Introduction to Pediatric Assistive Technology

Susan Johnson Taylor, OTR/L, Resna Fellow
Director of Training and Education
Numotion

Bethany Sloane, PT, DPT
Assistant Professor / Pediatric Physical Therapist
Institute on Development & Disability
Oregon Health & Science University

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Objectives

1. The participant will understand the importance of utilizing an interdisciplinary team approach when conducting an equipment evaluation and creating mobility goals.

2. The participant will understand the importance of early access and continued access to equipment & mobility

3. The participant will have a basic knowledge of equipment needs for people with disabilities throughout the lifespan

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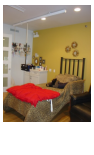
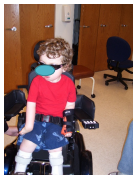
ASSISTIVE/ REHABILITATION TECHNOLOGY…

A broad range of devices used to augment and/or replace function.

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INTERNATIONAL CLASSIFICATION OF FUNCTION (ICF)

FIRST, THERE IS A HEALTH CONDITION (DIAGNOSIS)….

WHICH RESULTS IN…IMPAIRMENTS	WHICH RESULTS IN…LIMITATIONS	WHICH CAUSES….. AN INABILITY TO PARTICIPATE
Impairments are how the diagnosis affects body structure and/or function.	Limitations are how the impairment affects an ability to perform an activity	Decreased participation is how the limitations affect the client's ability to participate in activities that they need or want to do.
(abnormal tone, contractures, etc)	(such as an inability to sit, inability to reach upper shelves)	(such as an inability to cook a meal, drive, grocery shop)

Environmental factors and Personal factors

These play a role also. These are "**contextual factors**".

Environmental factors can include social attitudes, architectural characteristics, climate, terrain, among others.
Personal factors can include gender, age, coping styles, social background, education, past and current experience, overall behavior pattern, character.

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Seating is NOT:

Seating provides support surfaces for function

Seating is ***NOT***:

- A therapeutic device
- A device meant to provide range of motion
- A device meant to challenge someone's balance and motor skills

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SEATING *IS*:

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OVERVIEW OF SEATING GOALS

- Decrease effects of abnormal tone/reflexes/movement disorders
- Provide forces to provide corrective forces to or accommodate postural abnormalities
- Accommodate sensory impairments
- Improve functional/ADL skills
- Improve comfort/sitting tolerance
- Improve self image

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The Whole Evaluation Process: Clinical team of Therapist and ATP/Supplier

Client and family goals

Subjective information

Medical history

Surgical/procedure history and upcoming

Functional and ADL skill observations and questions

Objective information

Mat Evaluation

Initial goals (What direction are you thinking of going?)

Trialing equipment

Prescription of equipment

Fitting and training

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Setting expectations during the eval

Experienced vs new wheelchair user

Starts with communication

Must be **informed** enough to address what can and cannot be done. The time to figure out that something cannot be done is not at the delivery/fitting

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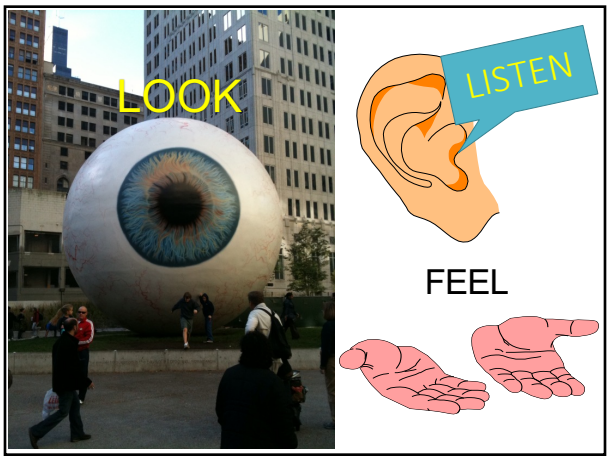

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MAT ASSESSMENT: physical takeaways

DETERMINE ***REDUCIBLE VS NON-REDUCIBLE*** POSTURAL ISSUES

DETERMINE ***LEVEL OF SUPPORT NECESSARY*** TO ALLOW SITTING (DEPENDENT, HAND DEPENDENT, INDEPENDENT)

NEUROMOTOR EVALUATION: ABNORMAL TONE, RELFEXES, MOVEMENT DISORDERS

SKIN CONDITION/ SENSORY STATUS

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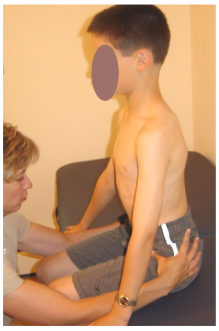
Sitting evaluation



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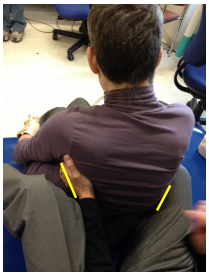
FIGURING OUT SHAPES AND BALANCE WHEN ASYMMETRY IS PRESENT: WHERE DOES THE CLIENT FEEL MOST BALANCED? WHAT KINDS OF SHAPES DOES THAT CREATE?



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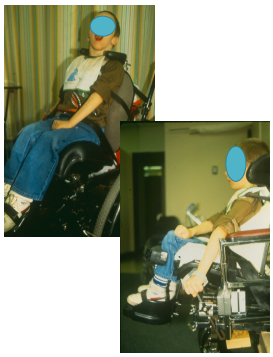
Tone, movement disorders, reflexes: what is functional, what needs to be decreased/ BLOCKED



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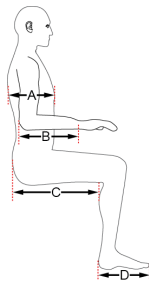
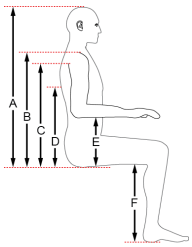
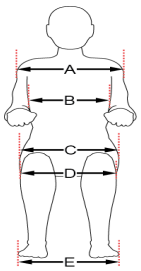
Anatomic Linear measurements that are needed to determine equipment



A – Trunk Depth
B – Forearm Depth
C – Buttock/Thigh Depth
D – Foot Depth



A –Maximum Sitting Height
B – Shoulder Height
C – Axilla Height
D – Scapula Height
E – Elbow Height
F – Lower Leg Length



A – Shoulder Width
B – Chest Width
C – Hip Width
D – External Knee Width
E – External Foot Width

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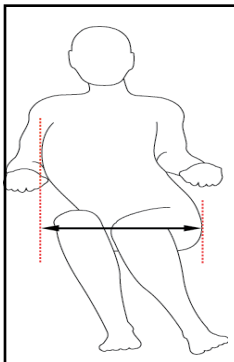

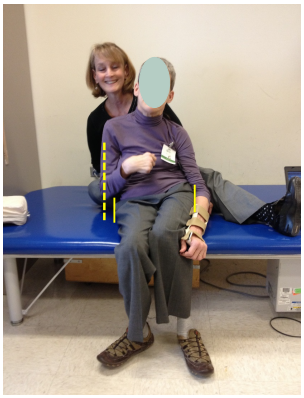

Maximum Sitting Width

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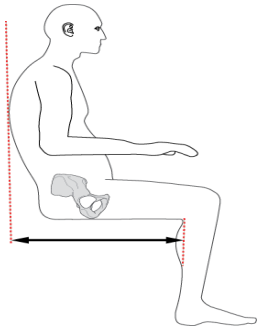

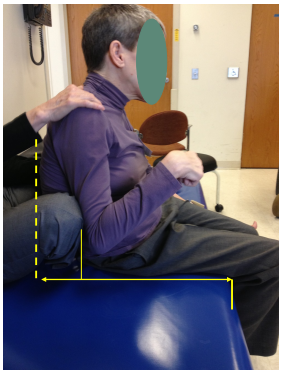

Maximum Sitting Depth

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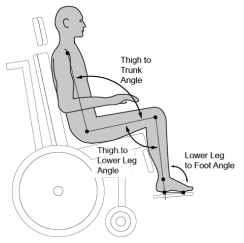
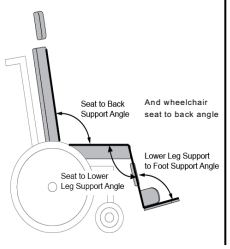
Measurement of key relative angles and what they relate to on the equipment

Relative Angles



Relative Angles



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Angular Measurements

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Therapist may need to provide objective measurements to recommend some things

Manual muscle test (_/5)

Wheelchair Propulsion Test (manual wheelchairs) (ATP can do)

Modified Ashworth score for spasticity

GMFCS Score for cerebral palsy

Timed up and go

Berg Balance test

Pressure mapping

Make sure in the case of changing conditions, ie MD, that tests are repeated and/or done at various times of the day OR that there are detailed questions to the client/parent about function throughout the day/ week.

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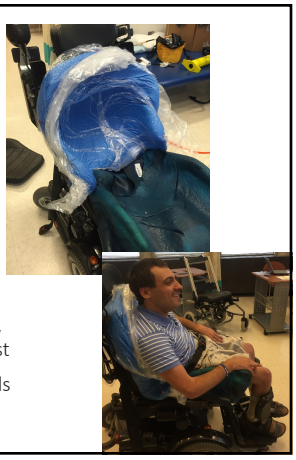
Simulation

-Always simulate in some manner

-What do you feel? How does the client react?

-If you are modifying current equipment, simulate in current wheelchair

-If you are thinking of significantly increasing/ changing support, must be done in conjunction with performance of key functional skills



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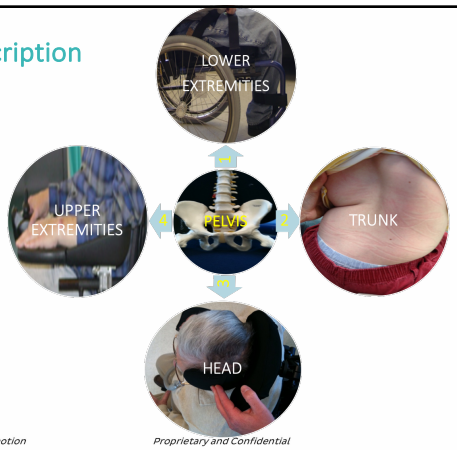
Prescription



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Off the Shelf: Understand Conditions The Components are meant for

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Modify off the shelf

- Examples:

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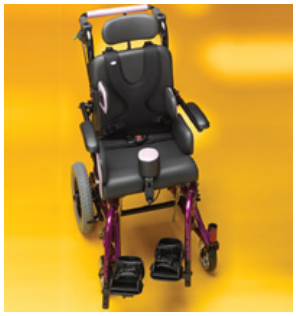
Custom configured seating



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Control of shape: Custom Contoured Seating

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Complex Seating Issues: Dynamic Components

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MANUAL WHEELCHAIRS

Dependent
Independent

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Dependent: strollers

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DEPENDENT: Tilt-in-space manual wheelchairs

Tilt-in-space manual wheelchairs **provide the client who has poor trunk control or who is unable to reposition themselves with the following benefits:**

- Gravity assisted positioning to enhance head and trunk control
- Provides pressure relief by re-distributing pressure from the buttocks to the trunk
- Decrease of spasticity by maintaining a fixed hip angle while providing pressure relief

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Independent manual

Growable, configurable for FUNCTION

Must be prescribed and adjusted to the individual child: example of one that was not

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Specific Objective Information:

This can assist with justification and, ultimately, set up of the wheelchair

-Collected by the therapist or the ATP Supplier:

- Wheelchair propulsion test: more detail
- Linear **and** angular measurements of the body

-Collected by the therapist:

- Range of motion limitations of the upper extremities
- Specific strength measures of the upper extremities
- Spasticity measures

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LINEAR/ ANGULAR MEASUREMENTS

Allows appropriate matching of the anatomic angles of the client to the angles of the wheelchair base components and set-up.

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Axle Adjustability for Center of Gravity

CENTER OF GRAVITY ADJUSTMENTS

AXLE POSITIONED FORWARD or even TO THE RIDER
- *USER'S WEIGHT IS AT OR BEHIND AXLE*
- ***DECREASED STABILITY, EASIER TO "POP A WHEELIE"***
- *SHORTER WHEEL BASE FOR BETTER MANEUVERABILITY*
- *IMPROVED ACCESS TO WHEEL*

AXLE POSITIONED BEHIND THE RIDER
- *USER'S WEIGHT IN FRONT OF THE AXLE*
- ***INCREASED STABILITY, MORE DIFFICULT TO DO WHEELIE***
- *LONGER WHEEL BASE*
- *DECREASED ACCESS TO WHEEL, decreased large, smooth strokes*

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Axle: Rear seat to Floor height

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Axle: Sleeving the Wheels In and Out

Sleeving in brings the wheels closer to the frame for better access.

Sleeving brings them farther away from the frame. (for such things as growth

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Power wheelchairs

Indications for the use of a power wheelchair might include one or more of the following:

- Upper extremity weakness, spasticity or paralysis
- *Inefficient* ambulation or use of a manual wheelchair
- Limited upper extremity range-of-motion, purposeful movement or a movement disorder
- Decreased endurance as a result of cardiac or respiratory disease
- The need to be able to independently relieve pressure
- Rapidly progressive disease that would result in a manual wheelchair not being a cost-effective alternative,

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Power Tilt and Recline Combination

Needed for those who do not get complete pressure relief with tilt only, or who require care in their chair, or who have a body type/ deformity that requires tilt and recline for positioning

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Alternative Drive Controls

Joystick Handle Options

Mini-joystick

Switch Options

Sip - n - Puff System

Head Array System

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TECHNOLOGY TOLERANCE

Some folks have trouble with the idea of regularly plugging the chair in to charge

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Technology Tolerance

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When do you start introducing assistive technology?

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What is a child's job?

To play
To go to school
To explore
To have fun
To grow
To learn
To discover
To interact

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How do they do this?

Practice
Through interactions
Exploring different environments
Being open minded
Socializing with others
Figuring out how things work

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When do children begin to move?

3-4 mo- rolling
6 mo- sitting
8-9 mo- crawling
9-10 mo- pulling to stand
9-15 mo- walking

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How is this different for a child with a disability?

- Its shouldn't be.
- We need to adapt as a society and profession.
- Tend to box in children with special needs.
- Need to help the children we work with have the same experiences and to be a kid.
- Gaps are forming.

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Why is *ACTIVE* mobility so important?

It helps with development in these areas:

Social

Participation

Engagement

Emotional

Language

Cognition

Perceptual

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There are currently no commercial pediatric powered mobility devices for kids under 3 years of age that employ alternative aesthetics or design materials.

Galloway et al, 2012

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What do supports look like?



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Beliefs about Power Mobility

- Belief that wheeled mobility is at odds with physical therapeutic or functional goals
- Belief wheeled mobility will promote laziness
- Belief that use of wheeled mobility will lead to the loss of function
- Polarized views of the need and use of a mobility device
- Belief that the child is too young
- Parents aren't ready

Berry et al., 1996; Bottos & Gericke, 2003; Everard, 1984; Gibson et al., 2011 Henderson et al., 2008; McKeever et al., 2013; Wiart & Darrah, 2002

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Research on Early Power Mobility

Shows increases in:

- Self-initiated peer interaction and social interaction in general
- Communication
- Other mobility skills, including walking
- Increased freedom & independence
- Improved sleep quality
- Decreased mobility-related energy expenditure

Butler et al., 1983; Jones et al;, 2012; Paulsson & Christofferson,1984; Livingstone, 2010; Nillson & Nyberg, 2003

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Children with disabilities as young as 7 months old can successfully learn to navigate their environment in an adapted power mobility device.

Lynch et al., 2009

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Why do we care?

- Early Intervention and Medicaid routinely deny powered mobility for young children.
- Also deny requests for modifications or new devices within one 5-year period, despite the fact that most children change and grow significantly in this timeframe.
- 6-8 months between the time of the mobility evaluation, the insurance approval, and the fabrication/delivery of the device.
- Device costs can be upwards of $25,000

Illinois Division of Specialized Care for Children, 2013; Nicholson & Bonsall, 2005; Staincliffe, 2003

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Determining Child Readiness

- Powered mobility skills checklists often used to determine mobility eligibility for children
- Based on adult ideals of appropriate and safe driving behavior rather than safe but exploratory child-led developmental mobility.
- Often given without practice experience or safe exploration of mobility in an alternative way.

(Illinois Division of Specialized Care for Children, 2013, Tefft et al., 2003)

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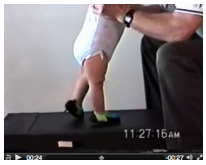
Traditional Principles of Peds AT

- **When** to start:
  - Specific criteria, "Readiness"
- **What** to focus on:
  - Targeted movement or behavior
- **Where** to use:
  - Controlled environments

  *** Additional requirements for use*
- **How** often?
  - 2 x 3 times per week for 20-30 minutes per session led by a PT
  - 'high intensity' is 2x/day, 5 days/wk for 20-30 minutes/day (ex. BWSTT)



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Emerging Principles of Peds AT

- When to start:
  - ~~Specific criteria, "Readiness"~~
  - NOW
- What to focus on:
  - ~~Targeted movement or behavior~~
  - EVERYTHING
- Where to use:
  - ~~Controlled environments~~
  - EVERYWHERE
- How often?
  - ~~2 x 3 times per week for 20-30 minutes per session led by a PT~~
  - ALL THE TIME

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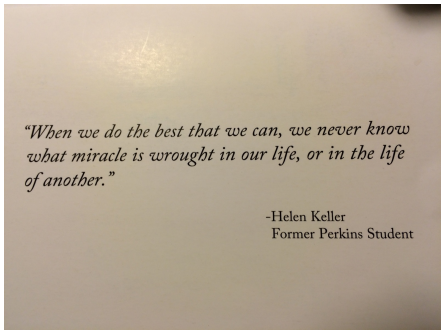

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