OBJECTIVE: To describe the development of the Selective Control of the Upper Extremity Scale (SCUES), a video based evaluation tool used to quantify and describe selective motor control in children with cerebral palsy and to present evidence of construct validity and reliability.

METHODS/ RESULTS: The SCUES pilot assessment was developed from a review of the evidence based literature, video-taped assessments, discussion among clinicians and use of the Selective Control Assessment of the Lower Extremity (SCALE)* as a model. Content validity was established from this pilot assessment which resulted in modifications. The modified version was used to determine the inter- and intra-rater reliability and construct validity of the SCUES.

CONTENT VALIDITY
Expert panel: 8 clinicians of various professions (mean and median 17 years of experience)
Method: The expert panel reviewed the SCUES packet and completed a questionnaire comprised of 34 statements related to the joint level analyzed, the grading system and the overall test. A comment section was provided for further clarification. Quantitative assessment was determined by calculating the content validity ratio (CVR).

Results: 9 of the 34 statements had CVR values less than 0.5 (indicating less than 75% agreement). Upon review of the expert panel’s comments, modifications were made to the administration of the forearm segment, and video examples were added for clarification of scoring definitions.

INTRA AND INTER-RATER RELIABILITY
Participants: 6 Occupational Therapists (mean clinical experience 13.8 years, median 17.5 years)
Method: Six proficient raters scored 10 videotaped cases. Blinded to their original scores the raters re-scored the 10 cases for intra-rater reliability. Inter-rater reliability was evaluated for each of the 5 joint levels and the total score using the intra class correlation based on repeated observations by each therapist.

Results: Intra-rater reliability (table 1) was excellent for all segments and joints of the affected extremity and all except the shoulder (ICC=0.60) and elbow (ICC=0.75) for the unaffected extremity. Inter-rater reliability (table 2) was excellent for all segments and joints of the affected extremity except the shoulder (ICC=0.72) and good/fair for all segments of the unaffected extremity except the forearm (ICC=0.76).

CONSTRUCT VALIDITY
Participants: 25 clients completed the SCUES, the Shiners Hospital Upper Extremity Evaluation (SHUEE), the Box and Block Test (BBT) and the Manual Ability Classification System (MACS).
Method: Spearman’s rank correlation, p, was used to compare the SCUES score with the SHUEE spontaneous functional analysis (SFA) score, the MACS rating, and the number of blocks moved on the BBT. Significance was established for p values less than 0.05.

Results: The SCUES score was strongly correlated with the scores from the SHUEE (p=.69, p<.003). The SCUES exhibited weak (non-significant) correlation with the Box and Block test (p=.47, p=.66) and the MACS score (p=.24, p=.369).

DISCUSSION: Based on this study, the SCUES may be used with clients ages 3-18 years with unilateral CP, and MACs levels I-V. The results of this study support the content validity, reliability and construct validity of the SCUES. The administration and the scoring materials are effective resources for implementation of the SCUES. The clinical utility is supported by the expert assessment of content validity and the strong inter/intra-rater reliability. The Spearman rank correlation between the SCUES and the SFA of the SHUEE supports a strong relationship between SM and spontaneous functional use of the affected upper extremity. Further studies are warranted to determine test-retest reproducibility, responsiveness, and minimally clinically important difference. Implementation of the SCUES should increase our knowledge of SMC and establish its significance with respect to upper extremity (UE) function. Understanding the complex relationship between SM and upper extremity function can help with the clinical decision-making when selecting from a variety of potential interventions.

Please rate the following statements as Agree, Disagree or Undecided. For those responses that are marked disagree or undecided, please clarify in the comments section.

Please make suggestions for improvement.

The SCUES
Time to Administer: less than 15 min
ICF-CY: Body Function/Structure
Diagnosis: Validated for Children with Unilateral CP
Age: 3 to 18 years of age
Equipment: video camera, table, chair, raised block surface
Training: Manual with directions for administration and scoring

The UE joint levels and motions examined include the shoulder (abduction/adduction • elbow (flexion/extension) • forearm (supination/pronation) • wrist (flexion/extension) • fingers/ thumb (grasp/release)

The characteristics of impaired SMC that are graded include the presence of mirror movements, movement of additional joints (other than the target or index joint), presence of trunk movement, dynamic (actual) motion less than passive (available) range of motion.

Grading scale: no SMC, moderately diminished SMC, mildly diminished SMC and normal SMC. The grade results in a numerical score.

Table 1: Intra-rater reliability

<table>
<thead>
<tr>
<th>Joint Segment</th>
<th>Affected Extremity</th>
<th>Unaffected Extremity</th>
<th>Combined (All) Extremities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoulder</td>
<td>0.76</td>
<td>0.60</td>
<td>0.72</td>
</tr>
<tr>
<td>Elbow</td>
<td>0.69</td>
<td>0.72</td>
<td>0.72</td>
</tr>
<tr>
<td>Forearm</td>
<td>0.80</td>
<td>0.76</td>
<td>0.78</td>
</tr>
</tbody>
</table>

Table 2: Inter-rater Reliability (Kappa)

<table>
<thead>
<tr>
<th>Joint Segment</th>
<th>Affected Extremity</th>
<th>Unaffected Extremity</th>
<th>Combined (All) Extremities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoulder</td>
<td>0.71</td>
<td>0.66</td>
<td>0.73</td>
</tr>
<tr>
<td>Elbow</td>
<td>0.80</td>
<td>0.76</td>
<td>0.79</td>
</tr>
<tr>
<td>Forearm</td>
<td>0.84</td>
<td>0.76</td>
<td>0.82</td>
</tr>
</tbody>
</table>

Based upon six raters who scored 10 cases individually, assigning five grades (one for each selected anatomical segment of the upper extremity being evaluated) per video study, on two separate occasions.