the professionals best trained to interpret cognitive tests...

Deciding When to Refer

Injury & Persistent Symptoms

Brief Testing

Comprehensive Testing
Deciding When to Refer

Injury & Persistent Symptoms

• 80-90% concussions resolve in 7-10 days ¹
  – May be longer in children and adolescents ²

• Physical complaints
  – Headaches, nausea, dizziness, balance problems, sleep disturbance

• Cognitive complaints
  – concentration, memory, processing speed, word-finding

¹ McCrory, et al. 2013; ² McCrory, et al., 2005
Deciding When to Refer

Injury & Persistent Symptoms

• Physical & cognitive

14 days to 3 months post injury

Brief Testing

• No Complications

Comprehensive Testing
Deciding When to Refer

For co-occurring complications

- History of psychiatric, cognitive, developmental, or medical issues

- Complex injury:
  - LOC > 10 min, Post-traumatic amnesia > 12 hrs after medical stabilization
  - Abnormal imaging
Deciding When to Refer

**Injury & Persistent Symptoms**
- Physical & cognitive

**Brief Testing**
- 14 days to 3 months post injury
- > 3 months post injury
- No Complications

**Comprehensive Testing**
Traditional Testing: Brief vs Comprehensive

- **ALL TESTING**
  - Information gathered:
    - Record review (neuroimaging, baseline testing, school reports, previous testing)
    - Interview with parent/guardian & child
    - Current concussion symptoms
  - Results integrated with developmental, medical and psychosocial history
  - Feedback, recommendations, and education on concussion provided

- **BRIEF**

- **COMPREHENSIVE**
Traditional Testing: Brief vs Comprehensive

- **ALL TESTING**
  - One appointment - 2 to 3 hours
- **BRIEF**
  - Assessment:
    - Estimate of baseline functioning
    - Attention & Executive functioning
    - Fluency
    - Processing Speed
    - Memory
    - Mood/Effort
- **COMPREHENSIVE**
Traditional Testing: Brief vs Comprehensive

- One or multiple appointments
  - 4 to 8 hours
- Assessment:
  - Intellectual, academic, and adaptive functioning
  - Neuropsychological domains from brief screen
  - Emotional, behavioral, social functioning
Traditional Testing: Brief vs Comprehensive

ALL TESTING
- Review of developmental, medical and psychosocial history
- Feedback, recommendations, education

BRIEF
- No complications; Most common
- Refer 14 days to 3 months post injury
- One appointment- 2 to 3 hrs

COMPREHENSIVE
- Complications/pre-existing factors
- Refer > 3 months post injury
- One or multiple appointments- 4 to 8 hrs
Neuropsychological Testing Informs...

- **Return to play decisions**
- **Further referrals**
  - Psychotherapy, Vestibular Rehabilitation Therapy, Cognitive Rehabilitation
- **School accommodations**
  - Establish plan for graduated return to academics
  - Individualized Education Plan (IEP)/504 Accommodation Plan
  - Student Support Teams (SST)
Multidimensional Model of Concussion Assessment

- Comorbid/Complicating Factors
- Concussion History
- Symptoms
- Balance/Postural Stability
- Cognition

1 Echemendia, et al, 2013
Preventing Post-Concussion Syndrome

• PRIOR to injury: ¹
  – Education on psychological symptoms of concussion **IN ADDITION** to physical

• FOLLOWING injury:
  – Seeking medical attention
  – Rest for body AND mind
  – Addressing co-morbid factors

¹ Ponsford, et al, 2001
Future Directions for Research

• Baseline data
  – Computerized neuropsychological testing

• Psychological functioning in athletes
  – *How* factors influence recovery

• Concussion in young children
  – Evaluation and management
Conclusions

• Multidimensional approach to concussion management
  – Neuropsychological testing is a key element
    • Cognitive and psychological
    • One piece used in return-to-play decisions

• Traditional neuropsychological testing
  – Brief vs comprehensive depends on...
    • Co-occurring complications, pre-existing factors

• Cognitive results from neuropsychological testing inform:
  – Return to play, recommendations for school, and biopsychosocial factors
Referring to Catalpa Health

- Website: Catalpahealth.org
  - Referring providers tab ➔ Download referral form

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References


