INTRODUCTION

• Of the 1.7 million annual traumatic brain injuries, 75% are concussions. 1,2
• 1 in every 220 pediatric patients seen in ED are diagnosed with concussion. 3
• Concussion is defined as “a complex pathophysiological process affecting the brain, induced by biomechanical forces… the acute clinical symptoms largely reflect a functional disturbance.” 4
• Concussion symptoms are divided into 4 categories:

  • Physical
  • Cognitive
  • Emotional
  • Sleep

  - Headaches
  - Nausea
  - Fatigue
  - Visual Problems
  - Balance Problems
  - Sensitivity to light
  - Sensitivity to noise
  - Numbness/Tingling
  - Vomiting
  - Dizziness
  - Irritability
  - Sadness
  - More emotional
  - Nervousness
  - Sleeping more
  - Sleeping less
  - Trouble falling asleep

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  - Nervousness
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  • At initial clinical evaluation:
    • 50% of patients endorsed at least one cognitive symptom (See Figure One).
    • 64% had missed at least one day of school (See Figure Two).
    • 34% had missed a week or more of school (See Figure Two).
    • Mean scores for the overall sample fell within the average range for age on measures of initial and delayed verbal memory scores response speed, and executive functioning, although some individual patients displayed clinically significant deficits (See Table One).
    • Pre-injury diagnosis of ADHD correlated with poorer performance on the WRAML-2 verbal learning recognition (r=0.44, p=0.03).
    • Pre-injury history of Learning Disabilities correlated with poorer performance on the ACT Total (r = 0.45, p<0.007) and D-KEFS letter fluency (r = 0.40, p =0.013) and D-KEFS category fluency (r = 0.37, p=0.016).
    • Number of symptoms (cognitive or otherwise) and number of missed school days did not correlate with performance on neuropsychological testing.

  - Table One
  - Mean Performance on Neuropsychological Testing

<table>
<thead>
<tr>
<th>Descriptive Statistics</th>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
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</thead>
<tbody>
<tr>
<td>WRAML-2 Verbal Learning Immediate</td>
<td>46</td>
<td>9.5</td>
<td>2.5</td>
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<tr>
<td>WRAML-2 Verbal Learning Delayed</td>
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<td>9.7</td>
<td>2.4</td>
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<td>WRAML-2 Verbal Learning Recognition</td>
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<td>9.8</td>
<td>3.6</td>
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<td>WiIII Math Fluency</td>
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<td>102.6</td>
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<tr>
<td>ACT Total</td>
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<td>98.8</td>
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<tr>
<td>DKEFS Letter Fluency</td>
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<td>10.5</td>
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<tr>
<td>DKEFS Category Fluency</td>
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<td>11.1</td>
<td>3.0</td>
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</table>

  - Statistical Analysis
    - SPSS 18: Mean and Standard Deviations; Pearson Correlations

  • The results of this clinical chart review provide a first look at the clinical presentation and neuropsychological performance of children less than 13 years old with concussion.
    • As a group, these patients presented as symptomatic and the majority missed at least one day of school, with a sizeable group missing at least a week of school.
    • While the group presented with largely average-range performance on selected neuropsychological measures, this is not surprising given that the acute neurocognitive effects of concussion are not expected to persist.
    • It is unclear whether the average range performance displayed by the clinical sample as a whole represents a decrease from typical baseline functioning of this population given the high report of symptoms of cognitive dysfunction. Evaluation of their repeat testing after symptom resolution will be useful.
    • A multi-disciplinary approach including neuropsychological and medical expertise is useful evaluate subjective symptoms, discern causes (cognitive and physical) and approaches to school difficulty following concussion and assist with school re-entry.
    • These results also highlight the importance and need for prospective studies of pediatric populations with neuropsychological testing performed closer to the time of initial injury.
    • Prospective studies examining performance of children on neuropsychological screening measures performed within 48-72 hours post-injury are essential, given this is the time thought to be most susceptible to neurometabolic disruption following mild TBI.
    • The persistent symptoms of children who present to clinical specialist attention following concussion, may reflect the exacerbation of pre-injury risk factors, such as ADHD, learning disability, and anxiety/depression.

REFERENCES