Can the Shriners Hospital Upper Extremity Evaluation (SHUEE) detect change in dynamic position and spontaneous function of the hand in Cerebral Palsy?

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Introduction

- Cerebral Palsy (CP) is a neuromuscular condition resulting from an insult to the immature brain causing movement impairments and activity limitations.
- Unilateral CP is the most common type and is characterized by limitations in grasp, reach, and performance of manual tasks.
- Occupational therapy (OT), botulinum toxin injections, and orthopedic surgery are interventions that may improve manual ability.
- Planning interventions and evaluating outcomes relies on standardized tools:
  - The Pediatric Outcomes Data Collection Instrument (PODCI) is a patient-reported survey designed to assess functional health in children with musculoskeletal conditions.
  - The Shriners Hospital Upper Extremity Evaluation (SHUEE) is a video-based test designed to assess two dimensions of hand use.
  - Dynamic Functional Analysis (SFA) evaluates use of an unaffected UE during the performance of nine tasks.
  - Dynamic Positional Analysis (DPA) evaluates alignment of fingers & thumb, wrist, forearm, and elbow during the performance of 12 tasks.
- There is limited research describing validity of the SHUEE.

Aims

- Evaluate the relationship between change in SHUEE score and change in the Extremity and Physical Function subsection of the PODCI in youth with unilateral CP.
- Evaluate the SHUEE's responsiveness to change, specifically, its ability to detect change in dynamic position or spontaneous function following upper limb surgery in youth with unilateral CP.

Methods

- IRB approved retrospective study at Nemours Alfred I. duPont Hospital for Children (AIDHC) of clinical data collected between May 2010 - July 2017 in the Motional Analysis Lab.
- We sampled youth with CP who were candidates for UE intervention and were tested in the Motion Lab to inform treatment planning and assess outcomes.
- We retrieved itemized SHUEE scores, PODCI data, demographic information, and surgical details from the medical record.
- Patients with diagnoses inconsistent with unilateral CP were excluded from the study.

Results

<table>
<thead>
<tr>
<th></th>
<th>PODCI comparison</th>
<th>No surgery</th>
<th>Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>n (n of comparisons)</td>
<td>13 (15)</td>
<td>9 (10)</td>
<td>13 (14)</td>
</tr>
<tr>
<td>Males (Female)</td>
<td>8 (7)</td>
<td>7 (11)</td>
<td>8 (7)</td>
</tr>
<tr>
<td>Mean ± SD age at initial administration (years)</td>
<td>31.3 ± 5.58</td>
<td>31.9 ± 4.27</td>
<td>31.9 ± 5.47</td>
</tr>
<tr>
<td>Mean ± SD age at final administration (years)</td>
<td>33.1 ± 5.87</td>
<td>33.0 ± 6.47</td>
<td>15.7 ± 5.71</td>
</tr>
<tr>
<td>GMRCI</td>
<td>I</td>
<td>II</td>
<td>III</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Number of PODCI comparisons</td>
<td>15</td>
<td>5</td>
<td>10</td>
</tr>
</tbody>
</table>

Discussion

- The PODCI and SHUEE target different dimensions of hand use.
  - The SHUEE provides information about dynamic alignment and spontaneous contribution of the affected UE.
  - The PODCI provides information on the child’s performance of ADLs.
  - Our data from children with unilateral CP points to the independence of these dimensions of hand function.
  - Many PODCI tasks can be completed with only the unaffected limb.
  - Success in ADL tasks does not depend on dynamic limb alignment.

Post Upper Limb Surgery

- There is improved dynamic limb alignment at follow-up in a surgery vs. non-surgery group, but no differences in ADLs or spontaneous use of the affected limb in children with unilateral CP.
- The PODCI lacked the specificity to detect a post-op change in ADLs in a group of children with unilateral CP.
- Our findings of improved dynamic alignment and unchanged spontaneous use of the affected limb after surgical intervention is consistent with previous studies of children with unilateral CP.
- Lack of improved spontaneous hand use likely reflects early and effective compensations by the contralateral limb in unilateral CP.
- The most dramatic changes in DPA scores were at the wrist segment owing to the number of wrist surgeries, the efficacy of wrist surgery, the ease of observing changes in wrist alignment with the SHUEE, and the greater range of scores on the wrist DPA subsection.

Conclusion

- The dimensions of hand function measured by the SHUEE and the PODCI are independent and complimentary of each other in children with hemiplegic CP.
- Although dynamic limb position was improved after orthopedic surgery, this was not associated with gains in ADL performance in children with hemiplegic CP.

Acknowledgments

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