OUTCOME MEASURES USED IN CEREBRAL PALSY

Types of scales & Validity, reliability & sensitivity of scales

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What is outcome measure?
Why do we have to measure the outcome?
How to choose the outcome measures?
Which scale will be able to pick up the change?
What is validity, reliability and sensitivity of a scale?
What level of ICF model do you want to target? (Body structure and function/ Activity/Participation)
Why do we have to measure the outcome?

1. It should be quantitative or qualitative
2. To monitor progress
3. To find out the effectiveness of treatment with changed scores
How to choose the outcome measures?

- Decide What do you want to measure?
  - Body structure and function
  - Activity
  - Participation

- Reliability = inter-rater and intra-rater
- **Validity** – does it measures what it proposed to measures and what you want measure.
- **Sensitivity**: is it sensitive enough to pick up the change?
- Ceiling effect
- Floor effect.
Body Structures and functions

- Range of motion (ROM)
- Modified Ashwarth scale
- Tardieu Scale
- Two-point discrimination (sensibility)
- Muscle asymmetry by EMG
- Muscle strength; Manual Muscle testing (MMT)
- Muscle strength by dynamometer
- Physiological cost index (PCI)
Activity and Participation

Gross motor function

1. Gross Motor Function Classification System GMFCS E & R (Palisano et al. 2007)
3. Functional Mobility Scale (FMS) (Graham et al. 2004)
Activity and Participation

Activities of daily living & Functional mobility

1. Pediatric Evaluation of Disability Inventory (PEDI) (Haley et al. 1992) (Feldman et al. 1990)
2. Canadian Occupational Performance Measure (COPM) (Law et al. 1990)
3. Functional Independence Measure for Children (WeeFIM) (Msall et al. 1994)
4. Bayley Motor Scale
5. Paediatric Balance Scale
6. Paediatric motor analog
Scales Descriptions

- Purpose
- Type of scale
- Target population
- Time requirements (administration & scoring)
- Administration
- Scoring
- Type of information resulting from testing
- Psychometric characteristics: reliability, validity & sensitivity
GROSS MOTOR FUNCTION
CLASSIFICATION SYSTEM
(GMFCS) E & R

Peter Rosenbaum, Doreen Bartlett, Michael Livingston,
2007
CanChild Centre for Childhood Disability Research, McMaster University
GMFCS is not used as an outcome measure.

- It is based on self-initiated movement, with emphasis on sitting, transfers, and mobility.
- The distinctions between is meaningful in daily life.
GROSS MOTOR FUNCTION CLASSIFICATION SYSTEM (GMFCS) E & R

- **Purpose** – To classify the levels of functioning in CP.
- **Target population** – CP age group 1–12yrs
- **Time taken** – varies
## General Headings for Each Level

<table>
<thead>
<tr>
<th>Level</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEVEL I</td>
<td>Walks without Limitations</td>
</tr>
<tr>
<td>LEVEL II</td>
<td>Walks with Limitations</td>
</tr>
<tr>
<td>LEVEL III</td>
<td>Walks Using a Hand-Held Mobility Device</td>
</tr>
<tr>
<td>LEVEL IV</td>
<td>Self-Mobility with Limitations; May Use Powered Mobility</td>
</tr>
<tr>
<td>LEVEL V</td>
<td>Transported in a Manual Wheelchair</td>
</tr>
</tbody>
</table>
**GMFCS E & R Descriptors and Illustrations for Children between their 6th and 12th birthday**

**GMFCS Level I**
Children walk at home, school, outdoors and in the community. They can climb stairs without the use of a railing. Children perform gross motor skills such as running and jumping, but speed, balance and coordination are limited.

**GMFCS Level II**
Children walk in most settings and climb stairs holding onto a railing. They may experience difficulty walking long distances and balancing on uneven terrain, inclines, in crowded areas or confined spaces. Children may walk with physical assistance, a handheld mobility device or used wheeled mobility over long distances. Children have only minimal ability to perform gross motor skills such as running and jumping.

**GMFCS Level III**
Children walk using a handheld mobility device in indoor settings. They may climb stairs holding onto a railing with supervision or assistance. Children use wheeled mobility when traveling long distances and may self-propel for shorter distances.

**GMFCS Level IV**
Children use methods of mobility that require physical assistance or powered mobility in most settings. They may walk for short distances at home with physical assistance or use powered mobility or a body support walker when positioned. At school, outdoors and in the community children are transported in a manual wheelchair or use powered mobility.

**GMFCS Level V**
Children are transported in a manual wheelchair in all settings. Children are limited in their ability to maintain antigravity head and trunk postures and control leg and arm movements.
Distinctions are based on
- Functional limitations,
- Need for hand-held mobility devices (such as walkers, crutches, or canes)
- Wheeled mobility,
- Much lesser extent on quality of movement

The distinctions between Levels I and II are not as pronounced as the distinctions between the other levels, particularly for infants less than 2 years of age.
The expanded GMFCS (2007) includes an age band for youth 12 to 18 years of age. Emphasis on environmental and personal factors. The focus on determining which level best represents the child’s or youth’s present abilities and limitations in gross motor function.
Reliability: good; Palisano 1997 establishes inter-rater reliability of GMFCS.

Validity: good; Palisano 1997 establishes validity of GMFCS. Authors have submitted an article reporting on the GMFCS–E&R.
GROSS MOTOR FUNCTION MEASURE (GMFM)

(Russell et al. 2002, Boyce et al. 1995)
Two version

- GMFM–88
- GMFM–66
What is the GMFM–88?

- The GMFM–88: original 88
- Item measure in 5 groups
  1. Lying And Rolling
  2. Sitting
  3. Crawling And Kneeling
  4. Standing;
  5. Walking, running, and jumping.
The GMFM–66 is a revised edition and is a subset (22 less) of the 88 items
GROSS MOTOR FUNCTION MEASURE (GMFM)

- **Purpose**: designed to evaluate change in motor performance over time in children with cerebral palsy, but can also be used for intervention purposes.
GROSS MOTOR FUNCTION MEASURE (GMFM)

- **Target Population and Ages**: Validated for
  - Cerebral palsy (GMFM–88 & GMFM–66)
  - Down syndrome (GMFM–88).

- **Age group**: 5 months to 16 years old.
- Also valid for 5 year old child without any motor disability.
GROSS MOTOR FUNCTION MEASURE (GMFM)

- Time Requirements (Administration & Scoring):
  45–60 minutes for someone familiar with the measure to administer the GMFM–88.
GROSS MOTOR FUNCTION MEASURE (GMFM)
SCORE SHEET (GMFM-88 and GMFM-66 scoring)

Version 1.0

Child’s Name: ________________________________ ID #: ________________

Assessment date: ____________________________
year / month / day

Date of birth: ________________________________
year / month / day

Chronological age: ____________________________ years/months

GMFCS Level 1

☐ ☐ ☐ ☐ ☐ ☐
I II III IV V

Testing Conditions (e.g., room, clothing, time, others present)

Evaluator’s Name: ________________________________
<table>
<thead>
<tr>
<th>DIMENSION</th>
<th>SCORING</th>
<th>NO OF ITEMS</th>
<th>TOTAL SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. LYING &amp; ROLLING</td>
<td>0–3</td>
<td>17</td>
<td>51</td>
</tr>
<tr>
<td>B. SITTING</td>
<td>0–3</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>C. CRAWLING &amp; KNEELING</td>
<td>0–3</td>
<td>14</td>
<td>42</td>
</tr>
<tr>
<td>D. STANDING</td>
<td>0–3</td>
<td>13</td>
<td>39</td>
</tr>
<tr>
<td>E. WALKING, RUNNING &amp; JUMPING</td>
<td>0–3</td>
<td>24</td>
<td>72</td>
</tr>
</tbody>
</table>
GROSS MOTOR FUNCTION MEASURE (GMFM)

- SCORING KEY
  - 0 = does not initiate
  - 1 = Initiates
  - 2 = Partially completes
  - 3 = Completes
  - NT = Not tested [used for the GMAE scoring]

It is now important to differentiate a true score of “0” (child does not initiate) from an item which is Not Tested (NT)
# GMFM RAW SUMMARY SCORE

<table>
<thead>
<tr>
<th>DIMENSION</th>
<th>CALCULATION OF DIMENSION % SCORES</th>
<th>GOAL AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Lying &amp; Rolling</td>
<td>Total Dimension A = 51 ÷ 51 × 100 = ____%</td>
<td>A. □</td>
</tr>
<tr>
<td>B. Sitting</td>
<td>Total Dimension B = 60 ÷ 60 × 100 = ____%</td>
<td>B. □</td>
</tr>
<tr>
<td>C. Crawling &amp; Kneeling</td>
<td>Total Dimension C = 42 ÷ 42 × 100 = ____%</td>
<td>C. □</td>
</tr>
<tr>
<td>D. Standing</td>
<td>Total Dimension D = 39 ÷ 39 × 100 = ____%</td>
<td>D. □</td>
</tr>
<tr>
<td>E. Walking, Running &amp; Jumping</td>
<td>Total Dimension E = 72 ÷ 72 × 100 = ____%</td>
<td>E. □</td>
</tr>
</tbody>
</table>

TOTAL SCORE = \[
\frac{\%A + \%B + \%C + \%D + \%E}{5}
\] = ____%  

GOAL TOTAL SCORE = \[
\text{Sum of \% scores for each dimension identified as a goal area} ÷ \text{# of Goal areas}
\] = ____%
<table>
<thead>
<tr>
<th>AID</th>
<th>DIMENSION</th>
<th>ORTHOSIS</th>
<th>DIMENSION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rollator/Pusher</td>
<td></td>
<td>Hip Control</td>
<td></td>
</tr>
<tr>
<td>Walker</td>
<td></td>
<td>Knee Control</td>
<td></td>
</tr>
<tr>
<td>H Frame Crutches</td>
<td></td>
<td>Ankle-Foot Control</td>
<td></td>
</tr>
<tr>
<td>Crutches</td>
<td></td>
<td>Foot Control</td>
<td></td>
</tr>
<tr>
<td>Quad Cane</td>
<td></td>
<td>Shoes</td>
<td></td>
</tr>
<tr>
<td>Cane</td>
<td></td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td></td>
<td>Other</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>(please specify)</td>
<td></td>
</tr>
</tbody>
</table>

(please specify)
### RAW SUMMARY SCORE USING AIDS/ORTHOSSES

<table>
<thead>
<tr>
<th>DIMENSION</th>
<th>CALCULATION OF DIMENSION % SCORES</th>
<th>GOAL AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>F. Lying &amp; Rolling</td>
<td>Total Dimension A = _______ × 100 = _______ %</td>
<td>A. □</td>
</tr>
<tr>
<td>G. Sitting</td>
<td>Total Dimension B = _______ × 100 = _______ %</td>
<td>B. □</td>
</tr>
<tr>
<td>H. Crawling &amp; Kneeling</td>
<td>Total Dimension C = _______ × 100 = _______ %</td>
<td>C. □</td>
</tr>
<tr>
<td>I. Standing</td>
<td>Total Dimension D = _______ × 100 = _______ %</td>
<td>D. □</td>
</tr>
<tr>
<td>J. Walking, Running &amp; Jumping</td>
<td>Total Dimension E = _______ × 100 = _______ %</td>
<td>E. □</td>
</tr>
</tbody>
</table>

**TOTAL SCORE** = \[
\frac{\%A + \%B + \%C + \%D + \%E}{\text{Total \# of Dimensions}}
\] = _______ = _______ %

**GOAL TOTAL SCORE** = \[
\frac{\text{Sum of \% scores for each dimension identified as a goal area}}{\# \text{ of Goal areas}}
\] = _______ = _______ %
Peabody Developmental Motor Scales, Second Edition (PDMS–2)

M. Rhonda Folio and Rebecca R. Fewell
Purpose: assessment of gross and fine motor skills.

Type of Test: evaluative, can also be used for interventions

Target Population: birth to age 5

Time Requirements: 45 to 60 minutes
The Peabody Gross Motor Scale and the Peabody Fine Motor Scale consist of 170 and 112 items, respectively. Each item is scored on a three-point scale:
0 = Unsuccessful
1 = Clear resemblance to item criterion, but criterion not fully met;
2 = Successful performance, criterion met.
EVIDENCE:
Reliability: good, r=0.84–0.99

EVIDENCE:

Validity: Convergent – total scores correlate well to Movement Assessment Battery for Children (M–ABC); however, low agreement between two tests in their ability to identify children with difficulties; PDMS–2 less sensitive to mild motor impairment

Peabody Developmental Motor Scales, Second Edition (PDMS–2)

- EVIDENCE:
  - Validity:
  - Concurrent: good to high correlations with Bayley Scales of Infant Development (BSID–II); poor agreement between classification of significant delayed, mildly delayed, and within normal limits; good validity for age equivalent scores but not for standard scores

Peabody Developmental Motor Scales, Second Edition (PDMS–2)

- **Strengths**: reliability, amount of information provided from scoring

**Weaknesses**: validity, time required for administration

**Clinical Applications**: can be used as an assessment tool for motor developmental delays as well as to guide interventions
ACTIVITIES OF DAILY LIVING & FUNCTIONAL MOBILITY OUTCOME MEASURES
Canadian Occupational Performance Measure (COPM)

Mary Law, Sue Baptiste, Anne Carswell, Mary Ann McColl, Helene Polatajko, Nancy Pollock
Purpose–

To detect change in a client's self-perception of occupational performance over time.

It identifies problem areas in occupational performance, evaluates performance and satisfaction relative to those problem areas, and measures changes in a client's perception of his/her occupational performance over the course of therapy.
Type of Test screening, evaluative, interview, observation, checklist or inventory)

It has a semi-structured interview format and structured scoring method.

Change scores between assessment and reassessment using the COPM are the most meaningful scores derived from this assessment.
Canadian Occupational Performance Measure (COPM)

- Target Population and Ages – > 8yrs
- It was designed for use with all clients regardless of their diagnosis. It may be of less value when the focus of the therapeutic intervention is very narrow in acute care settings where the intervention time is short and there is no anticipated follow-up.
- cannot use directly with very young children or individuals with severe cognitive deficits. In these cases, proxies will be necessary.
Canadian Occupational Performance Measure (COPM)

- Time Requirements—Administration and Scoring—20–40 minutes.
Canadian Occupational Performance Measure (COPM)

- Scoring – categories are:
  - Self-care,
  - Productivity,
  - Leisure;
- 1 = highest priority to 10 = lowest priority

Type of information resulting from testing (e.g. standard scores, percentile ranks)

- Change in scores from assessment to re-assessment are the most meaningful
Canadian Occupational Performance Measure (COPM)

- Reliability, Validity–
  Good reliability and validity of the COPM.
- Clinical utility– used with a wide variety of clients in many different settings.
- Sensitive to change
Canadian Occupational Performance Measure (COPM)

- Change of 2 or more points represents a clinically important change.
- It is an individualized measure, so the meaning of the change scores may vary by individual.
Canadian Occupational Performance Measure (COPM)

**Strengths**–
- Relatively quick;
- Used at admission and discharge
- Useful to see change in patient over time and see benefits of interventions

**Weaknesses**–
- Cost (must buy materials and train to use material);
- Cannot be used directly with very young children or individuals with severe cognitive deficits.
Clinical Applications–

- It assists therapists in using a client–centered approach to service delivery by indicating the family's priorities.
- Individualized and targeted to the areas of greatest need
- Offers an effective system of measuring the outcomes of therapy.
Pediatric Evaluation of Disability Inventory (PEDI)

Authors: Stephen M. Haley, Wendy J. Coster, Larry H. Ludlow, Jane T. Haltiwanger, and Peter J. Andrellos

Source: Pearson Education Inc. 19500 Bulverde Rd. San Antonio TX 78259
Costs: Manual $115.00, Scoring forms $39.00, software $250.00 iatric Evaluation of Disability Inventory (PEDI)
Pediatric Evaluation of Disability Inventory (PEDI)

- **Purpose**– Analyze functional capabilities in self care, mobility and social function
- **Type of test**– Inventory
- **Target population**– 6 months to seven years, can be used in older children with functional delays
- **Time requirements**– 45–60 minutes
Pediatric Evaluation of Disability Inventory (PEDI)

- **Scoring**– Standard and scaled performance scores
- **Type of Information resulting from testing**– Child’s developmental delayed
- **Improvements over the course of the year.**
Psychometric Characteristics

a) Standardization/ normative data–

For children 6 months to 7 ½ years normative scores give information on how sample compares to typically developing children.
Evidence of reliability–
On scale level – 0.90
self–care domain – 0.89
mobility domain – 0.74
social function domain – 0.87.

(Reliability of the Dutch PEDI. Clinical Rehabilitation. 2003; 17: 457–462)
Evidence of Validity—
Discriminate analysis (sensitivity and specificity. Correct predictions of disabled vs. nondisabled
- Children without disabilities (93.5% correctly predicted)
- Children with disabling conditions (91.6% correctly predicted).

The discriminative validity of the PEDI between children with and without disabilities was excellent.

Pediatric Evaluation of Disability Inventory (PEDI)

**Strengths**–
Can determine amount of developmental delay in ages 6 months to 7 ½ years, and also serves as a means of comparison across time high validity and reliability.

**Weaknesses**–
Time consuming; takes 45–60 min. to administer, can vary based on parenting styles, not validated for children over 7 ½ years of age.

**Clinical Applications**–
Determine level of developmental delay, document improvements over time.
PEDIATRIC QUALITY OF LIFE INVENTORY (PedsQL)
PURPOSE
The PedsQL Measurement Model is a modular approach to measuring health-related quality of life (HRQOL) in healthy children and adolescents and those with acute and chronic health conditions.

The PedsQL Measurement Model integrates both generic core scales and disease-specific modules into one measurement system.

TYPE OF TEST
Inventory (survey of parent and child separately)
PEDIATRIC QUALITY OF LIFE INVENTORY (PedsQL)

- ADMINISTRATION
  The PedsQL should be completed before any other health data forms. The PedsQL should be administered to the parent and the child separately. Parents, Children (8–12), Teens (13–18) may self-administer the test after introductory instructions. For young children (5–7) the PedsQL should be administered by reading the instructions and each item to the child word for word.

- When reading the items, a neutral tone should be kept in voice.

- Document all reasons for refusal or non-completion of the PedsQL.
SCORING
Scores can be broken down into a Generic Core Scale, Psychosocial Health Summary Score, and a Physical Health Summary Score.
SCORING

The items of the four Generic Core Scales include:
- physical functioning,
- emotional functioning,
- social functioning, and
- school functioning

are grouped together on questionnaire.
Psychosocial Health Summary Score include:
- emotional,
- social,
- school functioning scales.

The Physical Health Summary Score is the same as the physical functioning scale score.
Scoring is on a 0–100 linear scale, with a higher score indicating a better health-related quality of life.

Never = 0 raw score (100 points)
Almost Never = 1 raw score (75 points)
Sometimes = 2 raw score (50 points)
Often = 3 raw score (25 points)
Almost Always = 4 raw score (0 points)
PEDiatric Quality of Life INVENTORY (PedsQL)

- Type of Information, Resulting from Testing
  Determines the pediatric health–related quality of life from the child’s perspective and the parent’s perspective.

- A higher score on the survey indicates a higher perceived quality of life.
PEDIATRIC QUALITY OF LIFE INVENTORY (PedsQL)

- **PSYCHOMETRIC CHARACTERISTICS STANDARDIZATION/ NORMATIVE DATA**
  No normative data was found

**EVIDENCE OF RELIABILITY**

- Internal consistency is excellent, \( p > 0.70 \) standard for the generic core scale.
- Item response distributions were across the full scale range, and there were no documented floor effects and only minimal ceiling effects.
EVIDENCE OF VALIDITY
The PedsQL self- and proxy-report distinguished between children with and without a chronic health condition, and within the group of children with a chronic condition, between those who did or did not have an overnight hospital visit in the last 12 months. Both child self-report and parent proxy-report correlated significantly with the number of days the child was too ill to pursue normal activities, needed someone to care for him or her, missed school in the last month, the number of days the parent missed from work in the last month, and parent-report of problems pursuing their normal work routine and concentrating at work. The PedsQL Generic Core Scales are also responsive to clinical change, as demonstrated in field trials.
DISCRIMINATIVE
- Pediatric HRQOL instruments must have a clear conceptualization of the HRQOL construct for pediatric populations. A pediatric HRQOL instrument must be multidimensional, consisting at a minimum of the physical, mental, and social health generic core dimensions. The 23 item, multidimensional PedsQL Generic Core Scales encompass the essential core domains for pediatric HRQOL measurement: 1) Physical Functioning (8 items), 2) Emotional Functioning (5 items), 3) Social Functioning (5 items), and 4) School Functioning (5 items).

PREDICTIVE
- No documents were found on this issue
STRENGTHS

- Brief, as it is only 23 items long
- Practical – it takes less than 4 minutes to complete
- Flexible – designed for use in the community, school, and in the clinical pediatric populations
- Developmentally appropriate – Ages 2–18
- Multi-Dimensional – includes questions about physical, emotional, social, and school functioning
- Reliable
- Valid
- Responsive to clinical change over time
- Can be translated into multiple languages
• WEAKNESS
  o Children may have a different perspective on their actual quality of life
  o Parent could have a skewed perspective on the child’s quality of life
  o Interpretation may be less valid for younger children (<4 years old) due to lack of ability to read and understand questions.
CLINICAL APPLICATIONS

- Can be completed in the clinic, and used as a base line measure prior to initial evaluation and can be used to verbalize any concerns the parent or child may have while providing a private and supportive environment. This is a very time efficient tool that can be used as an outcome measure for further data collection at a later time.
UPPER LIMB FUNCTION SCALES
Pediatric Motor Activity Log (PMAL),
Pediatric Motor Activity Log (PMAL),

- PMAL
- The following is a list of activities and the scoring format for use of the more-affected arm in different activities in the life situation. (Note that a revised version of this test is currently in use.)
The PMAL is a semistructured interview administered every other day to a child’s principal caregiver, which in the case of all subjects in this experiment was the mother. It obtains systematic data about 22 distinct arm–hand functional activities typical of young children. It is an adaptation of the Motor Activity Log developed for adult patients with stroke. The adult Motor Activity Log is psychometrically robust, yielding scores that remain stable during a 2–week period when either a placebo treatment or no treatment was administered. It has high internal consistency (Cronbach’s .88 to .95), interrater reliability (patient compared with primary caregiver, Intra Class Correlation type 3, 1 .90), and high test–retest reliability (r .94; P .01)
<table>
<thead>
<tr>
<th></th>
<th>How Often</th>
<th>How Well</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Hold a bottle/cup</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Pick up and hold a small item while sitting in a chair</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Pick up and hold a large item while sitting in a chair</td>
<td></td>
<td></td>
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<tr>
<td>4. Eat finger foods</td>
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<td></td>
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<tr>
<td>5. Pick up an object out of arm’s reach</td>
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<td></td>
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<tr>
<td>6. Push a button</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Open a door or cabinet</td>
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<td></td>
</tr>
<tr>
<td>8. Use arm to move across floor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Take off shoes or socks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Pull a toy with a string</td>
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<td></td>
</tr>
<tr>
<td>11. Turn a knob</td>
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<td></td>
</tr>
<tr>
<td>12. Pick up a cylindrical object (e.g., crayon, marker, or drumstick)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Throw a ball or similar object</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Hold a handle on a riding, pulling, or push toy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Push up front of body with weaker arm while on stomach</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Hold an item while in standing position</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Carry an item from place to place</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Stop or roll a ball</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Pop bubbles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Push into sitting position</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Reach to be picked up by parent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Push arm through sleeve of clothing</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
How–Often Scale
0.0—Never used weaker arm when the task was attempted.
0.5—
1.0—Seldom used weaker arm when the task was attempted.
1.5—
2.0—Used weaker arm 25% of times when the task was attempted.
2.5—
3.0—Used weaker arm on half of the occasions the task was attempted.
3.5—
4.0—Used weaker arm on most of the occasions the task was attempted.
4.5—
5.0—Used weaker arm on almost every occasion that the task was attempted.
How–Well Scale

0.0—Weaker arm was not used at all for that activity (no use).

0.5—

1.0—Weaker arm was moved during that activity but was not helpful (very poor).

1.5—

2.0—Weaker arm was of some use during that activity but needed some help from the stronger arm or moved very slowly or with difficulty (poor).

2.5—

3.0—Weaker arm was used for that activity, but movements were slow or were made with only some effort (fair).

3.5—

4.0—Movements made by weaker arm for that activity were almost typical for age but not quite as fast or accurate (almost normal).

4.6—

5.0—Ability to use the weaker arm for that activity was typical for age (normal).
CHILD ARM USE TEST
The TAUT is a standardized laboratory motor test in which a series of 22 tasks/play activities are presented before treatment. The examiner tries to elicit the child’s best effort to secure or activate a toy or perform a given task. If the child does not use the more-impaired arm or hand at first, then the child is asked to try the task with that arm/hand, restraining the less-impaired upper extremity if necessary. Videotapes of these sessions were scored independently by 2 experienced pediatric occupational therapists (intrarater reliability .98) who were blind to the treatment group and pre- or posttreatment status of the children. A list of test activities, the scoring format, and the scoring scales for both the PMAL and TAUT are contained in Appendices 1 and 2, respectively.
CHILD ARM USE TEST

- Laboratory Motor Test
  - Test objects are placed in front of the subject (tasks 1–10) or affixed with Velcro to a vertical board facing the subject (tasks 11–21). Test performance was videotaped and rated independently by 2 blinded, experienced clinicians having a high interrater reliability (.95).
Scoring Instructions
(Rated from videotape; raters were blinded to
group and pre- or posttreatment status.)

Arm Selection
On unforced first attempt of each activity (both
arms available for use), which arm was chosen?
R  Right arm  L  Left Arm

Use the following scales to rate the child’s best
effort
with the more-involved arm.
Amount of Participation

0 Child does not attempt to use the more-involved arm.

1 Child moves more-involved arm during task, but it does not contribute to task completion.

2 Child uses more-involved arm to carry out the task regardless of whether the task was performed in an age-typical manner.
<table>
<thead>
<tr>
<th>Hand Used (Right/Left)</th>
<th>Amount of Participation</th>
<th>How Well</th>
<th>Willingness</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Strike a toy with hammer</td>
<td></td>
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<tr>
<td>2. Use markers for scribbling</td>
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<tr>
<td>3. Pick up snack</td>
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<tr>
<td>4. Pull lever</td>
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<td></td>
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<tr>
<td>5. Push button</td>
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<tr>
<td>6. Turn knob</td>
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<td></td>
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<tr>
<td>7. Push top</td>
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<td></td>
<td></td>
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<tr>
<td>8. Remove puzzle pieces with large knob</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>9. Remove puzzle pieces with small knob</td>
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<td></td>
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<tr>
<td>10. Squeeze horn</td>
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<td></td>
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<tr>
<td>11. Remove ball</td>
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<td></td>
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<tr>
<td>12. Place or throw ball</td>
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<td></td>
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<tr>
<td>13. Remove phone (vertical orientation)</td>
<td></td>
<td></td>
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<tr>
<td>14. Remove phone (horizontal orientation)</td>
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<tr>
<td>15. Unclip clothes pin (weak spring) from the edge of vertical surface</td>
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<tr>
<td>16. Unclip clothes pin (moderate spring) from edge of vertical surface</td>
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<tr>
<td>17. Unclip clothes pin (strong spring) from edge of vertical surface</td>
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<td></td>
<td></td>
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<tr>
<td>18. Unclip clothes pin (weak spring) from edge of horizontal surface</td>
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<td></td>
</tr>
<tr>
<td>19. Unclip clothes pin (moderate spring) from edge of horizontal surface</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Unclip clothes pin (strong spring) from edge of horizontal surface</td>
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<tr>
<td>21. Release clothes pin</td>
<td></td>
<td></td>
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</tbody>
</table>

Global Rating ___
- **How-Well Scale**
- (Same as for PMAL)
- **Willingness Scale**
- 0. Never attempted activity with more-involved arm.
- 1. Considerable resistance: pulled away or took an excessive amount of time to attempt with more-involved arm.
- 2. Some resistance: required a few prompts (tapping or cueing the more-involved arm) or needed less-involved arm restrained.
- 3. No resistance: attempted activity with more-involved arm with minimal prompting.
Global Rating

Rate your overall reaction to the child’s ability to utilize the more-involved arm, with 0 being no ability and 10 being age-typical ability.

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |