Measurement of ADHD Symptoms in Children with Cerebral Palsy
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Abstract

Purpose/Objective:
Children with CP are thought to have increased vulnerability to ADHD symptomatology (Goodman, 1998). Items on behavioral rating scales measuring ADHD symptoms often include components of speech and motor functioning (e.g., Conners Parent Rating Scale – Revised (CPRS-R)) and there is uncertainty about how accurately these items describe inattention or hyperactivity symptoms for children with CP (Gross-Tsur et al., 2002). The purpose of the current study is to compare standard and modified versions of an ADHD symptom rating scale among children with CP.

Research Method/Design:
78 parents of typically developing children and 51 parents of children with CP completed the original Conners’ Parent Rating Scale – Revised (CPRS-R) and a modified version in which items explicitly describing speech or motor behaviors were reordered.

Results
Repeated measures analysis of variance indicated that children with CP have significantly more inattentive and hyperactive symptoms than TD children. This was true for the CPRS-R and adapted versions; however, symptom scales on the adapted version showed more hyperactivity and less inattentive symptoms for children with CP.

Conclusions/Implications.
Children with CP demonstrate more symptoms of ADHD than TD children. The adapted scale may reveal more hyperactive behaviors and fewer inattentive symptoms in children with CP. Further investigation of ADHD symptoms and measurement in this population is needed.

Purpose/ Objective

• Cerebral palsy (CP) is “a group of permanent disorders of the development of movement and posture, causing activity limitation, that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain.” Associated difficulties include sensation, perception, cognition, communication, and behavior (Rosenbaum et al., 2007). CP is thought to occur in 2/1000 live births and is the leading cause of childhood physical disability.

• Cognitive and behavioral symptoms are also known to be co-morbid with CP. (Goodman, 1998; Parkes e al., 2008). Goodman (1998) also reported a 31 percent prevalence rate of hyperactivity in a CP sample. Pirlis and colleagues (2002) report that children with spastic diplegic CP have clear deficits in attention and executive functions.

• Because children with CP are generally excluded from studies examining motor impairment in ADHD, there is a paucity of literature examining relationships between CP, motor impairment, and ADHD symptoms.

• ADHD symptoms are frequently assessed using behavior ratings scales. Current ADHD behavior rating scales may not be appropriate for children with CP due to motor and language impairments. Previous studies have attempted to use the Conners’ Parent Rating Scale (CPRS-R) with children with CP. Gross-Tsur and colleagues (2002) report that parents of children with CP did not answer several questions because they were not relevant given their child’s level of motor functioning. This calls into question the appropriateness of ADHD behavior rating scales, such as the CPRS-R, for children with motor impairments.

• It was hypothesized that children with cerebral palsy would have higher behavior ratings across ADHD symptoms domains. It was also hypothesized that adapting existing questions of the Conners’ Parent Rating Form to reduce specific motor demands would facilitate more representative assessments of ADHD symptoms in children with CP.

Methods

Participants were 78 parents of typically developing children and 51 parents of children with CP who completed the CPRS-R, a modified version of the CPRS-R in which items explicitly describing speech or motor behaviors were reordered, and a survey of demographic information. The children described by the parents in these surveys were participants in the Adapted Cognitive Assessment Laboratory in the Department of Physical Medicine and Rehabilitation at the University of Michigan. Children with CP were more likely to have gross and fine motor impairments as well as impairments in expressive language; and scored approximately 1sd below TD children on the PPVT-III, a task of receptive vocabulary. This research was completed in compliance with APA ethical standards under the IRB at UM.

Demographics by Group

<table>
<thead>
<tr>
<th>Variable</th>
<th>CP (n=51)</th>
<th>TD (n=78)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>9.02 (1.81)</td>
<td>8.88 (1.74)</td>
</tr>
<tr>
<td>Gender (% male)</td>
<td>49</td>
<td>38.5</td>
</tr>
<tr>
<td>PPVT - III</td>
<td>98 (15.9)</td>
<td>113 (11.38)</td>
</tr>
<tr>
<td>GMFCS</td>
<td>2.08</td>
<td>1.01</td>
</tr>
<tr>
<td>MACS</td>
<td>2.14</td>
<td>1</td>
</tr>
<tr>
<td>ExPRS</td>
<td>1.67</td>
<td>1.01</td>
</tr>
</tbody>
</table>

Sample Original and Adapted Questions

<table>
<thead>
<tr>
<th>CPRS-R Question</th>
<th>Adapted Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>22. Needs close supervision to get through assignments</td>
<td>22a. Needs close supervision to get through assignments, even when assignments are fully accessible</td>
</tr>
<tr>
<td>32. Restless in the “squirmy sense”</td>
<td>32a. Restless in the “squirmy sense”, apart from uncontrolled movement due to CP</td>
</tr>
<tr>
<td>52. Will run around between mouthfuls at meals</td>
<td>52a. Will become very active between mouthfuls at meals</td>
</tr>
</tbody>
</table>

Conclusions

• Children with cerebral palsy show more vulnerabilities to cognitive and hyperactive symptoms of ADHD
• The adapted symptoms scale produces equitable ratings in most symptom domains
• Hyperactivity symptoms may be under-estimated by currently available behavior rating forms
• Cognitive/Inattentive symptoms may be over-estimated by currently available behavior rating forms

Implications

• Children with CP are vulnerable to higher levels of hyperactivity and inattention.
• Currently available behavior rating scales may not adequately capture symptoms of ADHD in children with CP due to phrasing of questions
• Speech and motor impairments may mask some hyperactivity symptoms and exacerbate inattentive symptoms on behavior rating scales
• Clinicians should use caution when diagnosing children with CP with ADHD based on behavior rating scales

Future Directions

• Item-level comparison of CPRS-R and adapted symptom ratings in TD and CP groups
• Examination of construct validity of the CPRS and other behavior rating scales in children with CP
• Psychometric studies examining reliability and validity of the adapted symptom scale in CP and TD populations
• Development of specialized behavior rating scales free of motor and language demands for use in the CP population
• Further investigation of diagnostic comorbidity of ADHD and CP

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