QUEST
Quality of Upper Extremity Skills Test

Carol DeMatteo
Mary Law
Dianne Russell
Nancy Pollock
Peter Rosenbaum
Stephen Walter

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Abstract

It is important to evaluate the effectiveness of therapy delivered to improve the function of children with cerebral palsy. One of the primary reasons cited for the lack of evidence of treatment effect is the limitations in the measurement tools available to evaluate the effects of therapy on motor function. To determine the effects of therapy on motor ability and function, reliable and valid measures are required.

The QUEST (Quality of Upper Extremity Skills Test) was developed to specifically overcome the limitations of measures of hand function currently available. This measure evaluates quality of upper extremity function in four domains: dissociated movement, grasp, protective extension, and weight bearing. It is designed to be used with children who exhibit neuromotor dysfunction with spasticity and has been validated with children 18 months to 8 years of age.

Our study group based at McMaster University completed a multi-centre trial evaluating the effect of neurodevelopmental therapy (NDT) and upper extremity casting on improvement of hand function in children with cerebral palsy.

Data collected during that study was analyzed to examine the validity and responsiveness of the QUEST. Consensus meetings were held with therapists who have used the QUEST, reliability testing was completed and a manual of test administration was written.

The results of these studies indicate that the QUEST is a criterion referenced measure with excellent reliability. The QUEST correlates strongly with another measure of hand function, the Peabody Developmental Fine Motor Scales. The QUEST is useful as a measure for therapists to use in describing upper extremity quality of movement and planning intervention programs.
Since treatment is costly and disruptive to other aspects of the child’s life, it is important to determine what treatment and therapy regimens are effective for children with cerebral palsy (CP). In order to evaluate the effectiveness of therapy, validated measures of motor function are needed.

Reviews of studies of occupational therapy and physiotherapy for children with cerebral palsy have found that as research designs become more rigorous, the evidence of the effect of therapy decreases. One of the primary reasons cited for the lack of evidence of treatment effect, is the limitations in the measurement tools available to evaluate motor function. Firstly, many tools were only developed for normal children and secondly, most of them have not been tested to ensure that their reliability, validity and responsiveness are adequate.

Our study group completed a multi-centre trial evaluating the effect of neurodevelopmental therapy (NDT) and upper extremity casting on improvement of hand function in children with cerebral palsy (Law, Cadman, Rosenbaum, DeMatteo, Walter & Russell, 1991). The initial outcome measures for this study included: the Peabody Fine Motor Scale (PDMS-FM) (Folio & Fewell, 1983), a measure of muscle tone, and measures of range of movement (ROM). It quickly became apparent in pretesting outcome measures that the PDMS-FM, which primarily measures quantitative hand function (that is, whether the child performs a fine motor task or not), would not be sufficient to capture important aspects of the quality of the movement, or how well the child performed that task. We felt that we required a measure of the quality of hand and upper extremity function to measure important changes of therapy.

Therefore, before the study commenced, an NDT-trained occupational therapist (CD) developed the QUEST (Quality of Upper Extremity Skills Test). The QUEST has been tested extensively in the clinic by the 16 therapists involved in the study.
Cerebral palsy (CP) is a group of chronic non-progressive disorders of the development of postural control and movement caused by injury to the developing central nervous system (Ingram, 1964). No definitive treatment exists for children or adults with CP. Conventional systems of therapy attempt to influence the development of postural control, muscle tone and reflex activity through a combination of body positioning, active exercises, and prevention of postures which enhance tonal and reflex abnormalities (Bobath & Bobath, 1964; Jones, 1975; Levitt, 1977). Treatment approaches usually comprise a combination of occupational therapy, physiotherapy, surgery, and orthotics. Recently, more invasive techniques such as rhizotomy have been used.

Parette and Hourcade (1984), Palisano (1990), and Piper (1990) reviewed studies designed to evaluate therapeutic interventions for gross and fine motor problems in CP. They found that as the research designs became more rigorous, the evidence to support the effectiveness of therapy decreased. The authors suggest that the measures of motor function used in these studies were unlikely to be responsive to important changes in motor function which may have occurred as a result of therapy. Martin and Epstein (1976) identify a lack of suitable methods and instruments for quantifying motor behaviour as a major limitation in attempts to evaluate effectiveness of therapy in CP.

Law (1987) has summarized the criteria needed to evaluate the usefulness of measurement instruments. The criteria include the clinical utility, construction and scaling, standardization, reliability, validity and responsiveness. To determine the need for or evaluate the effectiveness of therapy intervention, a valid measurement instrument is required. The most important characteristics for an outcome measure are that it be 1) responsive, that is, shown to be sensitive to change within individuals; 2) reliable, that is, stable in the absence of change; and 3) valid, that is, measure what its supposed to measure. A review of the literature shows that few measures currently available to measure hand function meet these criteria (Table 1).

Most assessments of hand function have been developed for use with adults to measure muscle strength, range of joint motion, sensory status and the functional performance of the hands (Evans & Lawton, 1984; Jebsen, Taylor, Trotter & Howard, 1969; Kellor, Frost, Silverberg, Iverson & Cummings, 1971; Mathiowetz, Volland, Cashman & Weber, 1985; Sherik, Weiss & Flatt, 1971). Some of these tests of hand function have been adapted for use with children, and normative data have been collected on children from 5 to 19 years of age. The focus of these tests have been on specific skills such as strength (Ager, Olivett & Johnston, 1984) and coordination (Mathiowetz, Federman & Weimer, 1985).

Sand and his colleagues (Sand, Taylor, Hill, Kosky & Rawlings, 1974; Sand, Taylor & Sakuma, 1973) have applied the test modified by Taylor (1973) to different clinical populations, including children with myelomeningocele and developmental disabilities.
<table>
<thead>
<tr>
<th>Criteria</th>
<th>Taylor, Sand &amp; Jebson</th>
<th>Lundberg</th>
<th>PDMS</th>
<th>Erhardt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age:</td>
<td>6 to 19 years</td>
<td>1 to 3 years</td>
<td>Birth to 83 months</td>
<td>Birth to 72 months</td>
</tr>
<tr>
<td>Population:</td>
<td>Nondisabled*</td>
<td>Nondisabled</td>
<td>Nondisabled*</td>
<td>Nondisabled*</td>
</tr>
<tr>
<td><strong>Clinical Utility</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) instructions</td>
<td>Excellent</td>
<td>Good</td>
<td>Excellent</td>
<td>Poor</td>
</tr>
<tr>
<td>b) completion time</td>
<td>20 minutes</td>
<td>10 minutes</td>
<td>30-40 minutes</td>
<td>30 minutes</td>
</tr>
<tr>
<td>c) format</td>
<td>Timed performance</td>
<td>Task performance</td>
<td>Task performance</td>
<td>Observation,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Task performance</td>
</tr>
<tr>
<td><strong>Standardization</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) item selection</td>
<td>No discussion of item selection process</td>
<td>Not given</td>
<td>Excellent</td>
<td>Literature review</td>
</tr>
<tr>
<td>b) level of measurement</td>
<td>Interval (time)</td>
<td>Nominal</td>
<td>Ordinal</td>
<td>Ordinal</td>
</tr>
<tr>
<td><strong>Reliability</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) observer</td>
<td>Not assessed</td>
<td>Not assessed</td>
<td>Adequate</td>
<td>Adequate</td>
</tr>
<tr>
<td>b) test-retest</td>
<td>Excellent</td>
<td>Not assessed</td>
<td>Adequate</td>
<td>Not assessed</td>
</tr>
<tr>
<td><strong>Validity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) content validity</td>
<td>Not assessed</td>
<td>Not assessed</td>
<td>Excellent</td>
<td>Good</td>
</tr>
<tr>
<td>b) construct validity</td>
<td>Good</td>
<td>Not assessed</td>
<td>Excellent</td>
<td>Not assessed</td>
</tr>
<tr>
<td>c) criterion validity</td>
<td>Not assessed</td>
<td>Not assessed</td>
<td>Adequate</td>
<td>Good</td>
</tr>
<tr>
<td>d) responsiveness</td>
<td>Not assessed</td>
<td>Not assessed</td>
<td>Poor</td>
<td>Not assessed</td>
</tr>
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</table>

* these assessments are used with children with disabilities but items are based on normal development

In this test children are timed as they complete seven manual activities: writing, turning over cards, picking up small objects, simulated feeding, stacking checkers, and picking up large, light and heavy objects. Results showed that this test was reliable, and could discriminate neurologically and developmentally disabled children from normal school-aged children on the basis of their speed of performance. This test looks globally at hand function; scoring is based solely on the speed of task completion and does not address the quality of the performance.

There have been few attempts to measure hand function in the infant or young child. Lundberg (1979a) described an assessment procedure in which arm and hand function were studied in children aged between one and three years. Her evaluation measures hand preference, posture, and the type of grasp used during a drawing task. She has used the test with a cohort of children whose ages were 15 or 18 months (Lundberg, 1979b), and showed more refined prehensile patterns in the 18 month-old group as compared to the 15 month-old group. This assessment has not been standardized and norms are not available for other age groups.

Another test used to assess motor function in children, the Peabody Developmental
Motor Scales (PDMS-FM), includes items that measure fine motor skills (Folio & Fewell, 1983). This scale was designed to identify children whose motor skills are delayed or aberrant relative to the normative group, and to assist in planning for remedial programs. The fine motor items have been grouped into four categories: grasps, eye-hand coordination, hand use, and manual dexterity, and the test scale was standardized on children from birth to seven years of age. Scoring is on a three point scale for each item with specific criteria given to judge the child's performance. Children are given credit for partial completion of test items, but there are few descriptors of the quality of the performance expected.

The authors suggest that the PDMS-FM can be used to help measure children with disabilities, although their scores cannot be compared to the norms given. However, the lack of qualitative descriptors may limit the use of the PDMS-FM for children with disabilities. Test items in the PDMS-FM may not be responsive to the changes expected in that child's hand function. Our experience to date indicates that the Peabody does not measure changes in the quality of upper extremity and hand function.

Erhardt (1982) designed a prehension assessment for use with infants and disabled children. The test assesses posture, reach, grasp, manipulation and release, as well as reflexive movements in children from birth to fifteen months of age. The test cannot be scored, is not standardized and little information is available on its reliability and validity (Pollock, 1991). In addition, the norms used for grading the child's responses have not been tested empirically. The Erhardt Developmental Prehension Assessment is most useful in its present form as a guide for program planning rather than evaluation.

A review of eleven functional hand evaluations (McPhee, 1987) found limitations in all of the assessments examined. Most measures provided limited information on functional hand use, and used time as the only measurement variable, thereby limiting the information gained through assessment. The author suggests that work is still needed to describe the dynamic qualities of hand prehension. None of the eleven evaluations reviewed was designed for use with children.

In a more recent review of hand assessments by Jones (1989) the strengths and limitations of techniques to evaluate hand functions are examined. This author also concludes that more versatile measuring instruments are required to predict the functional capacity of the hand. The importance of considering a number of variables including age when interpreting results is discussed, but again the tests are not designed for children.

Computer based tracking tests have been studied with good results in reliability and sensitivity for analysis of upper extremity coordination, force and speed (Carey, Patterson & Hollenstein, 1988; Reddiough, Bach, Burgess, Oke & Hudson, 1991). However this equipment is expensive and not readily available to clinics.

Most available assessments focus on the hand and do not incorporate the components of joint movement at the shoulder, elbow, forearm, and wrist necessary for hand function. In a study designed to quantify the range of upper limb joint motion, the variety and ranges of motion needed to perform three feeding tasks were well demonstrated (SafaeeRad, Shwedyk, Quanbury & Cooper, 1990).

In summary, there are no available measures which measure quality of upper extremity movement in children with cerebral palsy. Because of the need for such a measure, the Quality of Upper Extremity Skills Test (QUEST) was developed.
Item generation for the QUEST was based on an extensive review of the literature as well as discussions with clinicians and clinical experts. Items were selected if they were part of normal development from birth to 18 months, if they countered typical patterns of spasticity seen in neuromotor problems and if they were consistently used as goals of treatment in therapy. For example, reaching forward at the shoulder with the elbow and wrist extended is a movement pattern which requires dissociation of spastic synergies, is a normal developmental pattern and is often a functional goal of intervention. The selected items were grouped into four domains: dissociated movement, grasp, protective extension and weight bearing. These domains were included because they are essential neuro-developmental components of hand function that develops between birth and 18 months of age.

The dissociated movement domain included items that countered typical patterns of spastic synergy (e.g., shoulder forward flexion with elbow and wrist extension). In this domain, items were included to represent each joint in the upper limb. Grasp items were based on normal hand grasps as described in the developmental literature. Items within this domain were arranged in a hierarchical and developmental framework. Posture of the trunk and head was evaluated during these grasp activities. Protective extension items (front, back, side) were included because they represent a functional upper extremity equilibrium reaction. Weight bearing items (front, back, side) were included because they represent functional transitional movements involving the upper extremity. Weight bearing and protective extension items were based on the normal developmental sequence and are scored hierarchically based on the degree of abnormality as represented by joint positions (e.g., weight bearing in prone, elbow extended, hand open is the highest level and elbow flexed, hand fisted is the lowest. No credit is given if the thumb is tucked into the palm). Weight bearing and protective extension items were included to reflect both the static and dynamic abilities of the child. Movements are facilitated through verbal encouragement, toys and/or demonstration. All items are scored for both arms using a dichotomous (yes/no) scale and percentage scores are calculated. An example of the QUEST is included on Page 32. A short observational play session was included to observe hand function in unstructured activities and to incorporate crossing midline and bilateral functions. This section was later deleted because of the amount of time required.

After items were generated and grouped into domains, the QUEST was then pilot-tested by therapists with 10 children with CP, ages 18 months to 8 years. A one-day consensus meeting was then held between the investigators and 16 clinical pediatric therapists who had participated in item generation and/or pilot testing. During the consensus meeting, all items were reviewed, further defined, and scoring criteria modified. Any item which could not be defined clearly or which therapists believed should not be included in that domain was changed or eliminated from the assessment. A manual with administration guidelines was written. After this process, the QUEST included 34 items in the four domains of dissociated movement, grasp, weight bearing and protective extension.

An initial inter-observer reliability between two occupational therapists simultaneously
observing 16 children with cerebral palsy, ages 18 months to 8 years, was completed. This showed that the intra-class correlation coefficient for the QUEST total score was 0.95. Following this testing, the QUEST was used in a clinical trial of NDT and upper extremity casting. The QUEST takes approximately 30 to 45 minutes to complete. Details on the measure are listed in Table 2.

<table>
<thead>
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<td><strong>Domains of the QUEST</strong></td>
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**Dissociated Movement** (19 items with one level of response for each item)

- **Shoulder:**
  - Flexion
  - Flexion with fingers extended
  - Abduction
  - Abduction with fingers extended

- **Elbow:**
  - Flexion with supination
  - Extension with supination
  - Flexion with pronation
  - Extension with pronation

- **Wrist:**
  - Extension with elbow extension
  - Extension with elbow flexion
  - Extension with pronation
  - Extension with supination
  - Flexion with supination

- **Independent movements:**
  - Fingers
  - Thumb

- **Arm position during grasp/release:**
  - Grasp using thumb
  - Grasp using palm
  - Release from thumb and fingers
  - Release from palm

**Grasp** (6 items with 3-5 levels of response for each item)

- **Posture during grasp:**
  - Head
  - Trunk
  - Shoulders

- **Grasp of 1" cube**
- **Grasp of cereal**
- **Grasp of pencil/crayon**

**Weight Bearing** (5 items with six levels of response for each item)

- **Weight bearing in prone**
- **Weight bearing in prone with reach**
- **Weight bearing in sitting with hands forward**
- **Weight bearing in sitting with hands by side**
- **Weight bearing in sitting with hands behind**

**Protective Extension** (3 items with six levels of response for each item)

- **Protective extension - forward**
- **Protective extension - side**
- **Protective extension - backward**
Reliability and Validity

The specific objectives of reliability and validity testing were as follows:

1. Consensus meetings: To be held with therapists involved in the NDT/Casting study to receive their feedback regarding the QUEST and to institute any minor modifications.
2. Reliability testing: To test reliability between observers and over time.
3. Validity testing: To use data collected at the same time as the NDT/Casting study to evaluate the criterion validity of the QUEST by relating it to the Peabody Fine Motor Scales (PDMS-FM) scores, the child's age and severity of hand dysfunction.
4. Responsiveness: To use data collected to evaluate the responsiveness to change of the QUEST compared to the PDMS-FM and compared to change as judged by parents and therapists.

Study Methods

The study participants were children from three children's treatment centres in Ontario, Canada: Children's Developmental Rehabilitation Program, Chedoke-McMaster Hospitals, Hamilton; Erinoak, Mississauga; and Rotary Children's Centre, Kitchener and Cambridge (also see Table 3). The collective experience of these therapists gained through their involvement in the NDT/Casting study was gathered through a questionnaire and consensus meetings. Minor revisions were completed before reliability of the measure was determined. Data collected during the NDT/Casting study (Law et al., 1991) were used to analyze the validity and responsiveness of the QUEST.

Subjects

The children with whom the measure was tested have the following characteristics:

1. Spastic cerebral palsy as diagnosed by a physician using the classification system of the American Academy for Cerebral Palsy along with Scherzer's recommendations of clinical signs (Kiely, Paneth, Stein & Sussman, 1981).
2. Ages 18 months to 8 years.
3. Spasticity present in the wrist and hand during movement.

Table 3
Description of Study Sample

<table>
<thead>
<tr>
<th>Gender</th>
<th>N</th>
<th>%</th>
<th>Cognitive ability</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>33</td>
<td>61</td>
<td>Below average</td>
<td>30</td>
<td>42</td>
</tr>
<tr>
<td>Male</td>
<td>28</td>
<td>39</td>
<td>Average</td>
<td>41</td>
<td>58</td>
</tr>
<tr>
<td>CP Distribution</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quadriplegia</td>
<td>43</td>
<td>61</td>
<td></td>
<td>71</td>
<td>100</td>
</tr>
<tr>
<td>Hemiplegia</td>
<td>28</td>
<td>39</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years therapy before study</td>
<td></td>
<td></td>
<td>* subjective judgment of treating therapist.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;2</td>
<td>65</td>
<td>92</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;2</td>
<td>6</td>
<td>8</td>
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<td></td>
</tr>
</tbody>
</table>

*subjective judgment of treating therapist.
A questionnaire was designed to elicit specific information regarding the clarity and ease of administration of the QUEST items and instructions used in the clinical trial. Eighteen therapists who had used the QUEST in the NDT/Casting study were asked to give feedback. Information received through the questionnaire was collated, summarized and used to discuss suggested changes at a consensus meeting and write the manual.

The modifications suggested included: providing clearer instructions, more diagrams and starting positions on the evaluation sheet; changing layout for ease of scoring; and eliminating the play items. The modifications clarified the ease of administration of the QUEST but did not change the items, the nature or the intent of the measure. The recommendations of the consensus meetings were used to produce revised instructions for the manual.

This manual includes the QUEST measure with accompanying drawings to aid scoring, explicit instructions and definitions, scoring criteria and methods, equipment required, reliability and validation results and description of the population for which the QUEST is appropriate.
Three studies of the reliability of the QUEST were completed. In all studies, analysis of variance procedures were used, from which intraclass correlation coefficients for reliability were calculated. Before the NDT/Casting study, reliability between two observers was examined in 16 children and found to be 0.95 [ICC(1,1)]. All baseline assessments of the QUEST in the NDT/Casting study were completed by the research coordinator and the child's occupational therapist. Inter-observer reliability in this sample of 71 children was 0.96 [ICC(1,1)].

Thirdly, the inter-observer reliability of the QUEST was examined by having three observers evaluate 17 stable children. All testing was completed in the treatment centres, and conditions of testing such as time of day were consistent. All assessments were videotaped to be scored at a later date and in random order by trained observers. The observers were trained using a training videotape prior to the reliability testing. The observers viewed the videotape and were not allowed to view sections more than once.

In the third study, the observer reliability of the QUEST and its domains ranged from 0.51 to 0.94 [ICC(3,1)], with all coefficients except one greater than 0.70 (See Table 4). The test-retest reliability of the QUEST and its domains ranged from 0.75 to 0.95 (See Table 4).

### Table 4

**Inter-Observer and Test-retest Reliability of the QUEST**

<table>
<thead>
<tr>
<th>Domain</th>
<th>Intraclass Correlation Coefficient</th>
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<tbody>
<tr>
<td></td>
<td>Inter-Observer</td>
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<tr>
<td></td>
<td>N* = 71</td>
</tr>
<tr>
<td>QUEST total score</td>
<td>0.96</td>
</tr>
<tr>
<td>Dissociated Movement</td>
<td>0.91</td>
</tr>
<tr>
<td>Grasp</td>
<td>0.91</td>
</tr>
<tr>
<td>Posture</td>
<td>not completed</td>
</tr>
<tr>
<td>Protective Extension</td>
<td>0.80</td>
</tr>
<tr>
<td>Weight Bearing</td>
<td>0.61</td>
</tr>
</tbody>
</table>

* N refers to number of children in each study.
Validity

Construct Validity

The QUEST and the Peabody Developmental Fine Motor Scales were administered to 71 children. Correlations were done using age equivalent scores and raw scores. Due to the similar pattern of the data, only the raw scores are presented in these tables. All correlations were calculated using Pearson correlation coefficient.

The correlation of the QUEST with the PDMS-FM was examined and is presented in Table 5. We had hypothesized a moderate correlation of 0.60 between the QUEST and the PDMS-FM. The PDMS-FM is a discriminative measure which has a strong cognitive component based on hand function and not specifically quality of movement. Results indicate there is a high correlation of 0.84 between the QUEST and total score of the PDMS-FM.

Table 5 also illustrates the correlations between the QUEST domains and the subscores of the PDMS-FM. All correlations are moderately high, ranging from 0.58 to 0.84. The grasp domain on the QUEST correlates highly with all areas of the PDMS-FM, while the protective extension domain has a lower correlation. The correlations between the QUEST domains and the PDMS-FM subscores were similar over the three assessment times during the NDT/Casting study.

Construct validity was further investigated by correlating the QUEST with the therapists' judgement of the child's level of hand function. These data were collected at all three assessments using a Likert-type 11 point scale ranging from zero (defined as minimal independent hand grasp with no active release) to ten (defined as spontaneous reach, grasp and release with good eye-hand coordination). The correlations between the QUEST total score and left and right hand function ratings were 0.72 and 0.58 (p< .001).

The correlation between chronological age and the QUEST total score was 0.33 (p< .01).

Responsiveness

In the study of neurodevelopmental therapy and casting, the casted groups demonstrated statistically significant improvements in quality of movement (p< .03), as measured by the QUEST (Law et al., 1991). It was responsive in measuring changes over time.

To further assess the validity of the QUEST's responsiveness, the ability of the QUEST to measure changes in the quality of movement as seen by therapists, parents and as reflected in the PDMS-FM score was examined. After the treatment period of study, parents and therapists were both asked independently to make judgements about their perception of change in hand function. These were measured using an 11 point Likert scale, where zero was equal to no change in hand function and ten was equal to much improvement. It should be noted that parents and therapists were not asked to rate change in quality, but only change in function.

We hypothesized that the changes on the QUEST would be in the same direction as changes measured by the PDMS-FM scores and the therapist and parent ratings. The mean QUEST change score was 3.32 with a standard deviation of 9.08. The overall mean change on the QUEST was small, with considerable variability between children.
The correlations of change scores between the QUEST and PDMS-FM was 0.29 (p<.01).

The correlations of the change scores on the QUEST (that is, change between baseline and 6 months) and parents' and therapists' ratings of change in hand function were low (Table 6).

Table 5
Correlations of QUEST with the PDMS-FM

<table>
<thead>
<tr>
<th></th>
<th>PDMS-FM Total Score</th>
<th>PDMS-FM Coordination</th>
<th>PDMS-FM Grasp</th>
<th>PDMS-FM Hand Use</th>
<th>PDMS-FM Manual Dexterity</th>
</tr>
</thead>
<tbody>
<tr>
<td>QUEST total score</td>
<td>0.84</td>
<td>0.80</td>
<td>0.75</td>
<td>0.82</td>
<td>0.78</td>
</tr>
<tr>
<td>QUEST Domains:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dissociated Movement</td>
<td>0.78</td>
<td>0.74</td>
<td>0.69</td>
<td>0.75</td>
<td>0.75</td>
</tr>
<tr>
<td>Grasp</td>
<td>0.83</td>
<td>0.78</td>
<td>0.78</td>
<td>0.78</td>
<td>0.77</td>
</tr>
<tr>
<td>Weight Bearing</td>
<td>0.75</td>
<td>0.73</td>
<td>0.67</td>
<td>0.75</td>
<td>0.71</td>
</tr>
<tr>
<td>Protective Extension</td>
<td>0.69</td>
<td>0.68</td>
<td>0.58</td>
<td>0.67</td>
<td>0.64</td>
</tr>
</tbody>
</table>

All correlations are statistically significant at p < 0.001

Table 6
Correlations of Change Scores (Responsiveness) between the QUEST and Parent and Therapist Ratings of Change in Hand Function

<table>
<thead>
<tr>
<th></th>
<th>QUEST change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Therapist Ratings of Change (N=65)</td>
<td></td>
</tr>
<tr>
<td>Change (Left)</td>
<td>0.10</td>
</tr>
<tr>
<td>Change (Right)</td>
<td>0.33 *</td>
</tr>
<tr>
<td>Total change</td>
<td>0.13</td>
</tr>
<tr>
<td>Parent Ratings of Change (N=56)</td>
<td></td>
</tr>
<tr>
<td>Change (Left)</td>
<td>-0.15</td>
</tr>
<tr>
<td>Change (Right)</td>
<td>0.04</td>
</tr>
<tr>
<td>Total change</td>
<td>-0.05</td>
</tr>
</tbody>
</table>

* p < 0.01
The results of the reliability and validity studies indicate that the QUEST is a criterion referenced measure with good reliability between observers and over time. The QUEST correlated strongly with another measure of hand function, the PDMS-FM. This suggests that the QUEST may be useful as a discriminative measure. The QUEST does measure components of hand function as well as quality of movement, and the high correlations suggest that poor quality is associated with poor hand function.

The fact that each domain of the QUEST correlated highly with the PDMS-FM total score suggests that each domain of the QUEST is likely measuring aspects of hand function as well as quality. The correlations between the different domains of the QUEST and the PDMS-FM suggest that it is not measuring exactly the same attributes as the PDMS-FM. The grasp domain on the QUEST correlates highly with all areas of the PDMS-FM. This result is logical because the ability to grasp is an important component of many items measured on the Peabody. Protective extension is quite different from any part of the PDMS-FM, and as expected, it had a lower correlation with the PDMS-FM.

The QUEST provides information related to movement and postural responses that are not available through the PDMS-FM. Therefore, we recommend using both measures for a more comprehensive assessment.

The QUEST was designed so that scoring is related to severity of disability irrespective of age. This allows for a young and mild child to score well or an old and severe child to score poorly. This is supported by the evidence of lower correlations with age than with ratings of hand function severity. It is assumed that a child with no disabilities would score perfectly in all areas of the QUEST except grasp by about 18 months of age.

Evidence of the responsiveness of the QUEST is inconclusive. The NDT/Casting study results showed that children receiving casting in the presence of regular neurodevelopmental therapy improved significantly on the QUEST. As casting theoretically affects the biomechanical performance and tone of the upper limb, these results suggest that this measure may be responsive to evaluating the qualitative aspects of function. However, correlations between the change scores on the QUEST and parent and therapist ratings of change were low. This may be explained by the fact that they were asked to rate changes in function, not quality of movement. Specific information about changes in quality of movement is currently being collected as part of a second NDT/Casting study. We hope these studies will help further evaluate the responsiveness of the QUEST.

The QUEST has been developed by therapists for therapists and its greatest strength lies in its clinical utility for describing quality of movement and planning intervention programs in children with cerebral palsy. It is a reliable measure which correlates strongly with another previously validated measure of hand function.
Administration Instructions

General Instructions

The total testing time including administration and scoring should be approximately 45 minutes.

1. The child should be dressed in a short sleeved shirt so that elbows can be easily seen.

2. When a table is used during the evaluation, it should be at a height just above waist level.

3. The child should be seated in a chair (insert if required) with hips and knees at right angles and feet flat on a surface, floor or footrests.

4. The child should not be wearing any devices on the upper extremities during testing.

5. Facilitate movements through verbal encouragement, toys, demonstration, and/or handling the child as necessary. The child must demonstrate the required position without physical assistance, e.g., the therapist cannot hold the arm in extension against gravity, but may facilitate this through weight bearing, placing, etc.

6. The child must hold the position for at least 2 seconds.

7. The order of administration can be changed to suit the child and therapist.

8. If a child has a fixed contracture, the contracted position should be considered full range, e.g., if the child is lacking 10 degrees of extension due to a contracture, that position is considered full extension for that child.

Equipment:

- quiet room
- chair and/or seating system
- table just above waist level
- four one-inch cubes
- cup
- regular size crayon or pencil
- blank paper
- Cheerios cut into quarters
- mat
- small bench (optional)
- QUEST manual/score sheets
- toys, puppet, bubbles

Scoring

The score must be entered in every scoring box even if the item is not tested (i.e., yes, no, not tested). Every effort should be made to complete the entire assessment.

For any item for which the therapist is not sure of the child's response or thinks the child is almost doing it, the score must be NO.
Scoring Key:

✔ = Yes (able to complete item according to specification) Yes = 2 points
X = No (can not or will not complete item) No = 1 point
NT = Not Tested (not able to administer item) NT = 1 point

Each abnormal movement in posture section = -1 point

The number of items receiving a yes (✔), no (X), or not tested (NT) score are summed at the bottom of each page and at the end of each section of the test. These summaries are transferred to the QUEST scoring sheet and scores are calculated. Because the scoring system uses 1's and 2's, initial scores range from 50 to 100. These are standardized to range from zero (or below zero in grasp section) to 100 using the formula on the score sheet. This summary score is transferred to the front of the measure. If a complete section is not tested, no score for that section is calculated.

A. Dissociated Movement

This section is administered while the child is seated and a table is required for wrist, grasp and finger items. The joint to be scored is listed in the top centre of each page. The item to be scored is on the left side. The scoring scheme is in the middle of the page and the criteria are on the right side. All criteria must be met in order to score a YES for the item. If a child scores YES in the "greater than half" range category, then the "less than half" range is given credit. In other words, if the child can do the more difficult movement, then they are automatically credited with the simpler movement.

Independent finger movement: The child must wiggle and move every finger. Associated reactions are not acceptable (e.g., changes in muscle tone, clawing, thumb adduction, increased wrist and/or elbow flexion, shoulder elevation). Associated movements are part of normal motor development, and are acceptable (e.g., mirror movements on the opposite extremity).

Grasp of 1" cube: If the child can grasp with thumb and fingers, credit is given for the palmar grasp. For the release items, the cube can be placed in the child's hand for release. It does not need to be secondary to an active grasp.

Ideas for administration:

Shoulder items: reach for puppet, blocks, bubbles
Elbow items: "give me five", place block on their hand, stickers on the palm
Wrist items: say stop like a policeman, raise the "bridge", sticker in palm; for flexion, put Fisher Price person on distal forearm and have child flex wrist to touch its head
Finger movements: play the pretend piano, make rain, drum fingers on table, pretend fingers are spiders
Grasps: for grasp with wrist extension, ask the child to show you the cube; for radial-digital or fingertips, tell child to pretend the cube is hot, be careful and use just the tips of the fingers

Any joint that is within 5 degrees of full ROM will be considered complete in this assessment.
Guidelines for range calculations are as follows:

**Shoulder Items**

FLEXION

ABDUCTION

**Elbow Items**

FLEXION

EXTENSION

**Forearm Criteria**

COMPLETE PRONATION COMPLETE SUPINATION
B. Grasp

The blocks and the cereal must be on the table and the child must pick them up. The therapist should not hold the blocks or help in any way. The child must hold the object for at least two seconds to score a YES.

If the child cannot achieve wrist neutral to extended in the higher level grasp pattern cube, then try for a lower level. Record your observations. If the child could achieve the pinch or grasp, but only with wrist flexion position, the score in NO.

If the child achieves the highest level, then credit is given for all the lower level grasps. If the grasp is abnormal and not listed, then the child receives a NO for all grasps, but the therapist should describe the grasp seen.

Present the regular sized pencil or crayon at midline on the paper with the point toward the child. Let the child pick it up themselves. Record whether a pencil or crayon was used. Ask child to repeat the task with the other hand.

Dominance: Child demonstrates consistent use of one hand for drawing/writing tasks and is able to function in the opposite body space with this hand. This hand obviously leads while the other hand assists during bilateral tasks.

Preference: Clear preference for one hand in writing/drawing tasks, but does switch to the other hand. Mixed hand choice during bilateral tasks.

Sitting Posture During Grasp

These observations are made throughout the grasp section and scored at the end.

If the child has normal upright posture and position of head, trunk and arms score normal (2) points. If any of these are atypical, meaning the child has poor head or trunk control and elevated, retracted/abducted shoulders, score (-1) point for each postural abnormality noted. Record for your own information if it is to the left or right and in which direction of flexion or extension.
If a deviation in posture is noted only occasionally and the child corrects it, then the score should be considered normal.

If the child consistently shows postural abnormalities throughout the section, then the score must be atypical.

**C. Weight Bearing**

Prone weight bearing should be done on the floor or a mat, but not over a bolster. The child can be in either prone or 4-point kneeling and this should be noted on the score sheet and repeated on subsequent QUEST assessments.

In sitting, the cross-legged position is the optimum, followed by ring and long sitting. If the child is unable to sit on the floor, a bench or high mat can be used to compensate for tight lower limb muscles. Record which position was used and repeat on subsequent QUEST assessments.

The item to be scored is listed on the left. The scoring scheme is in the middle of the page and the criteria are on the right side of the page.

The child either assumes the position, or the therapist positions the child and they must be able to maintain it for at least two seconds.

As in the grasp section, if the child achieves the highest level, then credit is given for items below this.

The degree of shoulder rotation is not part of the criteria and should not affect the child's score on the items in this section.

**D. Protective Extension**

Protective extension differs from the weight bearing items in that it is combined with a rapid displacement of the centre of gravity, not merely achieving a static weight bearing position. Testing should be done in ring sitting or kneeling if possible.

The displacement of the child must be large enough so that the centre of gravity moves out over the base of support in order to get a true reaction. Full elbow extension can be from 10 degrees of flexion to full extension as it would be unusual for the child to land on locked elbows.

Scoring is the same as in the weight bearing section: credit is given for all items below the highest achievement.

**E. Hand Function Ratings**

Circle the number that best represents your opinion of the child's hand function. The rating for both hands together is an estimate of bilateral hand function, not an average of the scores for each hand.
F. Spasticity Rating

The descriptors in parentheses for the spasticity ratings are only guidelines; they are not criteria. They are there to help you make a decision on how to rate the level of spasticity.

G. Co-Operativeness Rating

It is important to note if the child's ability to participate and perform was affected by behaviour.

Note:
Sections E, F and G are not included in summary scores. However, the hand function and spasticity rating will provide a comparison and some measurement of change, although subjective, in the child.
The data collected to date on the QUEST can provide some information which may aid in the interpretation of scores. As the QUEST is used more, further information will be gained on the expected scores for children of varying ages and diagnoses. Its use in intervention trials will help us understand how much change on the measure can be considered clinically important. It must be noted that these scores are based on a study of 71 children with cerebral palsy, ages 18 months to 8 years. Validation of the measure for children of other ages or with other disabilities has not been done.

Scores for the QUEST and its domains are calculated as percentages. Scores can range from a negative score if all posture items are atypical to a top score of 100. Higher scores represent better quality of movement. Table 7 presents mean and standard deviation scores for different groups of children in the QUEST study. Figures one through three represent plots of QUEST total scores by hand function severity rating. This severity rating was done using an 11 point Likert-type scale. These data can be used to assist in interpreting scores.

Table 8 reports the mean and standard deviation scores for the 71 children in the NDT/Casting study at baseline, after 6 months of occupational therapy and after a 3-month follow-up. In this study, a difference of 4.89 percentage points between children who received casting in the presence of therapy, and those who did not receive casting, was statistically significant (p < .03).
### Table 7
**QUEST Scores**
**Mean (Standard Deviation)**
**(N = 71)**

<table>
<thead>
<tr>
<th></th>
<th>QUEST Total Score</th>
<th>Dissociated Movement</th>
<th>Grasp</th>
<th>Protective Extension</th>
<th>Weight Bearing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(N = 71)</td>
<td>(N = 71)</td>
<td>(N = 71)</td>
<td>(N = 71)</td>
<td>(N = 71)</td>
</tr>
<tr>
<td><strong>Total Sample</strong></td>
<td>49.93 (26.49)</td>
<td>58.25 (24.22)</td>
<td>43.00 (32.23)</td>
<td>38.04 (27.02)</td>
<td>60.99 (32.01)</td>
</tr>
<tr>
<td><strong>By Age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Young (18 mos - 4 years)</td>
<td>37.91 (26.76)</td>
<td>47.31 (24.51)</td>
<td>32.48 (32.88)</td>
<td>27.99 (26.44)</td>
<td>45.11 (31.38)</td>
</tr>
<tr>
<td>Older (&gt; 4 years - 7 yrs 11 mos)</td>
<td>56.32 (24.28)</td>
<td>64.06 (22.20)</td>
<td>48.71 (30.73)</td>
<td>43.38 (26.04)</td>
<td>69.45 (29.28)</td>
</tr>
<tr>
<td><strong>By Severity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mild</td>
<td>59.28 (17.43)</td>
<td>66.69 (15.57)</td>
<td>55.28 (18.84)</td>
<td>46.01 (22.04)</td>
<td>69.83 (26.89)</td>
</tr>
<tr>
<td>Severe</td>
<td>42.44 (30.11)</td>
<td>51.48 (27.15)</td>
<td>33.48 (37.12)</td>
<td>31.67 (29.14)</td>
<td>53.93 (34.28)</td>
</tr>
</tbody>
</table>

### Table 8
**QUEST Score Change over 6 Months**
**Mean (Standard Deviation)**
**(N = 71)**

<table>
<thead>
<tr>
<th></th>
<th>QUEST Score</th>
<th>Dissociated Movement</th>
<th>Grasp</th>
<th>Protective Extension</th>
<th>Weight Bearing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(N = 71)</td>
<td>(N = 71)</td>
<td>(N = 71)</td>
<td>(N = 71)</td>
<td>(N = 71)</td>
</tr>
<tr>
<td><strong>Total Sample</strong></td>
<td>3.48 (8.98)</td>
<td>2.57 (9.59)</td>
<td>5.13 (14.08)</td>
<td>0.97 (18.89)</td>
<td>4.24 (18.16)</td>
</tr>
<tr>
<td><strong>By Age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Young (18 mos - 4 years)</td>
<td>4.49 (9.60)</td>
<td>5.02 (10.95)</td>
<td>0.65 (13.55)</td>
<td>2.45 (19.53)</td>
<td>8.61 (21.62)</td>
</tr>
<tr>
<td>Older (&gt; 4 years - 7 yrs 11 mos)</td>
<td>2.95 (8.69)</td>
<td>1.26 (8.63)</td>
<td>7.57 (13.90)</td>
<td>0.17 (18.71)</td>
<td>1.91 (15.78)</td>
</tr>
<tr>
<td><strong>By Severity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mild</td>
<td>2.63 (9.85)</td>
<td>2.46 (10.02)</td>
<td>4.29 (14.37)</td>
<td>0.43 (21.00)</td>
<td>2.83 (16.49)</td>
</tr>
<tr>
<td>Severe</td>
<td>4.17 (8.28)</td>
<td>2.66 (9.37)</td>
<td>5.79 (14.00)</td>
<td>2.08 (17.21)</td>
<td>5.37 (19.52)</td>
</tr>
</tbody>
</table>

*Half of children were receiving occupational therapy an average of 10 times in 6 months and the other half were receiving occupational therapy an average of 28 times in 6 months (about once weekly).*
Figure 1
Plot of QUEST Scores and Rating of Left Hand Function
(N=71)

Quest Score (%)

Left Hand Function
(subjective judgment of assessor/therapist)

QUEST Manual
Figure 2
Plot of QUEST Scores and Rating of Right Hand Function
(N=71)

Quest Score (%)

Right Hand Function
(subjective judgment of assessor/therapist)
Figure 3
Plot of QUEST Scores and Rating of Bilateral Hand Function

(QUEST Manual)
Appendix 1

COPY OF

QUEST

Quality of Upper Extremity Skills Test

Carol DeMatteo, Mary Law, Dianne Russell, Nancy Pollock, Peter Rosenbaum, Stephen Walter

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QUEST Manual
Child's Name: ___________________________ Date: ____________ Time of Day: ________

year/month/day

Evaluator: ______________________________ Age: ________ years ________ months

Testing Conditions:

Room

Seating  (e.g., insert)

Table  (e.g., cutout)

Orthotics  (e.g., splints/AFOs)

Others Present  (e.g., parent)

---

Score Key

✓ = Yes (able to complete item according to specification)

✗ = No (can not or will not complete item)

NT = Not Tested (not able to administer item)

If a complete section is not tested, insert NT in summary score

MAKE SURE THERE IS A SCORE ENTERED IN EVERY SCORING BOX

SUMMARY SCORE (transfer from QUEST Scoring Sheet)

A: DISSOCIATED MOVEMENTS

B: GRASPS

C: WEIGHT BEARING

D: PROTECTIVE EXTENSION

TOTAL SCORE = SUM OF SCORES FOR EACH SECTION TESTED TOTAL # OF SECTIONS TESTED

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A. DISSOCIATED MOVEMENTS
Shoulder Items

Start Position: sitting in chair no table hands on lap

ITEM  | SCORE | CRITERIA
--- | --- | ---
“SHOULDER”  |   |   
1. Flexion  |   |   
2. Flexion with Fingers Extended  |   |   
3. Abduction  |   |   
4. Abduction with Fingers Extended  |   |   

elbow: complete extension
wrist: neutral to extension

elbow: complete extension
wrist: neutral to extension

elbow: complete extension
wrist: neutral to extension

elbow: complete extension
wrist: neutral to extension

✓   ×   NT  2.
A. DISSOCIATED MOVEMENTS continued
Elbow Items

Start Position: sitting in chair no table hands on lap

ITEM
"ELBOW"

SCORE

CRITERIA

1. Flexion

forearm: complete supination

2. Extension

forearm: complete supination

3. Flexion

forearm: complete pronation

4. Extension

forearm: complete pronation

✓ ☐ × ☐ NT ☐ 3.
A. DISSOCIATED MOVEMENTS continued

Wrist Items

Start Position: sitting at table for arm may be on table

ITEM       | SCORE L |       | SCORE R |       | CRITERIA
-----------|---------|-------|---------|-------|-----------------
"WRIST"    |         |       |         |       |                
1. Extension |         | <range|         | <range| elbow: complete extension*
            |         | half  |         | half  |                 
            |         | ≥range|         | ≥range|                 

*see manual for definition of complete extension

2. Extension |         |       |         |       | elbow: at least 10° flexion

3. Extension |         |       |         |       | forearm: complete pronation

4. Extension |         |       |         |       | forearm: complete supination

5. Flexion  |         |       |         |       | forearm: complete supination

✓ □ □       □ □ □       □ □ □ □
A. DISSIPATED MOVEMENTS

Finger Items

Start Position: sitting at table  forearms must rest on table

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Independent Finger Wiggling</td>
<td>L □</td>
<td>dissociation of all fingers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>no associated reactions</td>
</tr>
<tr>
<td>2. Independent Thumb Movement</td>
<td>□</td>
<td>no associated reactions</td>
</tr>
</tbody>
</table>

Grasp of 1" Cube

Start Position: sitting at table  cube at distance requiring elbow extension

Note: If Item 1 is performed, then Item 2 should also be scored YES

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Grasp Using Thumb</td>
<td>L □</td>
<td>shoulder: neutral</td>
</tr>
<tr>
<td></td>
<td></td>
<td>elbow: extension</td>
</tr>
<tr>
<td></td>
<td></td>
<td>wrist: neutral to extension</td>
</tr>
<tr>
<td>2. Grasp Using Palm</td>
<td>□</td>
<td>shoulder: neutral</td>
</tr>
<tr>
<td></td>
<td></td>
<td>elbow: extension</td>
</tr>
<tr>
<td></td>
<td></td>
<td>wrist: neutral to extension</td>
</tr>
</tbody>
</table>

☑  □  ☒  □  NT □  5.
A. DISSOCIATED MOVEMENTS continued
Release of 1" Cube

Start Position: sitting at table cube in child's hand *

* Allowable to put cube in child's hand if he/she can't actively grasp
Note: If Item 1 is performed, then Item 2 should also be scored YES

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE</th>
<th>CRITERIA</th>
</tr>
</thead>
</table>
| 1. Release from Thumb and Fingers |  | shoulder: neutral
| | | elbow: extension
| | | wrist: neutral to extension |
| 2. Release from Palm |  | shoulder: neutral
| | | elbow: extension
| | | wrist: neutral to extension |

Scoring for Part A: DISSOCIATED MOVEMENTS (pages 2-6)

Total ✓: = a
Total ✗: = b
Total NT: = c

TRANSFER TO QUEST SCORING SHEET ON PAGE 1
B. GRASPS

Sitting Posture *during grasps*

Note: Observations for scoring this item should be made while administering the grasp items in the following section.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NORMAL ATYPICAL</td>
</tr>
<tr>
<td>Head</td>
<td>□ □</td>
</tr>
<tr>
<td></td>
<td>Left Right Flexion Extension</td>
</tr>
<tr>
<td></td>
<td><em>circle atypical posture</em></td>
</tr>
<tr>
<td>Trunk</td>
<td>□ □</td>
</tr>
<tr>
<td></td>
<td>Forward Lateral</td>
</tr>
<tr>
<td></td>
<td><em>check off position</em></td>
</tr>
<tr>
<td>Shoulders</td>
<td>□ □</td>
</tr>
<tr>
<td></td>
<td>Retracted Elevated</td>
</tr>
<tr>
<td></td>
<td><em>check off position</em></td>
</tr>
</tbody>
</table>

*Scoring for Part B1: GRASPS - Sitting Posture (page 7 only)*

Total Normal (max. = 3) : □ □ = d

Total Atypical (max. = 5) : □ □ = e

TRANSFER TO QUEST SCORING SHEET ON PAGE ii
B. GRASPS continued
Grasp of 1" Cube

Start Position: sitting at table  cube on table within comfortable reach

Note: Once a grasp has been performed, give a YES score for all those below it.
If grasp observed is not listed, then score NO in all boxes and describe it under “Other” below.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>1. Radial Digital</td>
<td>☐</td>
<td>☐ wrist: neutral to extension</td>
</tr>
<tr>
<td>2. Radial Palmar</td>
<td>☐</td>
<td>☐ wrist: neutral to extension</td>
</tr>
<tr>
<td>3. Palmar</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

Other:

- ☑ - ☒ - NT - 8.
Start Position: sitting at table

Note: Once a grasp has been performed, give a YES score for all those below it. If grasp observed is not listed, then score NO in all boxes and describe it under "Other" below.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fine Pincer</td>
<td></td>
<td>wrist: neutral to extension</td>
</tr>
<tr>
<td>2. Pincer</td>
<td></td>
<td>wrist: neutral to extension</td>
</tr>
<tr>
<td>3. Inferior Pincer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Scissor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Inferior Scissor</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Other:

☐ ☒ × ☐ NT ☐ 9.
B. GRASPS continued
Grasp of Pencil or Crayon

Start Position: sitting at table pencil placed midline vertical with point facing child

Note: Child must pick up pencil on his/her own. Once a grasp has been performed, give a YES score for all those below it.

Circle one of: L Dominance R Dominance L Preference R Preference

Circle one of: grasp of Pencil grasp of Crayon

ITEM SCORE

1. Dynamic Tripod
   (pencil, grasped distally - precise opposition of thumb, index & middle finger)
   ☐ ☐

2. Static Tripod
   (pencil grasped proximally - crude approximation of thumb, index & middle finger)
   ☐ ☐

3. Digital Pronate
   ☐ ☐

4. Palmar Supinate
   ☐ ☐

Other:

✓ ☐ × ☐ NT ☐

Scoring for Part B: GRASPS (pages 8-10)

Total ✓: ☐ = f

Total ×: ☐ = g

Total NT: ☐ = h

TRANSFER TO QUEST SCORING SHEET ON PAGE II
C. WEIGHT BEARING

Start Position: prone or 4 point

Note: Once a position is scored, give a YES score for all those below it

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circle test position: prone</td>
<td>4 point</td>
<td></td>
</tr>
</tbody>
</table>

1. Weight Bearing

a) elbow extended, hand open   

b) elbow extended, fingers flexed

c) elbow extended, hand fisted

d) elbow flexed, hand open

e) elbow flexed, fingers flexed

f) elbow flexed, hand fisted

Thumb must be out of palm for all weight bearing items or they are scored "NO".

2. Weight Bearing with Reach

a) Bears weight on LEFT hand with LEFT elbow completely extended and reaches with other arm.

b) Bears weight on RIGHT hand with RIGHT elbow completely extended and reaches with other arm.
C: WEIGHT BEARING continued

Sitting

Start position: sitting on floor preferably cross-legged

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Hands forward - circle test position:</td>
<td>cross-legged ring</td>
<td>other</td>
</tr>
<tr>
<td>a)</td>
<td>elbow extended, hand open</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>elbow extended, fingers flexed</td>
<td></td>
</tr>
<tr>
<td>c)</td>
<td>elbow extended, hand fisted</td>
<td></td>
</tr>
<tr>
<td>d)</td>
<td>elbow flexed, hand open</td>
<td></td>
</tr>
<tr>
<td>e)</td>
<td>elbow flexed, fingers flexed</td>
<td></td>
</tr>
<tr>
<td>f)</td>
<td>elbow flexed, hand fisted</td>
<td></td>
</tr>
</tbody>
</table>

2. Hands by side - circle test position: cross-legged ring other

a) elbow extended, hand open
b) elbow extended, fingers flexed
c) elbow extended, hand fisted
d) elbow flexed, hand open
e) elbow flexed, fingers flexed
f) elbow flexed, hand fisted

3. Hands behind - circle test position: cross-legged ring other

a) elbow extended, hand open
b) elbow extended, fingers flexed
c) elbow extended, hand fisted
d) elbow flexed, hand open
e) elbow flexed, fingers flexed
f) elbow flexed, hand fisted

Thumb must be out of palm for all items.

Scoring for Part C: WEIGHT BEARING (pages 11-12)

Total ✓ : = i
Total ✗ : = j
Total NT : = k

TRANSFER TO QUEST SCORING SHEET ON PAGE iii
D: PROTECTIVE EXTENSION

Start position: preferably ring sitting or kneeling

Note: Once a position is scored, give a YES score for all those below it.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE L</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ring sit</td>
<td>kneeling</td>
</tr>
<tr>
<td>1. Protective Extension - Forward - circle start position:</td>
<td>ring sit</td>
<td>kneeling</td>
</tr>
<tr>
<td></td>
<td>a) elbow extended, hand open</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>b) elbow extended, fingers flexed</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>c) elbow extended, hand fist</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>d) elbow flexed, hand open</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>e) elbow flexed, fingers flexed</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>f) elbow flexed, hand fist</td>
<td>☐</td>
</tr>
<tr>
<td>2. Protective Extension - Side - circle start position:</td>
<td>ring sit</td>
<td>kneeling</td>
</tr>
<tr>
<td></td>
<td>a) elbow extended, hand open</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>b) elbow extended, fingers flexed</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>c) elbow extended, hand fist</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>d) elbow flexed, hand open</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>e) elbow flexed, fingers flexed</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>f) elbow flexed, hand fist</td>
<td>☐</td>
</tr>
<tr>
<td>3. Protective Extension - Backward - circle start position:</td>
<td>ring sit</td>
<td>kneeling</td>
</tr>
<tr>
<td></td>
<td>a) elbow extended, hand open</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>b) elbow extended, fingers flexed</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>c) elbow extended, hand fist</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>d) elbow flexed, hand open</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>e) elbow flexed, fingers flexed</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>f) elbow flexed, hand fist</td>
<td>☐</td>
</tr>
</tbody>
</table>

Scoring for Part D: PROTECTIVE EXTENSION (page 13 only)

| Total ✓ : | ☐ = l |
| Total ✗ : | ☐ = m |
| Total NT : | ☐ = n |

TRANSFER TO QUEST SCORING SHEET ON PAGE iv

13.
E: HAND FUNCTION RATING

Please rate this child’s hand function (circle a number)

Guidelines for scoring hand function:
POOR: minimal independent hand grasps, no active release, unable to combine reach and grasp
GOOD: spontaneous reach, grasp and release, good eye-hand coordination

<table>
<thead>
<tr>
<th></th>
<th>POOR</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>GOOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left Hand</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Right Hand</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Bilateral</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
</tbody>
</table>

F: SPASTICITY RATING

Please rate this child’s spasticity

Guidelines for scoring spasticity:
MILD: good spontaneous movement, normal tone at rest, associated reactions present
MODERATE: tone interferes with spontaneous movement, may be present at rest
SEVERE: minimal spontaneous movement, stiff limbs, tone present at rest

<table>
<thead>
<tr>
<th></th>
<th>NONE</th>
<th>MILD</th>
<th>MODERATE</th>
<th>SEVERE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left Hand</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right Hand</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

G: COOPERATIVENESS RATING

Please rate this child’s level of cooperation during this assessment.

<table>
<thead>
<tr>
<th></th>
<th>NOT cooperative</th>
<th>SOMEWHAT cooperative</th>
<th>VERY cooperative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DISSOCIATED MOVEMENTS

1. Transfer score information from page 6 of QUEST.

   Total ✓ = □ = a
   Total × = □ = b
   Total NT = □ x 2 = c

2. Calculate unstandardized score.

   Score A = \frac{2(a) + b}{128 - c} \times 100

   \text{c} \quad \text{a is multiplied by 2 because each ✓ scores 2 points.}

   \text{c} \quad \text{The 128 - c calculation adjusts the score for any items not tested.}

   \text{c} \quad \text{Round to two decimal points.}

Score A = □

3. Obtain a standardized score ranging from zero to 100.

   (Score A - 50) \times 2 = ( - 50) \times 2 = □

This is the dissociated movements score and can be transferred to the front page of the QUEST.
1. Transfer score information on sitting posture from page 7.

   Total Normal = □ x 2 = d
   Total Atypical = □ x (-1) = e
   Score B1 = d + e = □

2. Transfer score information on grasps from page 10.

   Total ✔ = □ = f
   Total ✗ = □ = g
   Total NT = □ x 2 = h

3. Calculate unstandardized score.

   Score B = \[
   \frac{\text{Score B1} + 2(f) + g}{54 - h} \times 100
   \]

   Score B = \[
   \frac{(\quad) + 2(\quad) + (\quad)}{54 - (\quad)} \times 100
   \]

   Score B = □

   c The 54 - h calculation adjusts the score for any items not tested.

   c Round to two decimal points.

4. Obtain a standardized score ranging from below zero (if a child scores ✗ on all items and has atypical posture) to 100.

   \[
   (\text{Score B} - 50) \times 2 = (\quad - 50) \times 2 = \text{□}
   \]

   This is the grasps score and can be transferred to the front page of the QUEST.
1. Transfer score information from page 12 of QUEST.

   Total ✔ =  \[ \square \] = i

   Total ✗ =  \[ \square \] = j

   Total NT =  \[ \square \] x 2 = k

2. Calculate unstandardized score.

   Score C = \( \frac{2(i) + j}{100 - k} \) x 100

   c  The 100 - k calculation adjusts the score for any items not tested.

   Score C = \( \frac{2(\quad) + (\quad)}{100 - (\quad)} \) x 100

   Score C =  \[ \square \]

   c  Round to two decimal points.

3. Obtain a standardized score ranging from zero to 100.

   (Score C - 50) x 2 = ( \[ \square \] - 50) x 2 =  \[ \square \]

   This is the weight bearing score and can be transferred to the front page of the QUEST.
1. Transfer score information from page 13 of QUEST.

\[
\begin{align*}
\text{Total } & \checkmark & = & 1 \\
\text{Total } & \times & = & m \\
\text{Total NT} & \times 2 & = & n
\end{align*}
\]

2. Calculate unstandardized score.

\[
\text{Score } D = \frac{2(l) + m}{72 - n} \times 100
\]

3. Obtain a standardized score ranging from zero to 100.

\[
(Score \ D - 50) \times 2 = (\quad - 50) \times 2
\]

This is the protective extension score and can be transferred to the front page of the QUEST.
EXAMPLES OF COMPLETED

QUEST

Quality of Upper Extremity Skills Test

Carol DeMatteo, Mary Law, Dianne Russell, Nancy Pollock, Peter Rosenbaum, Stephen Walter

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# Quality of Upper Extremity Skills Test

Carol DeMatteo, Mary Law, Dianne Russell, Nancy Pollock, Peter Rosenbaum, Stephen Walter

**Child's Name:** Paul  
**Date:** 9/12/88  
**Time of Day:** 9:00 am

**Evaluator:** D. Black  
**Age:** 4 years 10 months

**Testing Conditions:**
- **Room:** Room 9
- **Seating (e.g., insert):** Wheelchair with insert
- **Table (e.g., cutout):** Laptop tray
- **Orthotics (e.g., splints/AFOs):** None
- **Others Present (e.g., parent):** Father

---

### Score Key
- ✔️ = Yes (able to complete item according to specification)
- ❌ = No (can not or will not complete item)
- NT = Not Tested (not able to administer item)

*If a complete section is not tested, insert NT in summary score*

**MAKE SURE THERE IS A SCORE ENTERED IN EVERY SCORING BOX**

### SUMMARY SCORE (transfer from QUEST Scoring Sheet)

<table>
<thead>
<tr>
<th>Section</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>A: Dissociated Movements</td>
<td>50.00</td>
</tr>
<tr>
<td>B: Grasps</td>
<td>14.82</td>
</tr>
<tr>
<td>C: Weight Bearing</td>
<td>10.00</td>
</tr>
<tr>
<td>D: Protective Extension</td>
<td>Not tested</td>
</tr>
</tbody>
</table>

**Total Score**

\[
\text{Total Score} = \frac{\text{Sum of Scores for Each Section Tested}}{\text{Total # of Sections Tested}} = \frac{74.82}{3} = 24.94
\]

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A. DISSOCIATED MOVEMENTS
Shoulder Items

Start Position: sitting in chair  no table  hands on lap

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;SHOULDER&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Flexion</td>
<td></td>
<td>elbow: complete extension</td>
</tr>
<tr>
<td></td>
<td></td>
<td>wrist: neutral to extension</td>
</tr>
<tr>
<td>2. Flexion with Fingers Extended</td>
<td></td>
<td>elbow: complete extension</td>
</tr>
<tr>
<td></td>
<td></td>
<td>wrist: neutral to extension</td>
</tr>
<tr>
<td>3. Abduction</td>
<td></td>
<td>elbow: complete extension</td>
</tr>
<tr>
<td></td>
<td></td>
<td>wrist: neutral to extension</td>
</tr>
<tr>
<td>4. Abduction with Fingers Extended</td>
<td></td>
<td>elbow: complete extension</td>
</tr>
<tr>
<td></td>
<td></td>
<td>wrist: neutral to extension</td>
</tr>
</tbody>
</table>

☑️ L  ☑️  ☑️ R  ☑️  ☑️  ☑️  ☑️  ☑️  ☑️  ☑️  ☑️

☑️ 10  ☑️ 6  NT 0  2.
A. DISSOCIATED MOVEMENTS continued
Elbow Items

Start Position: sitting in chair  no table  hands on lap

ITEM “ELBOW”

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Flexion</td>
<td><img src="image" alt="Score: L: ✓ half &lt;range: ✓ half ≥range" /></td>
<td>forearm: complete supination</td>
</tr>
<tr>
<td>2. Extension</td>
<td><img src="image" alt="Score: R: x half &lt;range: x half ≥range" /></td>
<td>forearm: complete supination</td>
</tr>
<tr>
<td>3. Flexion</td>
<td><img src="image" alt="Score: L: ✓ half &lt;range: ✓ half ≥range" /></td>
<td>forearm: complete pronation</td>
</tr>
<tr>
<td>4. Extension</td>
<td><img src="image" alt="Score: R: ✓ half &lt;range: ✓ half ≥range" /></td>
<td>forearm: complete pronation</td>
</tr>
</tbody>
</table>

☑ 7  ❌ 5  NT 4
A. DISSOCIATED MOVEMENTS continued
Wrist Items

Start Position: sitting at table       forearms may be on table

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;WRIST&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Extension</td>
<td>✓</td>
<td>elbow: complete extension*</td>
</tr>
<tr>
<td></td>
<td>✓, X</td>
<td>*see manual for definition of complete extension</td>
</tr>
<tr>
<td>2. Extension</td>
<td>✓</td>
<td>elbow: at least 10° flexion</td>
</tr>
<tr>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>3. Extension</td>
<td>✓</td>
<td>forearm: complete pronation</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>4. Extension</td>
<td>✓, X</td>
<td>forearm: complete supination</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>5. Flexion</td>
<td>✓, X</td>
<td>forearm: complete supination</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

☑️ 9  ❌ 11  NT 0
### A. DISSOCIATED MOVEMENTS continued

**Finger Items**

Start Position: sitting at table  
forearms must rest on table

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Independent Finger Wiggling</td>
<td>L ✔</td>
<td>dissociation of all fingers</td>
</tr>
<tr>
<td></td>
<td>R ✗</td>
<td>no associated reactions</td>
</tr>
<tr>
<td>2. Independent Thumb Movement</td>
<td>☑</td>
<td>no associated reactions</td>
</tr>
</tbody>
</table>

**Grasp of 1" Cube**

Start Position: sitting at table  
cube at distance requiring elbow extension

Note: If Item 1 is performed, then Item 2 should also be scored YES

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE</th>
<th>CRITERIA</th>
</tr>
</thead>
</table>
| 1. Grasp Using Thumb          | L ✔   | shoulder: neutral  
elbow: extension  
wrist: neutral to extension |
| 2. Grasp Using Palm           | ☑     | shoulder: neutral  
elbow: extension  
wrist: neutral to extension |

试卷总分: 2  
错误: 6  
未通过: 0  
5.
A. DISSOCIATED MOVEMENTS continued

Release of 1" Cube

Start Position: sitting at table cube in child’s hand *

* Allowable to put cube in child’s hand if he/she can’t actively grasp
Note: If Item 1 is performed, then Item 2 should also be scored YES

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L</td>
<td>R</td>
</tr>
</tbody>
</table>
| 1.  | Release from Thumb and Fingers | ✓ | x | shoulder: neutral  
elbow: extension  
wrist: neutral to extension |
|      |       |          | |
| 2.  | Release from Palm | ✓ | x | shoulder: neutral  
elbow: extension  
wrist: neutral to extension |

Total ✓: 30 = a
Total x: 30 = b
Total NT: 4 = c

TRANSFER TO QUEST SCORING SHEET ON PAGE 1
B. GRASPS
Sitting Posture *during grasps*

Note: Observations for scoring this item should be made while administering the grasp items in the following section.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NORMAL</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Head</td>
<td>□</td>
</tr>
<tr>
<td>Trunk</td>
<td>□</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Shoulders</td>
<td>□</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Scoring for Part B1: GRASPS - Sitting Posture (page 7 only)*

Total Normal (max. = 3) : 0 = d

Total Atypical (max. = 5) : 3 = e

TRANSFER TO QUEST SCORING SHEET ON PAGE ii
B. GRASPS continued
Grasp of 1" Cube

Start Position: sitting at table  cube on table within comfortable reach

Note: Once a grasp has been performed, give a YES score for all those below it. If grasp observed is not listed, then score NO in all boxes and describe it under "Other" below.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Radial Digital</td>
<td>✔️</td>
<td>✗</td>
</tr>
<tr>
<td></td>
<td></td>
<td>wrist: neutral to extension</td>
</tr>
<tr>
<td>2. Radial Palmar</td>
<td>✔️</td>
<td>✗</td>
</tr>
<tr>
<td></td>
<td></td>
<td>wrist: neutral to extension</td>
</tr>
<tr>
<td>3. Palmar</td>
<td>✔️</td>
<td>✗</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Other:

☑️ 3  ✗ 3  NT 0
### B. GRASPS continued
Grasp of Cereal

**Start Position:** sitting at table

**Note:** Once a grasp has been performed, give a YES score for all those below it. If grasp observed is not listed, then score NO in all boxes and describe it under "Other" below.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fine Pincer</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>2. Pincer</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>3. Inferior Pincer</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>4. Scissor</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>5. Inferior Scissor</td>
<td>☑</td>
<td>☑</td>
</tr>
</tbody>
</table>

**Other:**

☑ 4 ☑ 6 NT 0
Start Position: sitting at table pencil placed midline vertical with point facing child

Note: Child must pick up pencil on his/her own. Once a grasp has been performed, give a YES score for all those below it.

Circle one of: L Dominance R Dominance L Preference R Preference

Circle one of: grasp of Pencil grasp of Crayon

ITEM | SCORE | L | R
--- | --- | --- | ---
1. Dynamic Tripod (pencil, grasped distally - precise opposition of thumb, index & middle finger) | | ✔ | ✗
2. Static Tripod (pencil grasped proximally - crude approximation of thumb, index & middle finger) | | ✔ | ✗
3. Digital Pronate | | ✔ | ✗
4. Palmar Supinate | | ✔ | ✗

Other: ____________________________

Total ✔: 10 = f
Total ✗: 14 = g
Total NT: 0 = h

Scoring for Part B: GRASPS (pages 8-10)

TRANSFER TO QUEST SCORING SHEET ON PAGE ii
C. WEIGHT BEARING

Start Position: prone or 4 point

Note: Once a position is scored, give a YES score for all those below it

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circle test position: prone</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Weight Bearing

   a) elbow extended, hand open           ✓  ✓
   b) elbow extended, fingers flexed      ✓  ✓
   c) elbow extended, hand fisted         ✓  ✓
   d) elbow flexed, hand open             ✓  ✓
   e) elbow flexed, fingers flexed        ✓  ✓
   f) elbow flexed, hand fisted           ✓  ✓

   Thumb must be out of palm for all weight bearing items or they are scored “NO”.

2. Weight Bearing with Reach

   a) Bears weight on LEFT hand with LEFT elbow completely extended and reaches with other arm. ✓

   b) Bears weight on RIGHT hand with RIGHT elbow completely extended and reaches with other arm. ✓
C: WEIGHT BEARING continued

Sitting

Start position: sitting on floor preferably cross-legged

ITEM | SCORE | CRITERIA
--- | --- | ---

1. **Hands forward** - circle test position: cross-legged ring other
   a) elbow extended, hand open x x
   b) elbow extended, fingers flexed x x
   c) elbow extended, hand fisted x x
   d) elbow flexed, hand open x x
   e) elbow flexed, fingers flexed x x
   f) elbow flexed, hand fisted

2. **Hands by side** - circle test position: cross-legged ring other
   a) elbow extended, hand open x x
   b) elbow extended, fingers flexed x x
   c) elbow extended, hand fisted x x
   d) elbow flexed, hand open x x
   e) elbow flexed, fingers flexed
   f) elbow flexed, hand fisted

3. **Hands behind** - circle test position: cross-legged ring other
   a) elbow extended, hand open x x
   b) elbow extended, fingers flexed x x
   c) elbow extended, hand fisted x x
   d) elbow flexed, hand open x x
   e) elbow flexed, fingers flexed
   f) elbow flexed, hand fisted

Scoring for Part C: WEIGHT BEARING (pages 11-12)

| Total ✓: | 5 | i |
| Total ×: | 4/5 | j |
| Total NT: | 0 | k |

TRANSFER TO QUEST SCORING SHEET ON PAGE iii
D: PROTECTIVE EXTENSION

Start position: preferably ring sitting  or  kneeling

Note: Once a position is scored, give a YES score for all those below it.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. **Protective Extension - Forward** - circle start position: ring sit  kneeling  other
   a) elbow extended, hand open
   b) elbow extended, fingers flexed
   c) elbow extended, hand fist ed
   d) elbow flexed, hand open
   e) elbow flexed, fingers flexed
   f) elbow flexed, hand fist ed

2. **Protective Extension - Side** - circle start position: ring sit  kneeling  other
   a) elbow extended, hand open
   b) elbow extended, fingers flexed
   c) elbow extended, hand fist ed
   d) elbow flexed, hand open
   e) elbow flexed, fingers flexed
   f) elbow flexed, hand fist ed

3. **Protective Extension - Backward** - circle start position: ring sit  kneeling  other
   a) elbow extended, hand open
   b) elbow extended, fingers flexed
   c) elbow extended, hand fist ed
   d) elbow flexed, hand open
   e) elbow flexed, fingers flexed
   f) elbow flexed, hand fist ed

---

Scoring for Part D: PROTECTIVE EXTENSION (page 13 only)

Total ✔ : 0 = 1

Total × : 0 = m

Total NT : 36 = n

TRANSFER TO QUEST SCORING SHEET ON PAGE iv
E: HAND FUNCTION RATING

Please rate this child's hand function (circle a number)

Guidelines for scoring hand function:

POOR: minimal independent hand grasps, no active release, unable to combine reach and grasp
GOOD: spontaneous reach, grasp and release, good eye-hand coordination

<table>
<thead>
<tr>
<th>POOR</th>
<th>GOOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left Hand</td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td>Right Hand</td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td>Bilateral</td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
</tr>
</tbody>
</table>

F: SPASTICITY RATING

Please rate this child's spasticity

Guidelines for scoring spasticity:

MILD: good spontaneous movement, normal tone at rest, associated reactions present
MODERATE: tone interferes with spontaneous movement, may be present at rest
SEVERE: minimal spontaneous movement, stiff limbs, tone present at rest

<table>
<thead>
<tr>
<th>NONE</th>
<th>MILD</th>
<th>MODERATE</th>
<th>SEVERE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left Hand</td>
<td>□</td>
<td>[ ]</td>
<td>□</td>
</tr>
<tr>
<td>Right Hand</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

G: COOPERATIVENESS RATING

Please rate this child's level of cooperation during this assessment.

NOT cooperative | SOMEWHAT cooperative | VERY cooperative
□ | [ ] | □
A. DISSOCIATED MOVEMENTS

1. Transfer score information from page 6 of QUEST.

   \[
   \begin{align*}
   \text{Total } & \checkmark = 30 = a \\
   \text{Total } & \times = 30 = b \\
   \text{Total NT} & = 4 \times 2 = c
   \end{align*}
   \]

2. Calculate unstandardized score.

   \[
   \text{Score } A = \frac{2(a + b)}{128 - c} \times 100
   \]

   \[
   \begin{align*}
   \text{Score } A & = \frac{2(\quad) + (\quad)}{128 - (\quad)} \times 100 \\
   \text{Score } A & = 75.00
   \end{align*}
   \]

   c. \( a \) is multiplied by 2 because each \( \checkmark \) scores 2 points.

   c. The \( 128 - c \) calculation adjusts the score for any items not tested.

   c. Round to two decimal points.

3. Obtain a standardized score ranging from zero to 100.

   \[
   (\text{Score } A - 50) \times 2 = (75.00 - 50) \times 2 = 50.00
   \]

   This is the dissociated movements score and can be transferred to the front page of the QUEST.
1. Transfer score information on sitting posture from page 7.

\[
\begin{align*}
\text{Total Normal} & = 0 \times 2 = d \\
\text{Total Atypical} & = 3 \times (-1) = e = -3 \\
\text{Score B1} = d + e & = -3
\end{align*}
\]

2. Transfer score information on grasps from page 10.

\[
\begin{align*}
\text{Total } \checkmark & = 10 = f \\
\text{Total } \times & = 14 = g \\
\text{Total NT} & = 0 \times 2 = h
\end{align*}
\]

3. Calculate unstandardized score.

\[
\text{Score B} = \frac{\text{Score B1} + 2(f) + g}{54 - h} \times 100 \quad \text{c \hspace{0.1cm} The 54 - h calculation adjusts the score for any items not tested.}
\]

\[
\text{Score B} = \frac{( \quad ) + 2( \quad ) + ( \quad )}{54 - ( \quad )} \times 100
\]

\[
\text{Score B} = 57.41 \quad \text{c \hspace{0.1cm} Round to two decimal points.}
\]

4. Obtain a standardized score ranging from below zero (if a child scores \times on all items and has atypical posture) to 100.

\[
\text{(Score B - 50) \times 2 = } (57.41 - 50) \times 2 = 14.82
\]

This is the grasps score and can be transferred to the front page of the QUEST.
C. WEIGHT BEARING

1. Transfer score information from page 12 of QUEST.

\[
\begin{align*}
\text{Total } \checkmark & = \boxed{5} = i \\
\text{Total } \times & = \boxed{45} = j \\
\text{Total NT} & = \boxed{0} \times 2 = k
\end{align*}
\]

2. Calculate unstandardized score.

\[
\text{Score C} = \frac{2(i + j)}{100 - k} \times 100
\]

\[
\text{Score C} = \frac{2(5) + (45)}{100 - (0)} \times 100
\]

Score C = \boxed{55.00}

- The 100 - k calculation adjusts the score for any items not tested.
- Round to two decimal points.

3. Obtain a standardized score ranging from zero to 100.

\[
(Score C - 50) \times 2 = (55.00 - 50) \times 2 = \boxed{10.00}
\]

This is the weight bearing score and can be transferred to the front page of the QUEST.
1. Transfer score information from page 13 of QUEST.

Total ✔  = 0  = l
Total ✗ = 0  = m
Total NT = 36 x 2  = n

2. Calculate unstandardized score.

\[
\text{Score D} = \frac{2(l) + m}{72 - n} \times 100
\]

\[
\text{Score D} = \frac{2( \quad ) + ( \quad )}{72 - ( \quad )} \times 100
\]

Score D = Not tested

3. Obtain a standardized score ranging from zero to 100.

\[
(\text{Score D} - 50) \times 2 = (\quad - 50) \times 2 = \text{Not tested}
\]

This is the protective extension score and can be transferred to the front page of the QUEST.
Child’s Name: Angela  Date: 92/08/29  Time of Day: 10:30 a.m.

Evaluator: E. Thompson  Age: 3 years 2 months

Testing Conditions:
- Room: Clinic room “A”
- Seating (e.g., insert) Small regular chair
- Table (e.g., cutout) cutout table
- Orthotics (e.g., splints/AFOs) AFO left
- Others Present (e.g., parent) Parents

Score Key
- ✓ = Yes (able to complete item according to specification)
- ✗ = No (can not or will not complete item)
- NT = Not Tested (not able to administer item)

If a complete section is not tested, insert NT in summary score

MAKE SURE THERE IS A SCORE ENTERED IN EVERY SCORING BOX

SUMMARY SCORE (transfer from QUEST Scoring Sheet)

A: DISSOCIATED MOVEMENTS 45.32
B: GRASPS 37.04
C: WEIGHT BEARING 32.00
D: PROTECTIVE EXTENSION 27.78
TOTAL SCORE = SUM OF SCORES FOR EACH SECTION TESTED
TOTAL # OF SECTIONS TESTED

= 35.54

© 1992 DeMatteo, Law, Russell, Pollock, Rosenbaum, Walter
# A. DISSOCIATED MOVEMENTS
## Shoulder Items

<table>
<thead>
<tr>
<th>Start Position:</th>
<th>sitting in chair</th>
<th>no table</th>
<th>hands on lap</th>
</tr>
</thead>
</table>

### ITEM

**"SHOULDER"**

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;90</td>
<td>X</td>
<td>✔</td>
</tr>
<tr>
<td>≥90</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

### CRITERIA

- **elbow:** complete extension
- **wrist:** neutral to extension

1. Flexion

2. Flexion with Fingers Extended

3. Abduction

4. Abduction with Fingers Extended

---

**Score:**

- ✔: 8
- ✗: 8
- NT: 0

2.
### A. DISSOCIATED MOVEMENTS continued

**Elbow Items**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;ELBOW&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Left Score</th>
<th>Right Score</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Flexion</td>
<td>X</td>
<td>X</td>
<td>forearm: complete supination</td>
</tr>
<tr>
<td>2. Extension</td>
<td>X</td>
<td>X</td>
<td>forearm: complete supination</td>
</tr>
<tr>
<td>3. Flexion</td>
<td>✓</td>
<td>✓</td>
<td>forearm: complete pronation</td>
</tr>
<tr>
<td>4. Extension</td>
<td>X</td>
<td>✓</td>
<td>forearm: complete pronation</td>
</tr>
</tbody>
</table>

Start Position: sitting in chair  no table  hands on lap
# A. DISSOCIATED MOVEMENTS continued

## Wrist Items

**Start Position:** sitting at table, forearms may be on table

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>&quot;WRIST&quot;</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 1. Extension | ![Diagram](image1.png) | elbow: complete extension*  
*see manual for definition of complete extension |
| 2. Extension | ![Diagram](image2.png) | elbow: at least 10° flexion |
| 3. Extension | ![Diagram](image3.png) | forearm: complete pronation |
| 4. Extension | ![Diagram](image4.png) | forearm: complete supination |
| 5. Flexion | ![Diagram](image5.png) | forearm: complete supination |

**Score:** 5 15

**NT:** 0
A. DISSOCIATED MOVEMENTS continued

Finger Items

Start Position: sitting at table  forearm must rest on table

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Independent Finger Wiggling</td>
<td>L X</td>
<td>dissociation of all fingers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>no associated reactions</td>
</tr>
<tr>
<td>2. Independent Thumb Movement</td>
<td></td>
<td>no associated reactions</td>
</tr>
</tbody>
</table>

Grasp of 1" Cube

Start Position: sitting at table  cube at distance requiring elbow extension

Note: If Item 1 is performed, then Item 2 should also be scored YES

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Grasp Using Thumb</td>
<td>L X</td>
<td>shoulder: neutral</td>
</tr>
<tr>
<td></td>
<td></td>
<td>elbow: extension</td>
</tr>
<tr>
<td></td>
<td></td>
<td>wrist: neutral to extension</td>
</tr>
<tr>
<td>2. Grasp Using Palm</td>
<td></td>
<td>shoulder: neutral</td>
</tr>
<tr>
<td></td>
<td></td>
<td>elbow: extension</td>
</tr>
<tr>
<td></td>
<td></td>
<td>wrist: neutral to extension</td>
</tr>
</tbody>
</table>

Total Score: 3  X 5  NT 0
A. DISSOCIATED MOVEMENTS continued
Release of 1" Cube

Start Position: sitting at table cube in child's hand *

* Allowable to put cube in child's hand if he/she can't actively grasp
Note: If Item 1 is performed, then Item 2 should also be scored YES

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Release from Thumb and Fingers</td>
<td>![Checkmark]</td>
<td>![Checkmark]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>shoulder: neutral</td>
</tr>
<tr>
<td></td>
<td></td>
<td>elbow: extension</td>
</tr>
<tr>
<td></td>
<td></td>
<td>wrist: neutral to extension</td>
</tr>
<tr>
<td>2. Release from Palm</td>
<td>![Checkmark]</td>
<td>![Checkmark]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>shoulder: neutral</td>
</tr>
<tr>
<td></td>
<td></td>
<td>elbow: extension</td>
</tr>
<tr>
<td></td>
<td></td>
<td>wrist: neutral to extension</td>
</tr>
</tbody>
</table>

Scoring for Part A: DISSOCIATED MOVEMENTS (pages 2-6)

Total ✓ : 29 = a
Total × : 33 = b
Total NT : 0 = c

TRANSFER TO QUEST SCORING SHEET ON PAGE i
B. GRASPS

**Sitting Posture during grasps**

Note: Observations for scoring this item should be made while administering the grasp items in the following section.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NORMAL</td>
</tr>
<tr>
<td>Head</td>
<td>☑</td>
</tr>
<tr>
<td></td>
<td>Left</td>
</tr>
<tr>
<td></td>
<td>Flexion</td>
</tr>
<tr>
<td></td>
<td>circle atypical posture</td>
</tr>
<tr>
<td>Trunk</td>
<td>☑</td>
</tr>
<tr>
<td></td>
<td>Forward</td>
</tr>
<tr>
<td></td>
<td>check off position</td>
</tr>
<tr>
<td>Shoulders</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Retracted</td>
</tr>
<tr>
<td></td>
<td>check off position</td>
</tr>
</tbody>
</table>

**Scoring for Part B1: GRASPS - Sitting Posture (page 7 only)**

Total Normal (max. = 3) : 2 = d

Total Atypical (max. = 5) : 1 = e

TRANSFER TO QUEST SCORING SHEET ON PAGE ii
B. GRASPS continued
Grasp of 1" Cube

Start Position: sitting at table cube on table within comfortable reach

Note: Once a grasp has been performed, give a YES score for all those below it. If grasp observed is not listed, then score NO in all boxes and describe it under "Other" below.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Radial Digital</td>
<td>☒</td>
<td>☑ wrist: neutral to extension</td>
</tr>
<tr>
<td>2. Radial Palmar</td>
<td>☒</td>
<td>☑ wrist: neutral to extension</td>
</tr>
<tr>
<td>3. Palmar</td>
<td>☒</td>
<td>☑</td>
</tr>
</tbody>
</table>

Other:

[Space for additional notes]
B. GRASPS continued
Grasp of Cereal

Start Position: sitting at table

Note: Once a grasp has been performed, give a YES score for all those below it.
If grasp observed is not listed, then score NO in all boxes and describe it under
"Other" below.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fine Pincer</td>
<td>🔧</td>
<td>🏞️ wrist: neutral to extension</td>
</tr>
<tr>
<td>2. Pincer</td>
<td>🔧</td>
<td>🏞️ wrist: neutral to extension</td>
</tr>
<tr>
<td>3. Inferior Pincer</td>
<td>🔧</td>
<td>🏞️</td>
</tr>
<tr>
<td>4. Scissor</td>
<td>🔧</td>
<td>🏞️</td>
</tr>
<tr>
<td>5. Inferior Scissor</td>
<td>🔧</td>
<td>🏞️</td>
</tr>
</tbody>
</table>

Other:

Score:

☑️ 4  ❌ 6  NT 0
B. GRASPS continued
Grasp of Pencil or Crayon

Start Position: sitting at table pencil placed midline vertical with point facing child

Note: Child must pick up pencil on his/her own.
Once a grasp has been performed, give a YES score for all those below it.

<table>
<thead>
<tr>
<th>Circle one of:</th>
<th>L Dominance</th>
<th>R Dominance</th>
<th>L Preference</th>
<th>R Preference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circle one of:</td>
<td>grasp of Pencil</td>
<td>grasp of Crayon</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ITEM

1. Dynamic Tripod
   (pencil, grasped distally - precise opposition of thumb, index & middle finger)
   
   ![Dynamic Tripod Image]
   
   \[ \checkmark_{\text{L}} \times_{\text{R}} \]

2. Static Tripod
   (pencil grasped proximally - crude approximation of thumb, index & middle finger)
   
   ![Static Tripod Image]
   
   \[ \times_{\text{L}} \checkmark_{\text{R}} \]

3. Digital Pronate
   
   ![Digital Pronate Image]
   
   \[ \times_{\text{L}} \checkmark_{\text{R}} \]

4. Palmar Supinate
   
   ![Palmar Supinate Image]
   
   \[ \times_{\text{L}} \checkmark_{\text{R}} \]

Other:

\[ \checkmark \ 3 \times \ 5 \ NT \ 0 \]

Scoring for Part B: GRASPS (pages 8-10)

Total \(\checkmark\) : \[10\] = f
Total \(\times\) : \[14\] = g
Total NT : \[0\] = h

TRANSFER TO QUEST SCORING SHEET ON PAGE ii
C. WEIGHT BEARING

Start Position:  
prone  or  4 point

Note:  Once a position is scored, give a YES score for all those below it

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circle test position:  prone  4 point</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


1. Weight Bearing

a) elbow extended, hand open  
   ✓  ✓  

b) elbow extended, fingers flexed  
   ✓  ✓  

c) elbow extended, hand fisted  
   ✓  ✓ 

d) elbow flexed, hand open  
   ✓  ✓ 

e) elbow flexed, fingers flexed  
   ✓  ✓ 

f) elbow flexed, hand fisted  
   ✓  ✓  

Thumb must be out of palm for all weight bearing items or they are scored “NO”.

2. Weight Bearing with Reach

a) Bears weight on LEFT hand with LEFT elbow completely extended and reaches with other arm.  
   ✓  

b) Bears weight on RIGHT hand with RIGHT elbow completely extended and reaches with other arm.  
   ✓  

* ✓ 5  × 9  NT 0 11.  

*
### C: WEIGHT BEARING continued

**Sitting**

Start position: _______ sitting on floor preferably cross-legged

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE L</th>
<th>L</th>
<th>R</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Hands forward - circle test position: <strong>cross-legged</strong> ring</td>
<td>other</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) elbow extended, hand open</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td></td>
</tr>
<tr>
<td>b) elbow extended, fingers flexed</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td></td>
</tr>
<tr>
<td>c) elbow extended, hand fisted</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td></td>
</tr>
<tr>
<td>d) elbow flexed, hand open</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td></td>
</tr>
<tr>
<td>e) elbow flexed, fingers flexed</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td></td>
</tr>
<tr>
<td>f) elbow flexed, hand fisted</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td></td>
</tr>
<tr>
<td>2. Hands by side - circle test position: <strong>cross-legged</strong> ring</td>
<td>other</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) elbow extended, hand open</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td></td>
</tr>
<tr>
<td>b) elbow extended, fingers flexed</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td></td>
</tr>
<tr>
<td>c) elbow extended, hand fisted</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td></td>
</tr>
<tr>
<td>d) elbow flexed, hand open</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td></td>
</tr>
<tr>
<td>e) elbow flexed, fingers flexed</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td></td>
</tr>
<tr>
<td>f) elbow flexed, hand fisted</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td></td>
</tr>
<tr>
<td>3. Hands behind - circle test position: <strong>cross-legged</strong> ring</td>
<td>other</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) elbow extended, hand open</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td></td>
</tr>
<tr>
<td>b) elbow extended, fingers flexed</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td></td>
</tr>
<tr>
<td>c) elbow extended, hand fisted</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td></td>
</tr>
<tr>
<td>d) elbow flexed, hand open</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td></td>
</tr>
<tr>
<td>e) elbow flexed, fingers flexed</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td></td>
</tr>
<tr>
<td>f) elbow flexed, hand fisted</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td></td>
</tr>
</tbody>
</table>

| ☑ | ✗ | 25 | NT | 0 |

**Scoring for Part C: WEIGHT BEARING (pages 11-12)**

- Total ✓: 16 = i
- Total ✗: 34 = j
- Total NT: 0 = k

**TRANSFER TO QUEST SCORING SHEET ON PAGE iii**
D: PROTECTIVE EXTENSION

Start position: preferably ring sitting or kneeling

Note: Once a position is scored, give a YES score for all those below it.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L</td>
</tr>
</tbody>
</table>

1. Protective Extension - Forward - circle start position: [ring sit] kneeling other
   a) elbow extended, hand open [x] [x] [x]
   b) elbow extended, fingers flexed [x] [x]
   c) elbow extended, hand fisted [x] [x]
   d) elbow flexed, hand open [x] [x]
   e) elbow flexed, fingers flexed [x] [x]
   f) elbow flexed, hand fisted [x] [x]

2. Protective Extension - Side - circle start position: [ring sit] kneeling other
   a) elbow extended, hand open [x] [x]
   b) elbow extended, fingers flexed [x] [x]
   c) elbow extended, hand fisted [x] [x]
   d) elbow flexed, hand open [x] [x]
   e) elbow flexed, fingers flexed [x] [x]
   f) elbow flexed, hand fisted [x] [x]

3. Protective Extension - Backward - circle start position: [ring sit] kneeling other
   a) elbow extended, hand open [x] [x]
   b) elbow extended, fingers flexed [x] [x]
   c) elbow extended, hand fisted [x] [x]
   d) elbow flexed, hand open [x] [x]
   e) elbow flexed, fingers flexed [x] [x]
   f) elbow flexed, hand fisted [x] [x]

Scoring for Part D: PROTECTIVE EXTENSION (page 13 only)

Total ✔: [10] = l
Total ✗: [26] = m
Total NT: [0] = n

TRANSFER TO QUEST SCORING SHEET ON PAGE iv
E: HAND FUNCTION RATING

Please rate this child’s hand function (circle a number)

*Guidelines for scoring hand function:*

**POOR:** minimal independent hand grasps, no active release, unable to combine reach and grasp
**GOOD:** spontaneous reach, grasp and release, good eye-hand coordination

<table>
<thead>
<tr>
<th></th>
<th>POOR</th>
<th></th>
<th>GOOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left Hand</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Right Hand</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Bilateral</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

F: SPASTICITY RATING

Please rate this child’s spasticity

*Guidelines for scoring spasticity:*

**MILD:** good spontaneous movement, normal tone at rest, associated reactions present
**MODERATE:** tone interferes with spontaneous movement, may be present at rest
**SEVERE:** minimal spontaneous movement, stiff limbs, tone present at rest

<table>
<thead>
<tr>
<th></th>
<th>NONE</th>
<th>MILD</th>
<th>MODERATE</th>
<th>SEVERE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left Hand</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right Hand</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

G: COOPERATIVENESS RATING

Please rate this child’s level of cooperation during this assessment.

<table>
<thead>
<tr>
<th></th>
<th>NOT cooperative</th>
<th>SOMEWHAT cooperative</th>
<th>VERY cooperative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DISSOCIATED MOVEMENTS

1. Transfer score information from page 6 of QUEST.

\[
\begin{align*}
\text{Total } \checkmark & = 29 = a \\
\text{Total } \times & = 35 = b \\
\text{Total } \text{NT} & = 0 \times 2 = c
\end{align*}
\]

2. Calculate unstandardized score.

\[
\text{Score } A = \frac{2(a) + b}{128 - c} \times 100
\]

\[
\begin{align*}
\text{Score } A & = \frac{2(29) + (35)}{128 - (0)} \times 100 \\
& = 72.66
\end{align*}
\]

\[
\text{c a is multiplied by 2 because each } \checkmark \text{ scores 2 points.}
\]

\[
\text{c The 128 - c calculation adjusts the score for any items not tested.}
\]

\[
\text{c Round to two decimal points.}
\]

3. Obtain a standardized score ranging from zero to 100.

\[
\begin{align*}
\text{(Score } A - 50) \times 2 & = (72.66 - 50) \times 2 = 45.32
\end{align*}
\]

This is the dissociated movements score and can be transferred to the front page of the QUEST.
1. Transfer score information on sitting posture from page 7.

Total Normal = 2 x 2 = d = 4
Total Atypical = 1 x (-1) = e = -1
Score B1 = d + e = 3

2. Transfer score information on grasps from page 10.

Total ✓ = 10 = f
Total ✗ = 14 = g
Total NT = 0 x 2 = h

3. Calculate unstandardized score.

Score B = \frac{\text{Score B1} + 2(f) + g}{54 - h} \times 100

\text{Score B} = \frac{3 + 2(10) + (14)}{54 - 0} \times 100

\text{Score B} = \boxed{68.52}

\text{c} \quad \text{Round to two decimal points.}

4. Obtain a standardized score ranging from below zero (if a child scores ✗ on all items and has atypical posture) to 100.

\text{(Score B - 50) x 2} = (68.52 - 50) x 2 = \boxed{37.04}

This is the grasps score and can be transferred to the front page of the QUEST.
C. WEIGHT BEARING

1. Transfer score information from page 12 of QUEST.

\[
\begin{align*}
\text{Total } \checkmark & = 16 = i \\
\text{Total } \times & = 34 = j \\
\text{Total NT} & = 0 \times 2 = k
\end{align*}
\]

2. Calculate unstandardized score.

\[
\text{Score } C = \frac{2(i) + j}{100 - k} \times 100
\]

The 100 - k calculation adjusts the score for any items not tested.

\[
\text{Score } C = \frac{2(16) + (34)}{100 - (0)} \times 100
\]

\[
\text{Score } C = 66.00
\]

Round to two decimal points.

3. Obtain a standardized score ranging from zero to 100.

\[
(Score \ C - 50) \times 2 = (66.00 - 50) \times 2 = 32.00
\]

This is the weight bearing score and can be transferred to the front page of the QUEST.
1. Transfer score information from page 13 of QUEST.

Total ✓ = 10 = l
Total ✗ = 26 = m
Total NT = 0 x 2 = n

2. Calculate unstandardized score.

\[
\text{Score } D = \frac{2(l) + m}{72 - n} \times 100
\]

\[
\text{Score } D = \frac{2(10) + 26}{72 - 0} \times 100
\]

Score D = 63.89

- The 72 - n calculation adjusts the score for any items not tested.
- Round to two decimal points.

3. Obtain a standardized score ranging from zero to 100.

\[
(Score \ D - 50) \times 2 = (63.89 - 50) \times 2 = 27.78
\]

This is the protective extension score and can be transferred to the front page of the QUEST.
References


