MANUAL ABILITY VS MANUAL DEXTERITY IN CHILDREN WITH CEREBRAL PALSY

BY: RAMYA MOHANRAJ
INTRODUCTION

• An Occupational therapist’s main aim is to improve/engage in purposeful occupation, it is a fundamental characteristic of human life.

• The Occupational therapist designs and uses purposeful activities with their clients to promote learning or re-learning of functional skills such as play, self care, activities of daily living and academic related skills.

• By optimizing upper body function and improving the coordination of small muscles, therapist can help children with CP master the basic activities of daily living.
## DEVELOPMENT OF REACH, GRASP, RELEASE, FINE MOTOR DEXTERITY, IN-HAND MANIPULATION AND BILATERAL HAND USE

<table>
<thead>
<tr>
<th>AGE</th>
<th>CHARACTERISTICS</th>
</tr>
</thead>
</table>
| 0 – 2 Months | - Palmar grasp reflex is strong  
- Hands are usually fisted  
- Has visual regard for hands  
- Puts hand in mouth  
- Unable to reach |
## DEVELOPMENT OF REACH, GRASP, RELEASE, FINE MOTOR DEXTERTITY, IN – HAND MANIPULATION AND BILATERAL HAND USE

<table>
<thead>
<tr>
<th>AGE</th>
<th>CHARACTERISTICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 – 4 Months</td>
<td>➢ Palmar grasp reflex is strong</td>
</tr>
<tr>
<td></td>
<td>➢ Hands are often fisted and clasped</td>
</tr>
<tr>
<td></td>
<td>➢ Begins to reach for objects but unable to grasp objects</td>
</tr>
<tr>
<td></td>
<td>➢ Holds on to objects momentarily</td>
</tr>
<tr>
<td></td>
<td>➢ Often puts hand in mouth</td>
</tr>
</tbody>
</table>
# DEVELOPMENT OF REACH, GRASP, RELEASE, FINE MOTOR DEXTERITY, IN – HAND MANIPULATION AND BILATERAL HAND USE

<table>
<thead>
<tr>
<th>AGE</th>
<th>CHARACTERISTICS</th>
</tr>
</thead>
</table>
| 4 – 8 months    | ➢ Palmar grasp reflex weakens  
➢ Reaches for objects easily  
➢ Picks up and holds objects in an ulnar, palmar grasp  
➢ Picks up tiny objects in a scissor grasp  
➢ Shakes rattle  
➢ Holds larger objects with both hands  
➢ Transfers objects from one hand to the other  
➢ Hand to mouth  
➢ Objects in mouth |
### DEVELOPMENT OF REACH, GRASP, RELEASE, FINE MOTOR DEXTERITY, IN–HAND MANIPULATION AND BILATERAL HAND USE

<table>
<thead>
<tr>
<th>AGE</th>
<th>CHARACTERISTICS</th>
</tr>
</thead>
</table>
| 8 – 12 months | ➢ Palmar grasp reflex fades  
               ➢ Reaches for objects easily  
               ➢ Picks up and holds objects in radial side  
               ➢ Voluntary release of objects  
               ➢ Uses both hands to pick up and hold large objects together  
               ➢ More mature pincer grasp  
               ➢ Throws, bangs and dumps  
               ➢ Finger feeds self |
• Hand impairment/Hand sensori-motor impairments are generally thought to be largely responsible for the difficulty experienced in daily activities.
• Hand function problems in children with CP are often associated with problems of:
  - Motor control
  - Active ROM
  - Grip strength,
  - Persistence of primitive grasp reflex
  - Touch pressure detection
  - Stereognosis
  - Proprioception
  - Gross manual dexterity
  - Fine finger dexterity
  - Manual ability.
# HAND FUNCTION SKILLS/MANUALABILITY IN CHILDREN

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Body contact hand skills</td>
<td>f. Reaching</td>
<td>m. Transferring</td>
</tr>
<tr>
<td>3. Adaptive skilled hand use</td>
<td>g. Turning</td>
<td>n. Using both the hands simultaneously.</td>
</tr>
<tr>
<td>a. Grasping</td>
<td>h. Carrying</td>
<td>o. Using both hands cooperatively.</td>
</tr>
<tr>
<td>c. In-hand manipulation.</td>
<td>j. Catching</td>
<td></td>
</tr>
<tr>
<td>d. Releasing</td>
<td>k. Throwing</td>
<td></td>
</tr>
<tr>
<td>e. Isolated finger movements.</td>
<td>l. Stabilizing</td>
<td></td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>LEISURE AND PLAY</th>
<th>SCHOOL RELATED WORK</th>
<th>ACTIVITIES OF DAILY LIVING</th>
</tr>
</thead>
</table>

Ncore 2018" manual ability vs manual dexterity in children with cerebral palsy, Ramya
Manual Dexterity

- Manual dexterity is the ability to use our hands in a skillful, coordinated way to grasp and manipulate objects and demonstrate small, precise movements.
- It is of utmost importance in performing activities of daily living.
• **Manual dexterity** assesses unilateral and bilateral handgrip function and reflects the 7 most common grip types used in daily life:
  - Pulp pinch
  - Lateral pinch
  - Tripod pinch
  - 5-finger pinch
  - Diagonal volar grip
  - Transverse volar grip
  - Spherical volar grip
Manual Ability

• **Manual ability** refers to the children’s attempts to perform a particular task/ or their capacity to manage daily activities requiring the use of hands and upper limbs.

• Whatever the strategies involved.

• Manual ability and achievement in motor tasks can be influenced by motivation and cognition.
Manual dexterity:

**Functional Dexterity Test**, measures the ability to perform a tripod pinch through the timed manipulation of pegs (administration time about 5 min). A tripod pinch pattern is frequently used during daily activities such as eating, writing and tying etc.,
1. Purdue pegboard test

✓ Tiffin, 1968,
✓ Age: above 5 yrs
✓ It assess picking up, manipulating, and placing little pegs into holes with speed & accuracy.
✓ Purpose: finger dexterity.
✓ Time required: 10 to 20 minutes.
2. Minnesota rate of manipulation test

- Developed by American guidance service, 1969.
- It assess the speed and accuracy of repetitive reaching, picking up, manipulating, and placing disks.
- Purpose: measure manual dexterity.
- Target population: healthy subjects & in rehabilitation settings.
3. Box and Block test

- Box and block test was developed in 1957, to test people with severe problems affecting coordination.
- Purpose: basic measure of gross motor dexterity.
- Age above 7 years
- Target population: decreased hand function, patients with severe co-ordination deficits.
Manual ability is a capacity concealed within a person or a child and cannot be directly measured. The term manual ability will be used to refer to the children’s attempts to perform a particular task/capacity to manage daily activities requiring the use of hands and upper limbs.
Moreover, manual ability and achievement in motor tasks can be influenced by motivation and cognition.
Manual Ability Classification System
for Children with Cerebral Palsy
4-18 years
MACS classifies how children with cerebral palsy use their hands to handle objects in daily activities.

- MACS describes how children usually use their hands to handle objects in the home, school, and community settings (what they do), rather than what is known to be their best capacity.
- In order to obtain knowledge about how a child handles various everyday objects, it is necessary to ask someone who knows the child well, rather than through a specific test.
- The objects the child handles should be considered from an age-related perspective.
- MACS classify a child’s overall ability to handle objects, not each hand separately.
I. Handles objects easily and successfully. At most, limitations in the ease of performing manual tasks requiring speed and accuracy. However, any limitations in manual abilities do not restrict independence in daily activities.

II. Handles most objects but with somewhat reduced quality and/or speed of achievement. Certain activities may be avoided or be achieved with some difficulty; alternative ways of performance might be used but manual abilities do not usually restrict independence in daily activities.

III. Handles objects with difficulty; needs help to prepare and/or modify activities. The performance is slow and achieved with limited success regarding quality and quantity. Activities are performed independently if they have been set up or adapted.

IV. Handles a limited selection of easily managed objects in adapted situations. Performs parts of activities with effort and with limited success. Requires continuous support and assistance and/or adapted equipment, for even partial achievement of the activity.

V. Does not handle objects and has severely limited ability to perform even simple actions. Requires total assistance.
ABILHAND-Kids
Manual Ability Measure

• ABILHAND-Kids is a functional scale specifically developed to measure manual ability and provides guidelines for goal setting in treatment planning.

• It’s range and measurement precision are appropriate for clinical practice.
# Functional Scale for Manual Ability

A functional scale specifically developed to measure manual ability and providing guidelines for goal setting in treatment planning.

- Its range and measurement precision are appropriate for clinical practice.

## Activities and Difficulty Levels

<table>
<thead>
<tr>
<th>Activity</th>
<th>Possible</th>
<th>Difficult</th>
<th>Easy</th>
<th>?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switching on a bedside lamp</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unwrapping a chocolate bar</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taking a coin out of a pocket</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Putting on a hat</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opening a bread box</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Filling a glass with water</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Washing the upper body</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opening cap of toothpaste</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Squeezing toothpaste onto the brush</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taking off a t shirt</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Putting on school bag</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rolling up a sleeve</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zipping up trousers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fastening snap of a jacket</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zipping up jacket</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unscrewing a bottle cap</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opening a bag of chips</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sharpening a pencil</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opening a jar of jam</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buttoning up a shirt / sweater</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buttoning up trousers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Informant’s name and relationship:

**Therapist’s signature:**
MACS is not designed to classify best capacity and does not mean to distinguish different capacities between hands.

MACS reports the collaboration of both hands together: it is not an assessment of each hand separately. It looks for the children’s manual ability to ‘handle object(s) in daily life’.

By that we mean those activities that are relevant and age appropriate for the child including eating, dressing, playing, writing, etc.; these are distinct from advanced skilled activities that require special training for performance, such as playing a musical instrument.

Neither does it classify activities closely related to academic skills in school.

Dexterity scales are designed to quantify the capacity, grip-strength, visuo-motor coordination of unilateral dominant and non-dominant hand.
• There is abundant research saying that, “gross manual dexterity is a good predictor of manual abilities in children with cerebral palsy”.

• But to improve the quality of life in children with cerebral palsy and making them independent in their ADL and self care, manual ability skills is more important than manual dexterity skills.
Benefits of manual ability skills in CP children:

• Increasing their chance for independence
• Improving their ability to play and learn
• Boosting their self-esteem and confidence
• Helping them develop a workable routine
• Giving them a sense of accomplishment
• Improving their quality of life
THANK YOU