

# Evidence-Based Approach to Assessment and Therapy Planning in Cerebral Palsy

*Marcia Greenberg MS, PT  
Clinical Coordinator  
Center for Cerebral Palsy at UCLA/OIC*



International Alliance  
of Academies of  
Childhood Disability

# What's the Difference?

## Functional Classification

- Discriminates among different expressions or stages of a health condition
- Allows for recommendations and expectations based on classification
- Not outcome measures
- Typically stable

## Functional Assessment

- Identifies impairments that may be amenable to treatment
- May be used as outcome measures
- Identifies responses to treatment that may determine if
  - Treatment was effective
  - Treatment needs to be modified or discontinued
  - Goal needs to be changed

# Assessments in CP

“Giving patients the best possible treatment demands that we use the most accurate assessment of motor performance available to identify problems and to measure outcomes”

Suzann Campbell, PhD, PT



# Why Do We Measure?

- Provide data to patients and families that are meaningful
  - Motivate the patient
  - Inform families of status to allow participation in goal setting
- Monitor progress
  - Know when to modify treatment
  - Know when to discontinue treatment
  - Justify reimbursement
- Share objective, consistent data to colleagues



# Why Don't We Measure?

- Not sure what to measure
- Not sure how to measure
  - What tool to use, how to administer it correctly
- Not sure if method or tool is reliable or valid
- Not sure how to interpret results from a measure – “What does it mean?”
- Not sure how to apply the results to a treatment – “What do I do with it?”
- Colleagues may not be familiar with tool or its utility
- Lack of time, money or training for implementation

# Properties of Assessments

- **Validity**
  - Degree to which tool measures what it is intended to measure
- **Reliability**
  - Extent to which a measure is consistent among those who use it
  - Extent to which measure is free from error
- **Utility**
  - Degree to which it measures what you want it to
- **Responsiveness**
  - Degree to which a measure can detect a clinically significant change

# Considerations in Assessments

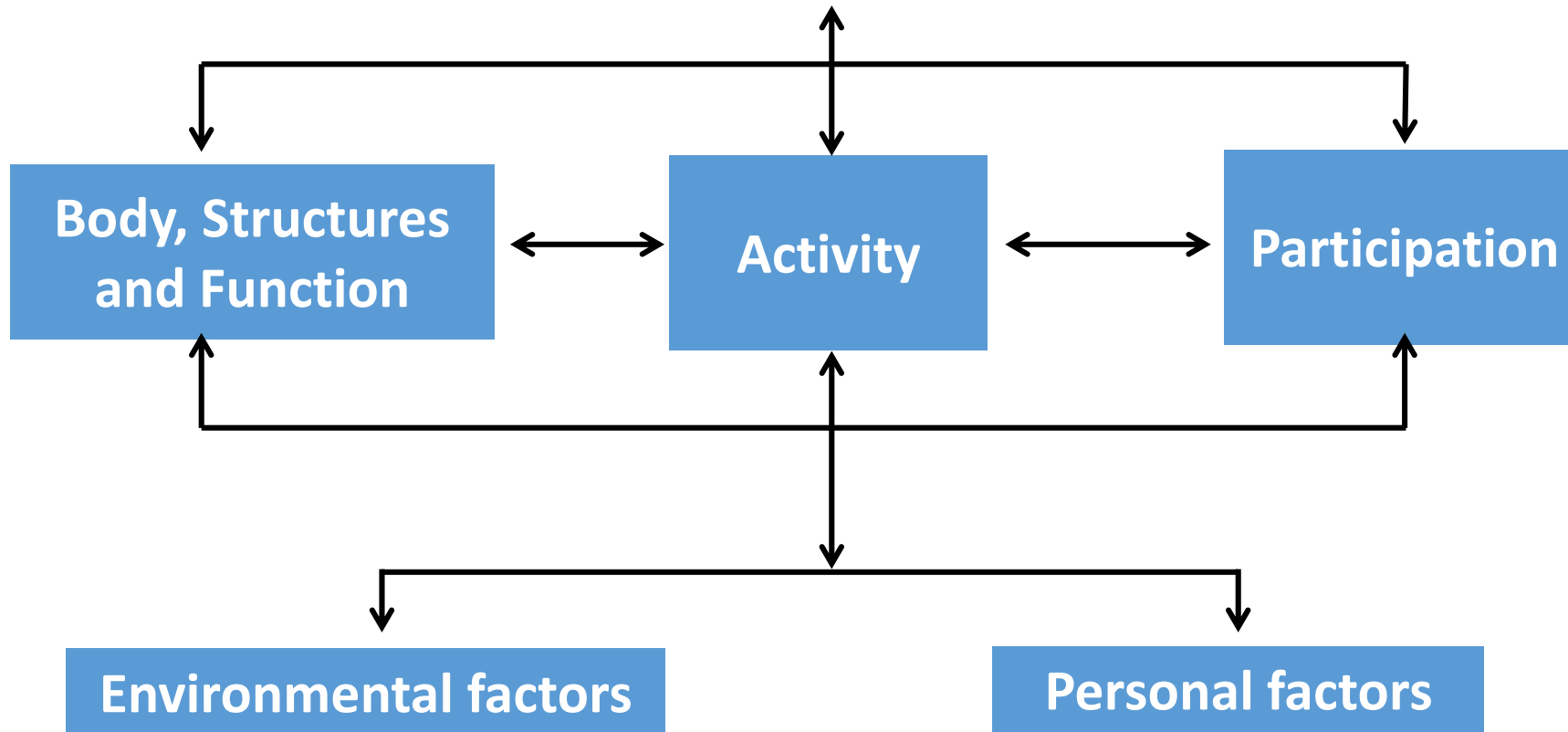
## Validation

- Instruments are typically developed specifically for one, or more than one purpose in a target population
- They must be validated for that purpose and population

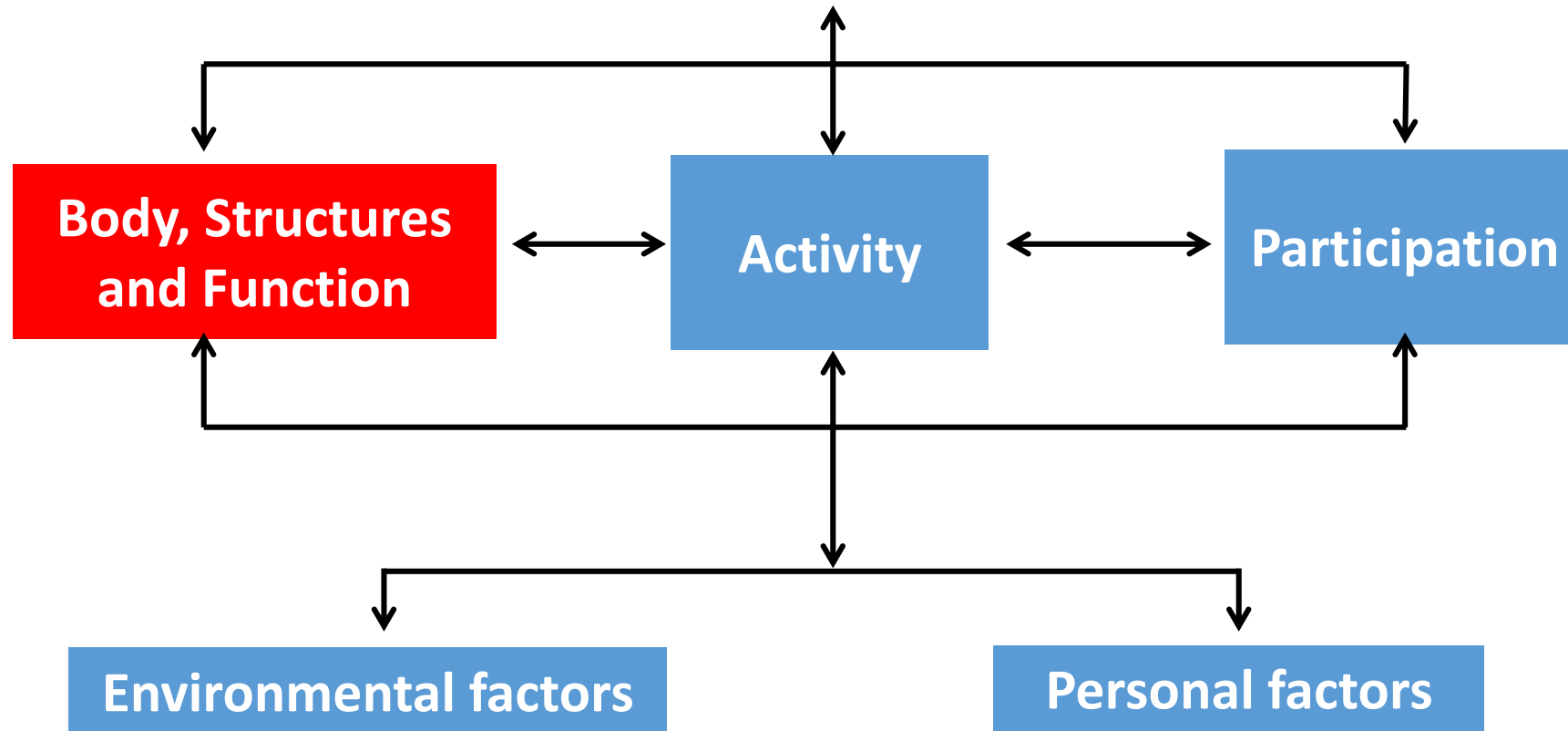
## Population

- You cannot automatically use an instrument for a purpose or on a population dissimilar to that for which it has been developed and validated
  - GMFM now validated for CP, TBI, Down Syndrome as evaluative measure; it is not appropriate for other diagnoses

# Health Condition



# Health Condition



# Body, Structure and Function – Impairments



# Why We Measure Impairments

- Easy to measure quantitatively and objectively
- Often the direct target of interventions
  - Reduction of spasticity, contracture or weakness
- Some goals may be set at impairment level
  - Was this goal met?

## The challenge

- Improvement in impairments has not been shown to improve participation
- Specificity of exercise
- Are we using the right tool to measure?

# Impairment Measures

- Range of motion
- Manual Muscle Testing
- Pediatric Balance Scale
- Modified Ashworth Scale
- Tardieu Scale
- Hypertonia Assessment Tool, or HAT ([Jethwa et al. 2010](#))
- Selective Control Assessment of the Lower Extremities, or SCALE ([Fowler et al. 2009](#))

# HAT – Hypertonia Assessment Tool

| HAT ITEM  | SCORING GUIDELINES<br>(0=negative or 1=positive)                                | SCORE<br>0=negative<br>1=positive<br>(circle score) | TYPE OF<br>HYPERTONIA |
|---|---|---|-----------------------|
| 1. Increased involuntary movements/postures of the designated limb with tactile stimulus of another body part | 0= No involuntary movements or postures observed                                | 0   | DYSTONIA              |
|   | 1= Involuntary movements or postures observed                                   | 1   |                       |
| 2. Increased involuntary movements/postures with purposeful movements of another body part                    | 0= No involuntary movements or postures observed                                | 0   | DYSTONIA              |
|   | 1= Involuntary movements or postures observed                                   | 1   |                       |
| 3. Velocity dependent resistance to stretch   | 0= No increased resistance noticed during fast stretch compared to slow stretch | 0   | SPASTICITY            |
|   | 1= Increased resistance noticed during fast stretch compared to slow stretch    | 1   |                       |
| 4. Presence of a spastic catch  | 0= No spastic catch noted   | 0   | SPASTICITY            |
|   | 1= Spastic catch noted  | 1   |                       |
| 5. Equal resistance to passive stretch during bi-directional movement of a joint                              | 0= Equal resistance not noted with bi-directional movement                      | 0   | RIGIDITY              |
|   | 1= Equal resistance noted with bi-directional movement                          | 1   |                       |
| 6. Increased tone with movement of another body part  | 0= No increased tone noted with purposeful movement                             | 0   | DYSTONIA              |
|   | 1= Greater tone noted with purposeful movement                                  | 1   |                       |
| 7. Maintenance of limb position after passive movement  | 0= Limb returns (partially or fully) to original position                       | 0   | RIGIDITY              |
|   | 1= Limb remains in final position of stretch                                    | 1   |                       |

- 4-19 years of age
- Each limb assessed
- Seven items per limb
- Active and passive movement

# Selective Voluntary Motor Control – SVMC

- Selective voluntary motor control is the ability to perform isolated joint movement upon request
- Impairment occurs with white matter damage
- Impaired SVMC occurs in adults following stroke and TBI and in children with spastic cerebral palsy
- Often overlooked in treatment planning in children with CP
- Good SVMC associated with better functional mobility
  - Validated with GMFCS
  - Best predictor of walking function

# SCALE – Selective Control Assessment of the Lower Extremity

- Minimum of 4 years of age and ability to follow directions
- Asked to perform an isolated (selective motion)
  - Hip, knee, ankle, subtalar joint and toes
- Each joint graded as 2 (Normal), 1 (Impaired) or 0 (Absent)

# Selective Voluntary Motor Control – SVMC

Knee – Normal SVMC



Knee – Absent SVMC



# SCALE – Selective Control Assessment of the Lower Extremity



## SCALE: Selective Control Assessment of the Lower Extremity Score Sheet

Date: \_\_\_\_\_ Patient's Name: \_\_\_\_\_ DOB: \_\_\_\_\_ GMFCS level: \_\_\_\_\_




Diagnosis:  spastic diplegia  spastic quadriplegia  spastic hemiplegia R L other: \_\_\_\_\_

- Each limb summed for Total Limb Score

|                    |  |    | Left |      |       |     |      | Right |      |       |     |      |      |
|--------------------|--|----|------|------|-------|-----|------|-------|------|-------|-----|------|------|
| Grade              |  |    | Hip  | Knee | Ankle | STJ | Toes | Hip   | Knee | Ankle | STJ | Toes |      |
| Normal (2 points)  |  |    |      |      |       |     |      | ✓     | ✓    |       |     |      |      |
| Impaired (1 point) |  |    |      |      |       |     |      |       |      | ✓     |     | ✓    |      |
| Unable (0 points)  |  |    |      |      |       |     |      |       |      |       | ✓   |      |      |
| Total Limb Score   |  | L= |      |      |       |     |      |       |      |       |     |      | R= 6 |

Fowler EG, Staudt LA, Greenberg MB, Oppenheim WL. Selective Control Assessment of the Lower Extremity (SCALE): development, validation, and interrater reliability of a clinical tool for patients with cerebral palsy. Dev Med Child Neurol. 2009 Aug;51(8):607–14.

# www.uclaccp.org/SCALE



(424) 259-6593

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## SCALE

The Center for Cerebral Palsy at UCLA team developed the clinical assessment tool SCALE, or Selective Control Assessment of the Lower Extremity. SCALE is designed for health care practitioners to evaluate the selective voluntary motor control of children and adults with the spastic form of cerebral palsy. The Center has a video that offers health care providers instruction in the administration and scoring of the SCALE. If you would like to view this video, please complete our short form below, including your name, profession and where you work. You will then be able to view the video.

**Thank you for your interest in SCALE** ✕

|  |                  |
|--|------------------|
| First & Last Name                          | Enter your Email |
| Your Degree                                | Profession       |
| Work Setting (PT School, hospital, clinic) |                  |
| Name of Institution of place of work       |                  |

**WATCH THE VIDEO**

### Stay Informed

**STAY INFORMED**

To better serve you, please respond to the following questions. Your name & email will be placed on the appropriate mailing list. Thank you for your interest in the Center for Cerebral Palsy at UCLA.

**I am a \***

CONSUMER (a parent of or person with Cerebral Palsy.)

PROFESSIONAL

**My Name is \***

0 of 30 max characters

**My Email is \***

# Why Use HAT and SCALE in Treatment Planning?

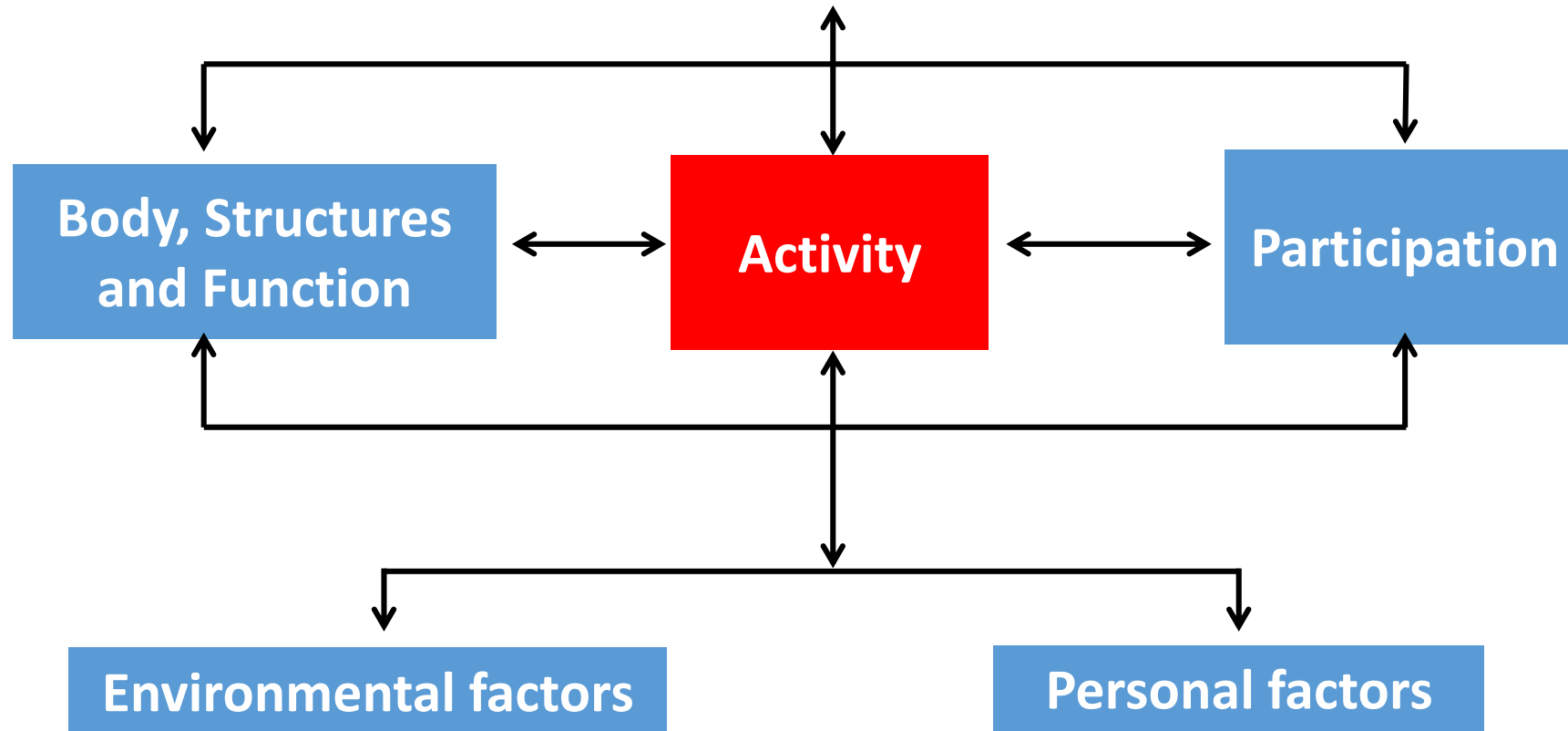
## Neither are outcome measures

- Guide treatment, since some treatments are more effective for one impairment than the other
  - Baclofen and SDR for spasticity
- Some interventions have higher complication rate based on type of movement disorder
  - Orthopedic surgery in dystonia
- Children with better SVMC have been shown to have better outcomes
  - Optimal candidates for SDR
- Depends on the goal

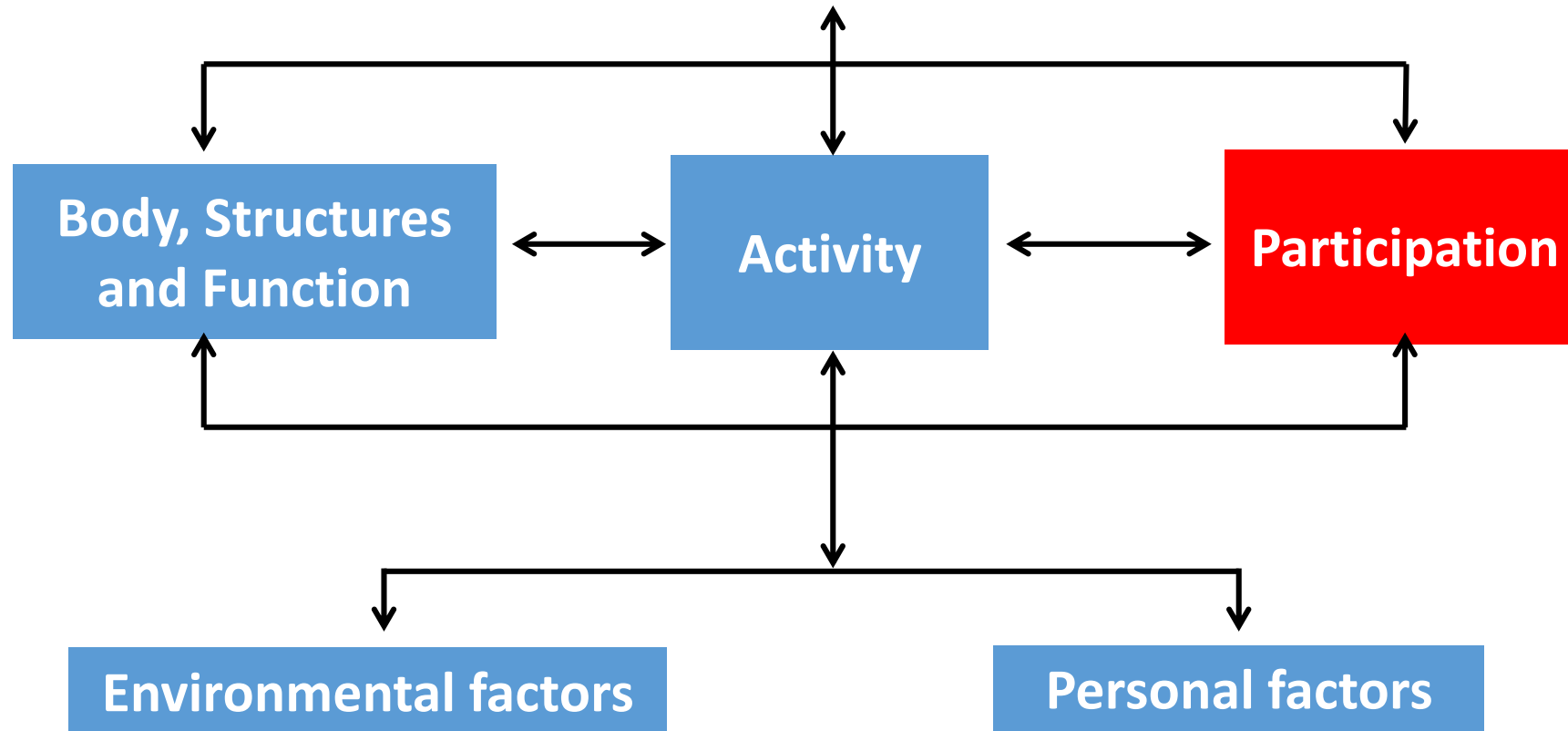
# Why Assessments Must Go Beyond Impairment Level

- Passive evaluation is poor predictor of voluntary motor capacity and function
  - Popliteal angle
- Improvements in muscle strength and endurance alone have not been shown to lead to improvements in participation
- Patient's goals typically deal with function, participation, and quality of life

# Health Condition



# Health Condition



# Functional Mobility Scale (FMS)

- Validated as classification and evaluative measure in CP ages 4-18 years
- Describes mobility at 5, 50 and 500 meters
- Rate “C” if mobility is achieved by crawling and “N” if does not apply
- Not by direct observation
- Measures “performance” – what the child actually does in real life

Rating

6

**Independent on all surfaces:**

Does not use any walking aids or need any help from another person when walking over all surfaces including uneven ground, curbs etc. and in a crowded environment.



Rating

3

**Uses crutches:**

Without help from another person.



Rating

5

**Independent on level surfaces:**

Does not use walking aids or need help from another person.\* Requires a rail for stairs.

\*If uses furniture, walls, fences, shop fronts for support, please use 4 as the appropriate description.



Rating

2

**Uses a walker or frame:**

Without help from another person.



Rating

4

**Uses sticks (one or two):**

Without help from another person.



Rating

1

**Uses wheelchair:**

May stand for transfers, may do some stepping supported by another person or using a walker/frame.



Graham HK, Harvey A, Rodda J, Nattrass GR, Pirpiris M. The functional mobility scale (FMS). J Pediatr Orthop. 2004;24(5):514–520

# Validated Functional Assessments in Cerebral Palsy

| Assessment  | Measures   | Age         | GMFCS   | Domain                   |
|---|--|-------------|---------|--------------------------|
| Gross Motor Function Measure (GMFM-66)  | Basic gross motor skills, mostly lower extremities                                 | 2 – 18yrs   | I - V   | Activity                 |
| Pediatric Evaluation of Disability Inventory (PEDI)                           | Self care, mobility and social function; level of assistance needed; modifications | 18mo – 7yrs | III-V   | Activity & Participation |
| Pediatric Evaluation of Disability Inventory-Computer Adapted Test (PEDI-CAT) | Daily activities, mobility, social/cognitive, responsibility                       | 0 – 20yrs   | I - V   | Activity & Participation |
| Activity Scale for Kids (ASK)   | Capacity and performance   | 5 – 15yrs   | I – III | Participation            |
| Canadian Occupational Performance Measure (COPM)                              | Parent (or child) selects 3 goals and rates satisfaction                           | Any         | I – V   | Participation            |
| Pediatric Patient-Reported Outcomes Measurement Information System (PROMIS)   | Parent report of child’s physical, mental, and social health                       | 5 – 17yrs   | I – V   | Participation            |

# In the Interest of Time...

- Upper extremity evaluation
  - Impairments
  - Activity
- Quality of life assessment measures
  - “An individual’s perception of life satisfaction and enjoyment”
  - Encompasses all of the ICF model
- Contextual factors
  - Environmental
  - Personal

# Where To Find Tests and Measures

Shirley Ryan Rehab Labs (formally Rehab Measures)

- <https://www.sralab.org/rehabilitation-measures>

Common Data Elements in Cerebral Palsy

- <https://www.commondataelements.ninds.nih.gov/cerebral%20palsy>

PEDro is the Physiotherapy Evidence Database in Australia

- <https://www.pedro.org.au/>

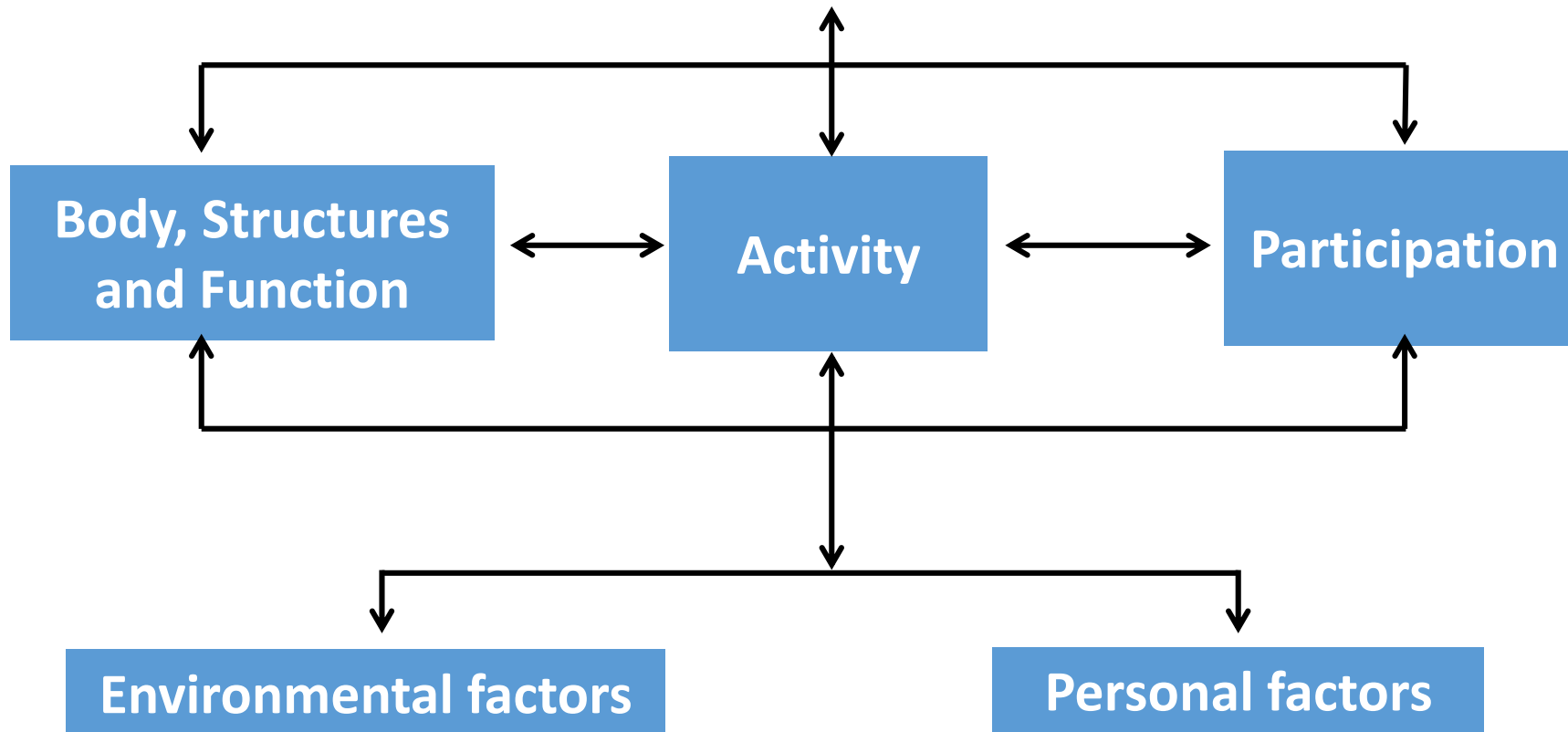
APTA – American Physical Therapy Association

- <https://www.apta.org/EvidenceResearch/EBPTools/>

Evidence based practice resources from Australia

- <https://canberra.libguides.com/evidence>

# ICF as Framework



# ICF as Framework for Treatment

## Participation

- What role in society is important for the patient to resume?

## Activity Limitation

- What activity limitations contribute to the above participation restrictions?
- What skills are necessary in order to achieve the above role?

## Body Structure & Function

- What impairments are interfering with performing the above mentioned activities?
- How can you prioritize the impairments to optimize goal?

# ICF as Framework for Treatment

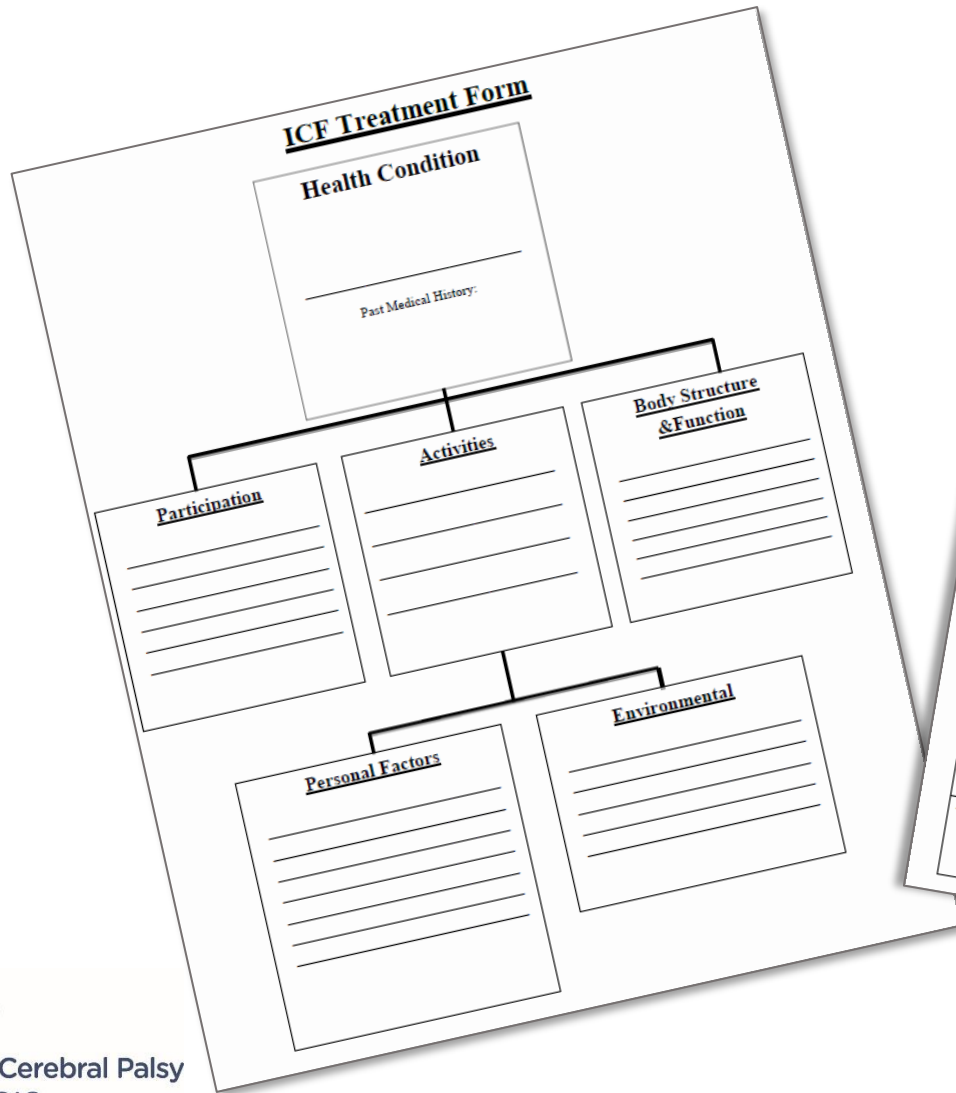
## Health Condition/Disorder

- Based on the pathophysiology, what is the prognosis for this patient?

## Contextual Factors

- What are the environmental barriers or facilitators in the patient's home, school or community?
- What are the personal barriers or facilitators in the patient's home, school or community?

# ICF as Framework for Treatment



**ICF/TOP-DOWN MODEL (Patient Goals)**

| Participation: What role in society is important for your patient to resume?   | PT GOALS | Treatment Interventions and Outcome Tools to Measure Progress |
|--|----------|---|
| Activity Limitation: What activity limitations contribute to the above participation restrictions? What skills are necessary in order to achieve the above role? |          |   |
| Body Structure & Function: What impairments are interfering with performing the above mentioned activities? (Please place in prioritized order)                  |          |   |
| Health Condition/Disorder: Based on the pathophysiology, what is the prognosis for this patient?   |          |   |

Treatment focus prior to this session:

Clinical question for mentor session:

Treatment plan for today:

Reflection based on outcome of session and planning for next session:

# The Core Sets

- List of factors by ICF Domain
- Activity and Participation – performing a task in a life situation
  - Participation
    - Creating and maintaining relationships
    - Working
    - Social engagement
  - Activity
    - Transfers
    - Walking

Schiariti V, Selb M, Cieza A, O'Donnell M. International Classification of Functioning, Disability and Health Core Sets for children and youth with cerebral palsy: a consensus meeting. *Dev Med Child Neurol.* 2015;57(2):149–58.

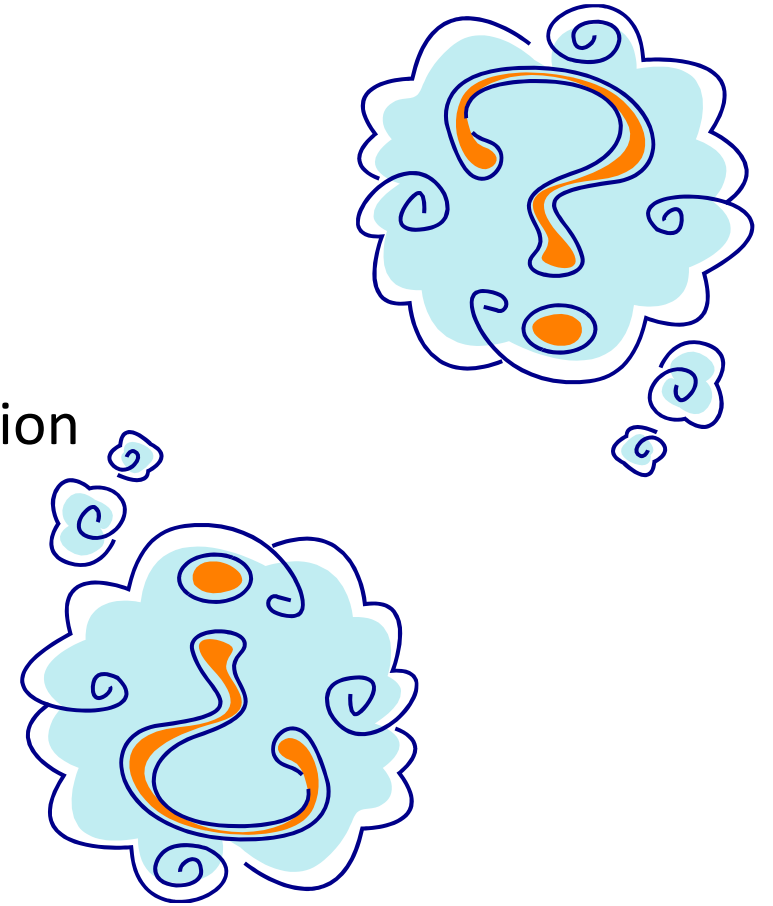
# How Do the Core Sets Fit In?

- Body Structure and Function – physiological functions of body systems
  - Intellectual function
  - Mobility of joint function
  - Muscle tone function
  - Control of voluntary movement function
- Environmental Factors – physical, social and attitudinal environment
  - Products and technology
  - Societal attitudes
  - Architectural barriers

Schiariti V, Selb M, Cieza A, O'Donnell M. International Classification of Functioning, Disability and Health Core Sets for children and youth with cerebral palsy: a consensus meeting. *Dev Med Child Neurol.* 2015;57(2):149–58.

# What Should I Do?

- Look at each item
  - Participation, activity limitation, body, structure and function
- How does my treatment advance the patient's participation goal?
- Is the goal objective and measurable?
- What is the evidence for the treatment?



# The Evidence: Motor Learning and Neuroplasticity

- In order for motor learning through neuroplasticity to occur, the person must be actively engaged
- Actively
  - Can't be done **to** the patient
  - Must be done **by** the patient
- Engaged
  - Important to the patient and/or family
- Patient must be forced to do problem solving
  - Problem solving means errors occur

# Implications for Therapy



- Task specific
  - As close to real task as possible
  - Focused on the goal the patient and family want
- High intensity
  - Practice and repetition
- Variable
  - Different environments

# Summary

- Classification systems can be used to guide patient, family and therapist to expectations
- Functional assessment tools can be used to measure status and progress before, during and after therapy
- The ICF framework can be used to identify the patient's goal (Participation) and the factors that interfere with that goal

# Questions to Ask Yourself

- What does the patient and family want?
- How can their goal be translated into therapy?
- Who's doing the therapy?
- Is the patient doing enough to cause a change?
- What is the evidence for what you are doing?
- Are their valid, reliable tools to assess patient's function and progress?
- If not, what objective measures can you use to assess progress?

# Case Example

## **10-year old boy with bilateral spastic CP, GMFCS III, MACS II, CFCS I, EDACS I**

- Walks with Lofstrand crutches in school and community
- Walks without equipment in home, uses walls and furniture for balance
- Mainstreamed in public school
- Had SEML surgery – bilateral hamstring releases, gastrocnemius recessions, bilateral FDRs 3 months ago
- Recovered post-operatively
- Referred to physical therapy

# Case Example

## **10-year old boy with bilateral spastic CP, GMFCS III, MACS II, CFCS I, EDACS I**

- His goal is to play with friends in school yard
  - Currently school will not allow him to participate because they worry he is unsafe in his walker
  - He is concerned that he will need to rest and there are nowhere to sit in the play yard
- Parents' goal is for him to use toilet independently
  - He is currently assisted with hygiene and clothing due to poor stance stability without walker (bathroom is too small for the walker)

# Case Example

## **10-year old boy with bilateral spastic CP, GMFCS III, MACS II, CFCS I, EDACS I**

- What are the questions you want to ask the child and the parents?
  - How will these questions guide your treatment?
- What are some assessment tools you will use and why?
  - What are you looking for to help drive your treatment?
- What outcome measures will you use?
- What are three treatments you will use to achieve the participation goal?
- What are the possible contextual factors that may be a barrier or facilitator?

