Development of the Hand-object Observation Tool (HOOT): an observation based assessment of upper extremity functioning in children diagnosed with bilateral cerebral palsy (BCP) GMFCS III, IV, and V, during daily activities

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OBJECTIVES

1. Development of a newly designed tool, the Hand-object Observation Tool (HOOT), to measure upper extremity functioning in children with bilateral cerebral palsy (BCP), GMFCS III, IV, and V
2. To complete the content validation process

METHODS

- The International Classification of Functioning, Disability and Health-Children and Youth Version (ICF-CY) (WHO, 2007) was utilized to identify the assessment domains: body function and activity
- The Occupational Therapy Practice Framework (OTPF-3) (AOTA, 2014) was utilized to identify assessment subdomains: occupations (play, education, ADL); client factors (movement related functions); performance skills (motor and process skills) and physical environments (community, home, school).
- Validation study logic model was developed (Figure 1)
- Administration procedures were developed from the literature and review of established standardized assessment tools

Content validation:

- Participants: 8 expert clinicians (mean years of clinical experience working with children with cerebral palsy=19.75 years) and 3 children diagnosed with BCP, GMFCS III, IV and V
- Experts viewed videos of HOOT administration, reviewed completed score forms, rated items for relevance and provided qualitative feedback regarding task relevance and representativeness of upper extremity functioning in children with BCP
- Item content validity index (I-CVI) and scale content validity index average (S-CVI/Ave) (Polit & Beck, 2006) were calculated to determine the proportion of items judged to be relevant
- Analysis of qualitative data (*NVivo* qualitative data analysis Software; QSR International Pty Ltd. Version 12, 2018)

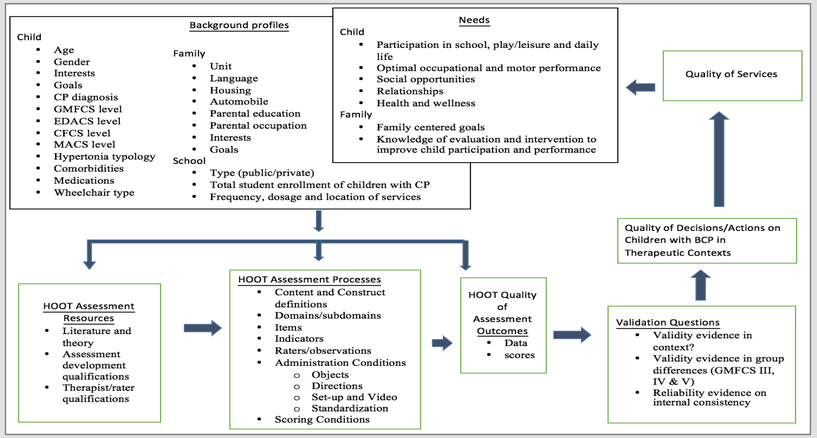

Figure 1. HOOT Validation Study Logic Model

RESULTS

The Hand-object Observation Tool (HOOT)

- **Description:** The HOOT is a manualized tool composed of 10 items in which the child reaches for, manipulates and places objects to engage in play, educational and self-care activities. Task completion time and errors are measured during the activities, when presented in three locations on a table or tray. Administration is video-recorded and scored via video observation.
- **Population:** Children, ages 5-14 years of age diagnosed with BCP, GMFCS III, IV and V
- **Time to administer**: 15-45 minutes

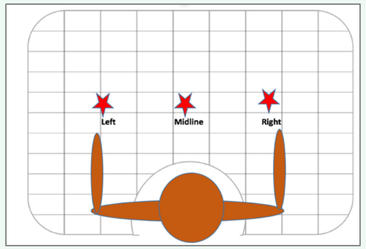

Figure 2. Prior to administration, clinicians evaluate hypertonicity and range of motion. 75% of available reaching range is calculated to determine object placement at right, left and midline locations

Figure 3. Seated and starting positions are standardized in a wheelchair or adaptive chair at a table or with mounted tray

Outcome Following set up and instruction, the child will	Indicator Within one minute, the child can (errors)
1. Activate cause and effect toy or touch screen device technology via direct selection	1.1 Reach to touch tablet/iPad (overshoot, undershoot) 1.2 Activate device/sound
2. Propel a 7" ball in any direction	2.1 Reach to touch ball (overshoot, undershoot) 2.2 Propel a ball in any direction
3. Pick up a cup from tray and place on mouth to drink*	3.1 Reach to touch cup (overshoot, undershoot) 3.2 Secure cup in hand to lift off of table (drop) 3.3 Transport cup to mouth (overshoot, undershoot, drop)

Table 1. An tem specification table was developed to identify indicators of activity and upper extremity performance

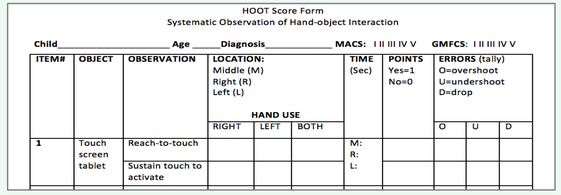

Figure 4. Score Form Sample Item

RESULTS

Content Validation

Item number/object	Number of experts in agreement (n=8)	Item CVI
1. Tablet/technology	8	1
2. Ball	6	.75
3. Cup*	8	1
4. Food*	8	1
5. Napkin	7	.875
6. Brush	7	.875
7. Marker	8	1
8. Drawstring bag	7	.875
9. Container	7	.875
10. Game	8	1
		S-CVI/AVE=0.925

Table 2. Computation of CVI or proportion of items rated 3 or 4 on a 4-point rating scale. Ratings: *1=not relevant*; 2=*somewhat relevant*; *3=quite relevant* and 4=*highly relevant*
*alternate items: (3) microphone and (4) lip-balm

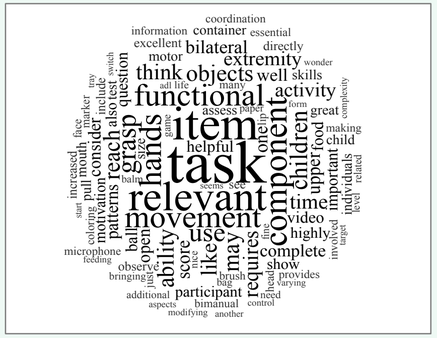

Figure 5. Word cloud of frequently used words generated from expert feedback regarding item relevance and representativeness to evaluate upper extremity functioning in children with BCP

DISCUSSION

- The HOOT is a manualized observation-based tool developed to systematically observe upper extremity performance in children with BCP GMFCS III, IV and V, during functional activities
- Based on this study, the content of the HOOT is consistent with expert opinions of upper extremity functioning in children with BCP GMFCS III, IV and V

Considerations:

- Natural context influences standardization of tool use
- Similar task completion indicators for multiple items
- Standardization of object orientation
- Additional options and/or alternative objects per item

Plan:

- Further standardization of item instruction, tool administration and scoring based on expert recommendations and pilot administration
- Inter-rater reliability and internal consistency evaluation in a full study to include tool administration in a school-based setting and rating by occupational therapists

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