

A video will (hopefully) play for  
the 2 minutes prior to the  
beginning of this presentation ....



# 'On time' Mobility



**Mobility (noun)**

**məʊ'biləti/**

**'the ability to move or  
be moved freely and  
easily'**

Scott Langmead

Current Role: Clinical Lead - Posture and Mobility

AbilityWA

Clinical Advisor – Ability TECH



“mobility is an inherent characteristic of being human”  
( Kangas, 1997)

## Learning Objectives

- Today we will review the considerations for use of powered and some non powered mobility devices as an assistive technology intervention, within an occupational therapy context.
1. Review the What, When, Why, How and Who of powered mobility.
  2. To consider (powered mobility) prescription and considerations for children using current frames of reference.
  3. To apply the basic occupational therapy process, task analysis and relevant frameworks to equipment consideration and selection.
  4. Identify basic components of (powered) mobility devices, assessment, prescription and training, which consider the function and development of children.





## What's your experience of (powered) mobility devices?

- How many of us here this evening access mobility based AT as part of our practice? Or want to?
- Driven a powered device as an attendant?
- Tried a power assist system? Tried to get one into a boot?
- Crashed a scooter or PMD?



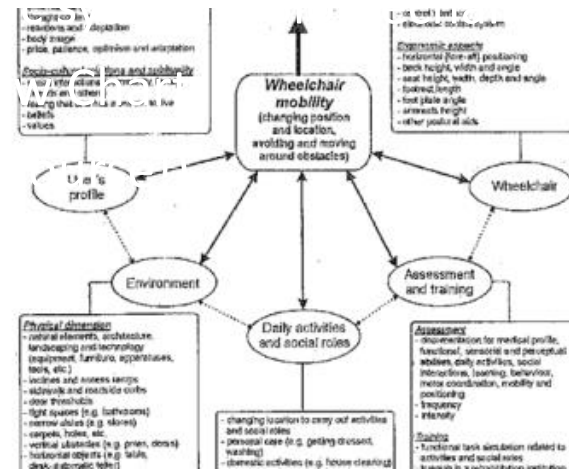
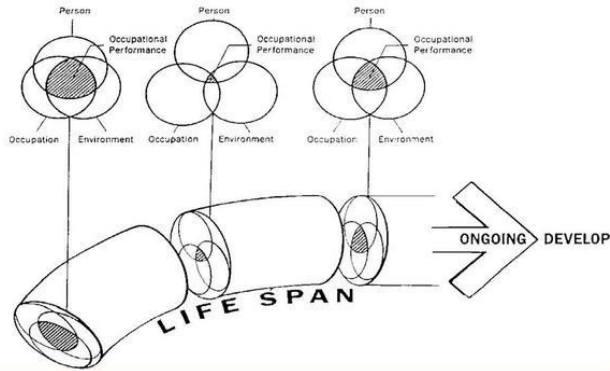


How can we frame our intervention?

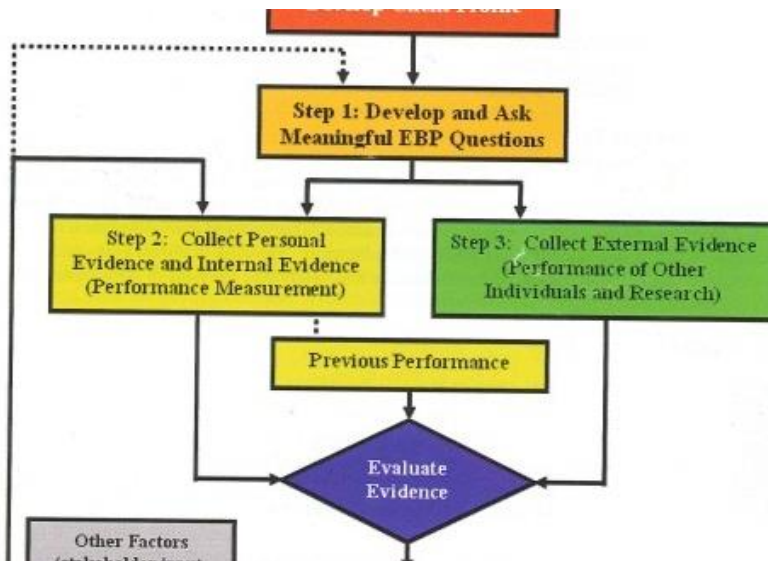


# Frames of reference and theory

Figure 1b  
Depiction of the Person-Environment-Occupation Model of Occupational Performance across the lifespan if hypothetical changes in occupational performance at three different points in time



(Routhier, et al, 2009)





# MPT: Matching Person to Technology

*“When matching person and technology, you become an investigator, a detective. You find out what the different alternatives are within the constraints”.*

(From Living in the State of Stuck: How Technology Impacts the Lives of People with Disabilities)

























Focusing on the Person, Milieu, and Technology



(Scherer, 2007)



# Typical development

Watch and help me grow from birth to 18 months!						
	Birth - 3 Months	3 - 6 Months	6 - 9 Months	9 - 12 Months	12 - 15 Months	15 - 18 Months
<b>PHYSICAL HEALTH</b> I grow and learn best when my body is healthy.	<b>I can lift my head.</b>  I need some awake time on my tummy, playing with you is the best.	<b>I can roll over.</b>  I love exploring on the floor. Put toys near me... I reach for them!	<b>I can sit up, try to move.</b>  I learn by doing. Give me toys I can hold and a safe place to move around.	<b>I use my fingers and toes.</b>  Play games and sing songs with me that use my hands and feet.	<b>I start walking without help.</b>  Let me try new things. Play and walk with me outside.	<b>I can climb and dance.</b>  Find places I can use my arms and legs to climb safely. Dance with me!
<b>SOCIAL &amp; EMOTIONAL</b> I learn best when you love me, encourage me and help me be with other people.	<b>I need and trust you.</b>  Pick me up and respond when I cry so I learn I can count on you.	<b>I show my feelings.</b>  Notice my feelings. Respond to my words and moods in a reassuring way.	<b>I like familiar people best.</b>  Have the same people take care of me. This helps me feel safe and loved.	<b>I enjoy playing with adults.</b>  Sing, read and dance with me. Play with things that make noise.	<b>I like to explore with help.</b>  Encourage me to explore where you watch. Smile and say, "You did it!"	<b>I need help with my feelings.</b>  Stay near me when I'm upset. Hug me and say kind words to me.
<b>HOW I LEARN</b> I want to learn and you can encourage me.	<b>I look at faces and smile.</b>  Look at my eyes when you change me or feed me. Smile at me.	<b>I like to hold things.</b>  I like to see and touch everything. Help me play with safe toys.	<b>I like to play with toys.</b>  Play with me using toys with different textures, sounds and shapes.	<b>I move to explore.</b>  Give me safe places to play and move. Watch me closely.	<b>I know what I want.</b>  Notice what I like and want to do. Play along with me.	<b>I learn through play.</b>  Let me find new ways to play. Show me your ideas, too.
<b>THINGS I KNOW</b> I learn when you help me explore the world around me.	<b>I learn through my senses.</b>  Play quiet music when you hold me close.	<b>I notice routines.</b>  Cuddle me and sing quietly to me before bedtime.	<b>I am interested in people.</b>  Show me people in pictures and books. Look in the mirror with me.	<b>I like to play hiding games.</b>  Hide something and then uncover it. Play peek-a-boo with me.	<b>I begin to scribble.</b>  Let me try crayons and markers while you draw with me.	<b>I put things together.</b>  Help me play with things I can stack or separate (cups).

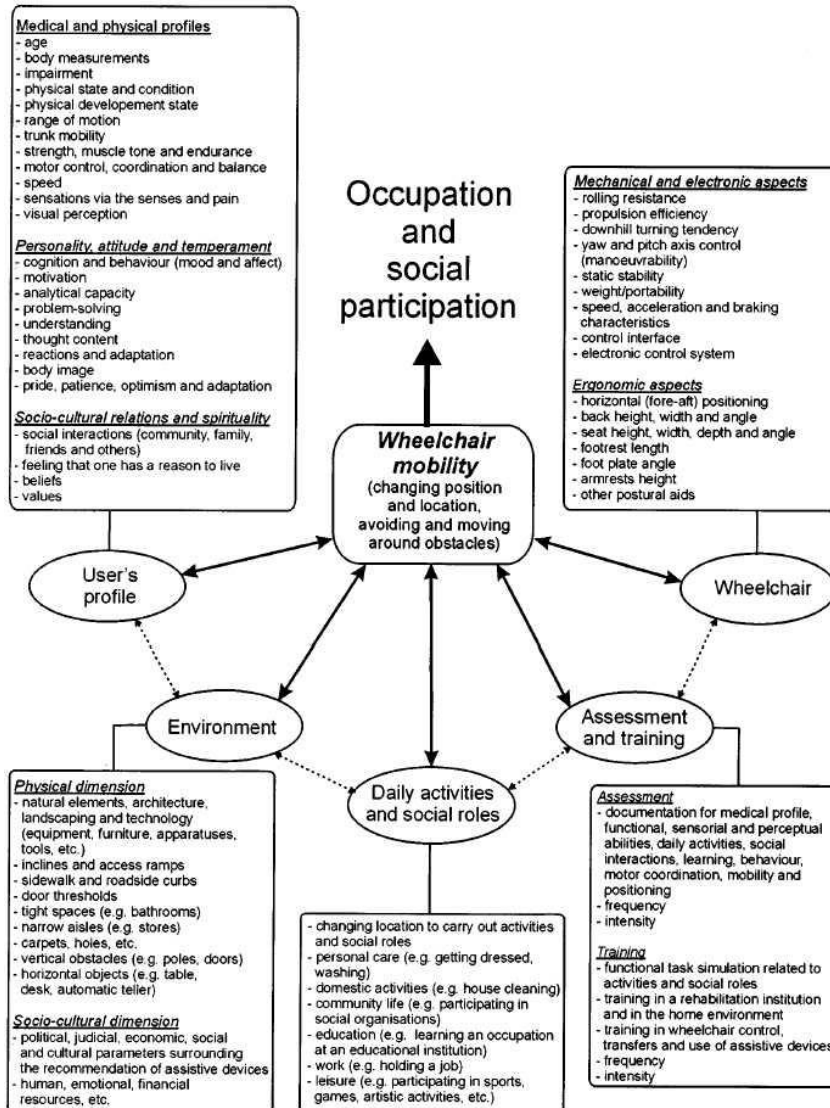


Prognosis for Independent Mobility	Rehab Concerns	Intervention Strategies
Dependent on caregivers	<ul style="list-style-type: none"> <li>• Symbiotic relationship</li> <li>• Deformity</li> </ul>	<ul style="list-style-type: none"> <li>• Assistive devices and equipment</li> <li>• Variety of caregivers</li> <li>• Normal life rhythm</li> <li>• Prevent deformities</li> </ul>
Independence achieved through powered mobility	<ul style="list-style-type: none"> <li>• Functional mobility</li> <li>• Functional sitting, transfers, standing</li> <li>• Deformity</li> </ul>	<ul style="list-style-type: none"> <li>• PT to develop balance, prevent deformities</li> <li>• Assistive devices</li> <li>• Early provision of powered mobility</li> </ul>
Mixed Independence (walking and wheeled mobility, manual and powered)	<ul style="list-style-type: none"> <li>• Limited mobility</li> <li>• Physiological burnout</li> <li>• Deformity</li> </ul>	<ul style="list-style-type: none"> <li>• PT to age 8 for walking</li> <li>• Walking aids and orthosis</li> <li>• Possible ortho surgery</li> <li>• Wheeled devices, possibly powered</li> <li>• PT to prevent deformities</li> </ul>
Independent walking	<ul style="list-style-type: none"> <li>• Pain, possibly limiting function in adulthood</li> </ul>	<ul style="list-style-type: none"> <li>• Periodic PT in adulthood for balance and gait, monitor Musculoskeletal status/deformity</li> <li>• Assistive devices over ages 40-45</li> </ul>

## Bottos FCS for Mobility Independence in children with CP

(Bottos ,M Bolcati, C Sciuto L, Gericke, C Vianello A ,2001)





## Relational model of wheelchair mobility



# Relational Model of Wheelchair Prescription

**Main Goal: Occupation and social participation**

facilitated by;

## **Wheelchair mobility**

Which is impacted by;

1. **The User profile**
2. **Environment**
3. **Daily Activities and social roles**
4. **Assessment and training**
5. **Wheelchair/ mobility device**

Learn from the past, improve the future

“If any prescription is exactly the same”.....





# Predictive Assessment

- Example GMFCS, GMFCS curves.
- Conditions where function deteriorate
- Efficient mobility – design of seating system and mobility base.

## Reality of Walking (Cerebral Palsy)

Never achieved by some

Loss or deterioration in many Teenage years: extraordinary energy cost

Mid-20s: physiological burn-out syndrome

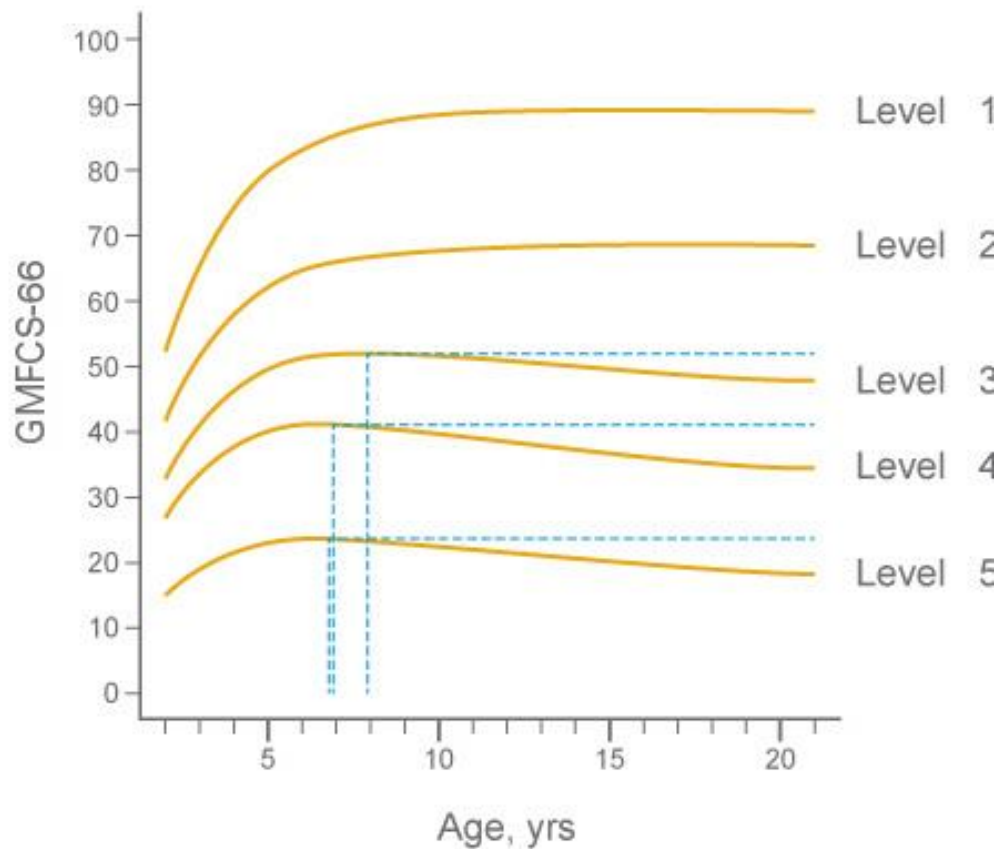
Mid-40s: painful joint deterioration










# Predictive analysis






## GMFCS



#### GMFCS E & R between 12<sup>th</sup> and 18<sup>th</sup> birthday: Descriptors and illustrations

	<b>GMFCS Level I</b> Tooth walks at home, school, outdoors and in the community. Toes are able to climb stairs and stairs without physical assistance or a railing. They perform other motor skills such as running and jumping but speed, balance and coordination are limited.
	<b>GMFCS Level II</b> Tooth walks in most settings but may need a railing to turn and cannot move without assistance. At school or work they may require a hand held mobility device for safety and child starts holding onto a railing. Outdoors and in the community tooth may use wheeled mobility when negotiating long distances.
	<b>GMFCS Level III</b> Tooth are capable of walking using a hand held mobility device. Tooth may climb stairs using a railing with supervision or assistance. At school they may use a manual wheelchair or use a powered mobility. Outdoors and in the community tooth are transported in a wheelchair or use powered mobility.
	<b>GMFCS Level IV</b> Tooth use wheeled mobility in most settings. Physical assistance or support is required for transfers, indoors and outdoors with short distances with physical assistance, use wheeled mobility or a body support when using a wheelchair. They may require a powered (EMC) wheelchair and transported in a manual wheelchair.
	<b>GMFCS Level V</b> Tooth are transported in a manual wheelchair in all settings. Tooth are limited in their ability to maintain independently head and trunk position and use movements. They are limited in their ability to use movements. They are limited in their ability to use movements.

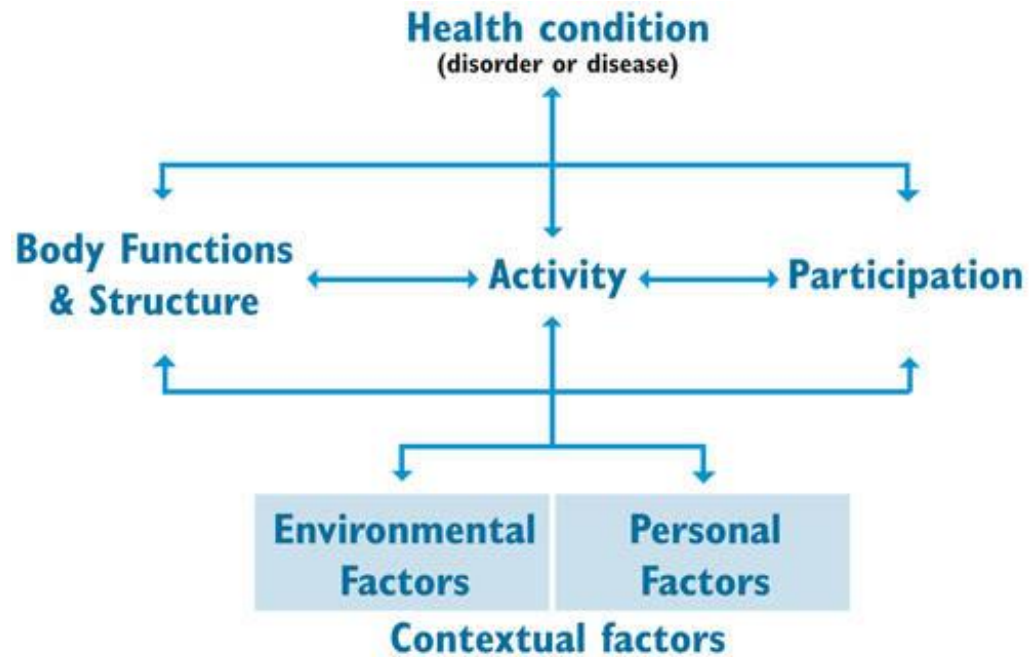
#### GMFCS E & R between 6<sup>th</sup> and 12<sup>th</sup> birthday: Descriptors and illustrations

	<b>GMFCS Level I</b> Children walk at home, school, outdoors and in the community. They are able to climb stairs and stairs without physical assistance or a railing. Children perform other motor skills such as running and jumping, but speed, balance and coordination are limited.
	<b>GMFCS Level II</b> Children walk in most settings and climb stairs, holding onto a railing. They may experience difficulty walking long distances and balancing on uneven terrain, outdoors or crowded areas in confined spaces. Children may use physical assistance, a hand held mobility device or use wheeled mobility over long distances. Children have low physical ability to perform gross motor skills such as running and jumping.
	<b>GMFCS Level III</b> Children walk using a hand held mobility device in most settings. They may climb stairs holding onto a railing with supervision or assistance. Children use wheeled mobility when traveling long distances and may need support for short distances.
	<b>GMFCS Level IV</b> Children use methods of mobility that require physical assistance or support in most settings. They may walk for short distances at home with physical assistance or use wheeled mobility or a body support when using a wheelchair. At school, outdoors and in the community children are transported in a manual wheelchair or use powered mobility.
	<b>GMFCS Level V</b> Children are transported in a manual wheelchair in all settings. Children are limited in their ability to maintain independently head and trunk position and control leg and arm movements.

<p><b>Rating 6</b></p> <p>Independent on all surfaces: Does not use any walking aid or need help from another person when walking over all surfaces in familiar settings, outdoors, stairs etc. and in a crowded environment.</p> 	<p><b>Rating 3</b></p> <p>Uses crutches: Without help from another person.</p> 								
<p><b>Rating 5</b></p> <p>Independent on level surfaces: Does not use walking aids or need help from another person? Requires a rail for stairs. If use motion, with focus, may need to report, other per 1 of the appropriate description.</p> 	<p><b>Rating 2</b></p> <p>Uses a walker or brace: Without help from another person.</p> 								
<p><b>Rating 4</b></p> <p>Does climb (use or use) Without help from another person.</p> 	<p><b>Rating 1</b></p> <p>Uses wheelchair: May need for transfers, may do some walking supported by another person or using a walker/cane.</p> 								
<table border="1"> <thead> <tr> <th>Walking distance</th> <th>Rating: select the number (from 1-4) which best describes current function.</th> </tr> </thead> <tbody> <tr> <td>5 metres (yards)</td> <td></td> </tr> <tr> <td>50 metres (yards)</td> <td></td> </tr> <tr> <td>100 metres (yards)</td> <td></td> </tr> </tbody> </table>	Walking distance	Rating: select the number (from 1-4) which best describes current function.	5 metres (yards)		50 metres (yards)		100 metres (yards)		<p><b>Rating C</b></p> <p>Cane/crutch: Child needs to be able to use both.</p>
Walking distance	Rating: select the number (from 1-4) which best describes current function.								
5 metres (yards)									
50 metres (yards)									
100 metres (yards)									
<p><b>Rating N</b></p> <p>N = does not apply For example this does not complete the distance (N/A etc).</p>									

## GMFCS & FMS: Mobility considered



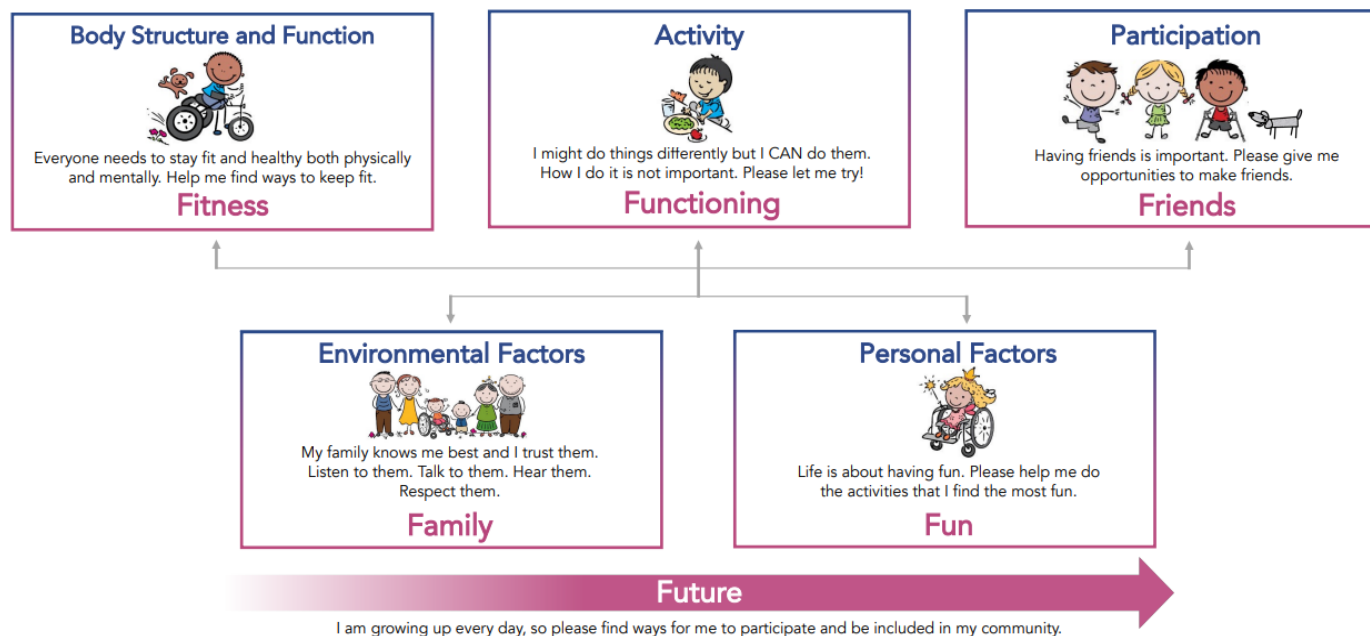


What model?



# The F Words

## The ICF Framework<sup>1</sup> and the F-Words<sup>2</sup>

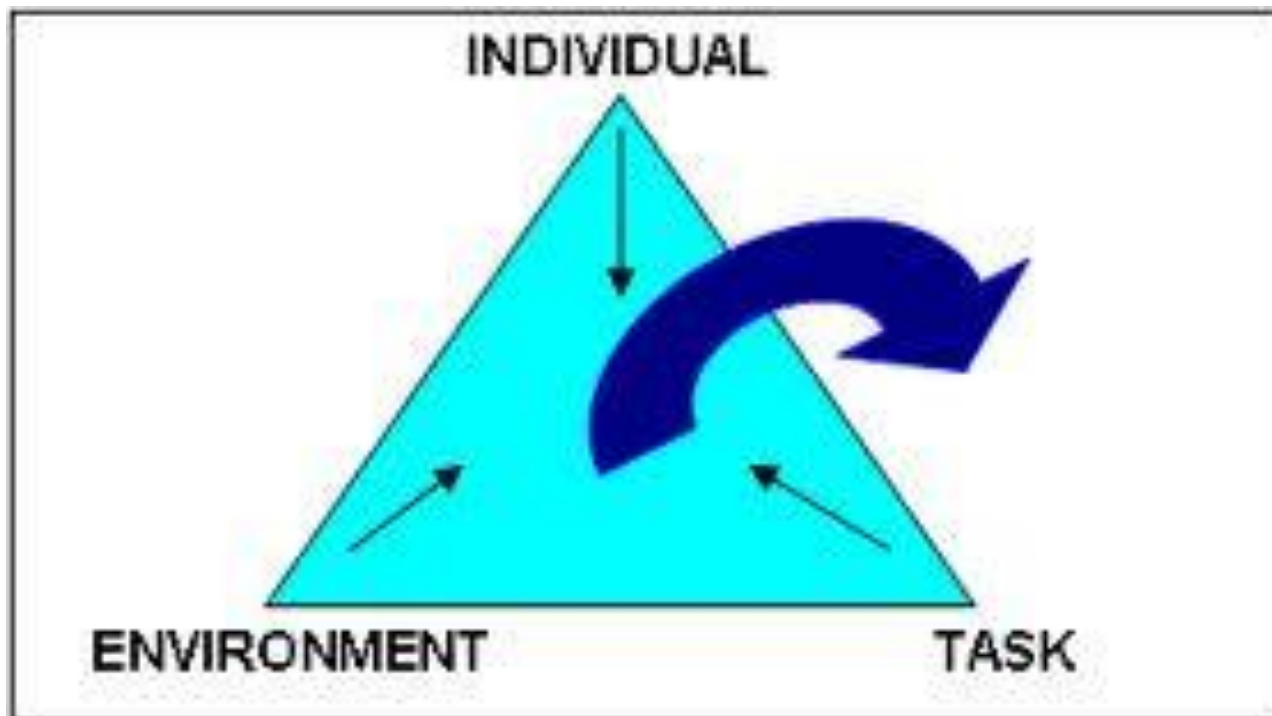


For more information visit the F-words Knowledge Hub:  
[www.canchild.ca/f-words](http://www.canchild.ca/f-words)



1) World Health Organization. (2001) *International Classification of Functioning, Disability and Health (ICF)*  
2) Rosenbaum P & Gorter JW. (2012). The 'F-words' in childhood disability: I swear this is how we should think! *Child Care Health Dev*; 38.

# Dynamic Systems Theory



# Who: Benefits from powered mobility\*?

Children Who	Representative Diagnosis
Will never walk	Severe CP with spastic quadriplegia or athetosis, spinal muscular atrophy types 1 and 2, multiple limb deficiency
Have inefficient mobility	Ataxia, spastic diplegia and milder forms of quadriplegia and athetoid CP, myelomeningocele, and juvenile RA
Will eventually ambulate	Spastic diplegia CP or arthrogriposis in which eventual surgical corrections may make walking possible; osteogenesis imperfecta requiring protection during childhood
Have lost mobility	Neurological sequelae from trauma and infectious disease, progressive disorders such as Duchenne muscular dystrophy

Hayes Four Part Classification\*

(Ref: Hayes, R 1987)





# The Red Flags

- Falling (Fractures)
- Friends (keeping up in the playground)
- Family (lifestyle and coping)
- Fatigue (wheelchair as a Taxi)
- Freedom (behavioural/learning effects)



# Cerebral Palsy Specific data

- Wheelchair use- Sweden CP population- 29% used a wheelchair indoors, 41% outdoors.
- Ontario study- only 24% of children with GMFCS level 4/5 CP between 4 and 12 years of age used powered mobility (Palisano et al., 2003)
  - 86% pushed using MWC
  - PM- 86% independent mobility
- GMFCS level 4/5 at risk of.....
- Diagnosis specific info ( base on evidence)



# Early 'On Time' Powered Mobility

- Children aged 24 months and younger (RESNA, 2009)
- Self produced mobility has been shown to develop a child's thinking and social skills (Hansen, 2008).
- Self produced mobility has been linked to the development of key developmental skills and the development of coping skills.
- Powered mobility increases the child's interaction with objects and people around them. (Durkin, 2005))



# Mobility conversations

(with counseling 101)

- Early Intervention;  
Pram = wham
- Sensitive use of counselling vs real world conversations
- Walking will always be the 'ultimate' (typical development) goal
- Planning transport options /safe & sustainable manual handling
- Conversations prior to important life transitions
- Long term, planned and thoughtful intervention, includes good handover to maintain continuity
- Self Direction- Considering and identifying “a good life” & “hopes and dreams” within a ‘reasonable and necessary’ framework [NDIS]



- Development;
  - Social emotional
  - Cognitive
  - Spatial perceptual
  - Visual tracking
  - Increased alertness
  - Increased understanding of cause and effect
  - Increased arm use
  - Reduce learned helplessness
  - Efficiency
  - Participation! Etc....

- \* Cost
- \* Transport decisions
- \* Environmental issues
- \* Stigma?

**Benefits  
and....not benefits**



Mid way break – Questions/ comments





# What; options and complexities in mobility decision making





# Compromise/folding chairs



Series 4, Pride R4, Series 2 Joy, I xpress, To Do, Alber E – fix



# Efficient manual mobility





# Rear Wheel Drive (RWD)

## Rear Wheel drive

### Positives

- Easier to drive at high speeds
- Easier to define boundaries
- Can do wheelies?

### Negatives

- Larger turning radius
- More difficult to turn on carpet/  
grass
- May get tippy backwards
- Getting rarer







# Mid Wheel Drive (MWD)

## Mid wheel drive

### Positives

- Shorter turning radius
- Easier to turn on grass/ carpets
- Better for rough terrain (if castors do not get stuck)

### Negatives

- More unstable at high speeds
- More chair is out of sight when turning
- Small front or rear castors





# Front Wheel Drive (FWD)

## Front wheel drive

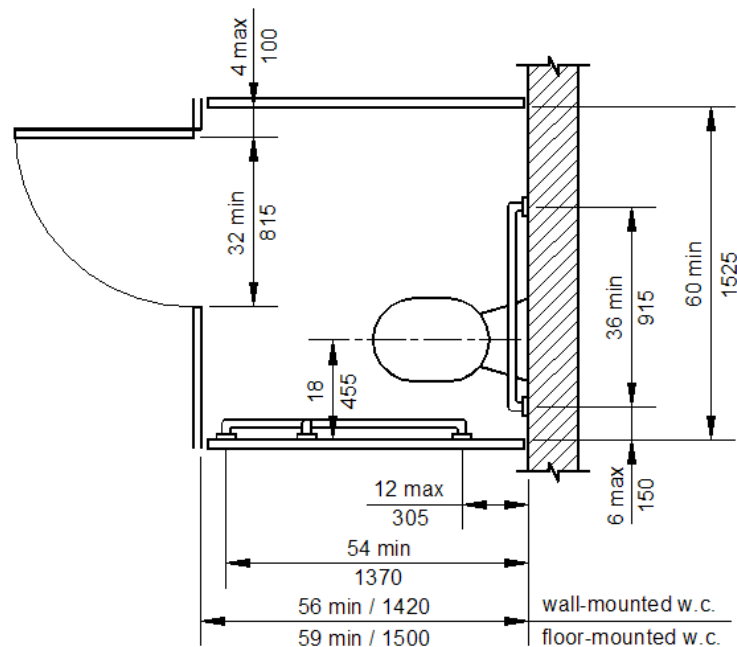
### Positives

- Easier to approach tables
- Least likely to get stuck
- Very easy to turn
- Good for standing transfers

### Negatives

- Difficult to drive straight
- Bump into things behind when turning





## Illustrating drive formats



# Seat Functions



# Power and control.....

## Controls



# Complex Displays



<sup>S</sup> R Net Omni, Q Logic 2 Enhanced display, mounted off the armrest

- For additional and alternate inputs, Factor in deterioration; Switches, mini, midi, micro joystick, chin control
- Bluetooth and infra red – ECU, Phone Scanning, mouse, I-pad, Android .
- Progressively more functions in hand controls now.





# Options.....

## Access





Single or two switch scanning





# Options

# Options

# Options

## electronics

### Non-Expandable



NE and NE+ PG VR2 (4-key) PG VR2 (6-key) PG VR2 (9-key)

### Expandable



Q-Logic EX Joystick Q-Logic EX Joystick with Lights Q-Logic EX Enhanced Display Q-Logic EX Stand Alone Joystick/EX Attendant Joystick

### Multi-Switch Systems



TASH Star Board TASH Penta Switch TASH Waferboard Switch-It Lap Tray TASH Mini Joystick with Push ASL 3-Switch Head Array 3-Switch Stealth Ultra Head Array Switch-It Head Array (3, 4 or 5 switch)

### Proportional Drive Controls



ASL Micro Extremity Control Switch-It Proportional Joystick Finger Steering HMC Mini Joystick Stealth Mushroom Joystick ASL Rim Control Switch-It Touch Pad

### Single Switch



TASH Tip Switch TASH Pillow Switch TASH Trigger Switch Switch-It Microtouch Buddy Button Egg Switch MicroLite Switch Switch-It Unwobble Switch

### Sip-N-Puff Options



Therafin Whisper-Lite Sip-N-Puff Hardware ASL Sip-N-Puff Head Array Switch-It Sip-N-Puff with Opti-Stop

### Additional Options



ASL Remote Stop Switch Switch-It Remote Stop Switch TASH Relax II Infrared Interface Module Joystick Handles

**QUANTUM**  
**REHAB**  
MOVING FORWARD

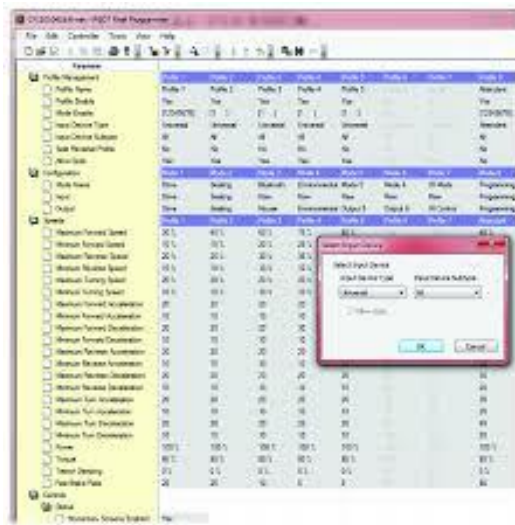
(US) 866-800-2002 • (Canada) 888-570-1113  
Visit us on the web: [www.quantumrehab.com](http://www.quantumrehab.com)

02/00-1-09-10



Ability  
WA

# Programming



HHP (Hand Held Programmer)

Computer based



# Assessment



- Seating review
- Performance components that may impact on device use
- Medical assessment
- Lifestyle assessment
- Risk Assessment
- Match it to the funding body e.g. NDIS/CAEP/Compensable

Apply: 1. Biomechanical, 2. Relational, 3. PEO/P, 4. Client centered approach 5.MOHO 6.Others?



# Adult Assessment Model



- Pass/fail thinking- function snapshot
  - Standardised assessment/ clinic oriented skills
  - 3-7 day trial
  - Directive 'show me that you can do this'
  - Independence and safety
  - Rehabilitation?
- 
- For a contrasting perspective look at Dr Durkin (Sweden)'s Drive to Learn research.



# Child Assessment Model



- Understanding and supporting the context and priorities of the child
- Play based
- Child led ( within Family Centered Practice)
- My exploration is more important than your walls!

**‘Your job is to keep me safe in the same way you would my peers’**

- What skill development do I need to develop now that I might use later?
- Dynamic Systems Theory
- Development of Skills- Exploratory to Directed to Independent



# Access to powered mobility

- Age appropriate supervision is a natural, and may be required for safety and to enhance learning
- Switch consistency is higher when utilising a power wheelchair as compared to switch toys – additional vestibular and visual information (Nilsson, Nyberg, 1999)
- Training is usually required before a child is able to demonstrate readiness
- Almost always a good activity with benefits





# Introducing... Mater, Wizzybug, Stretto, Explorer Mini & Koala!



designability  
Bath Institute of Medical Engineering

Pride®  
Mobility Products Ltd.

permobil

permobil



Ability+  
WA



# Introducing Wizzybug!

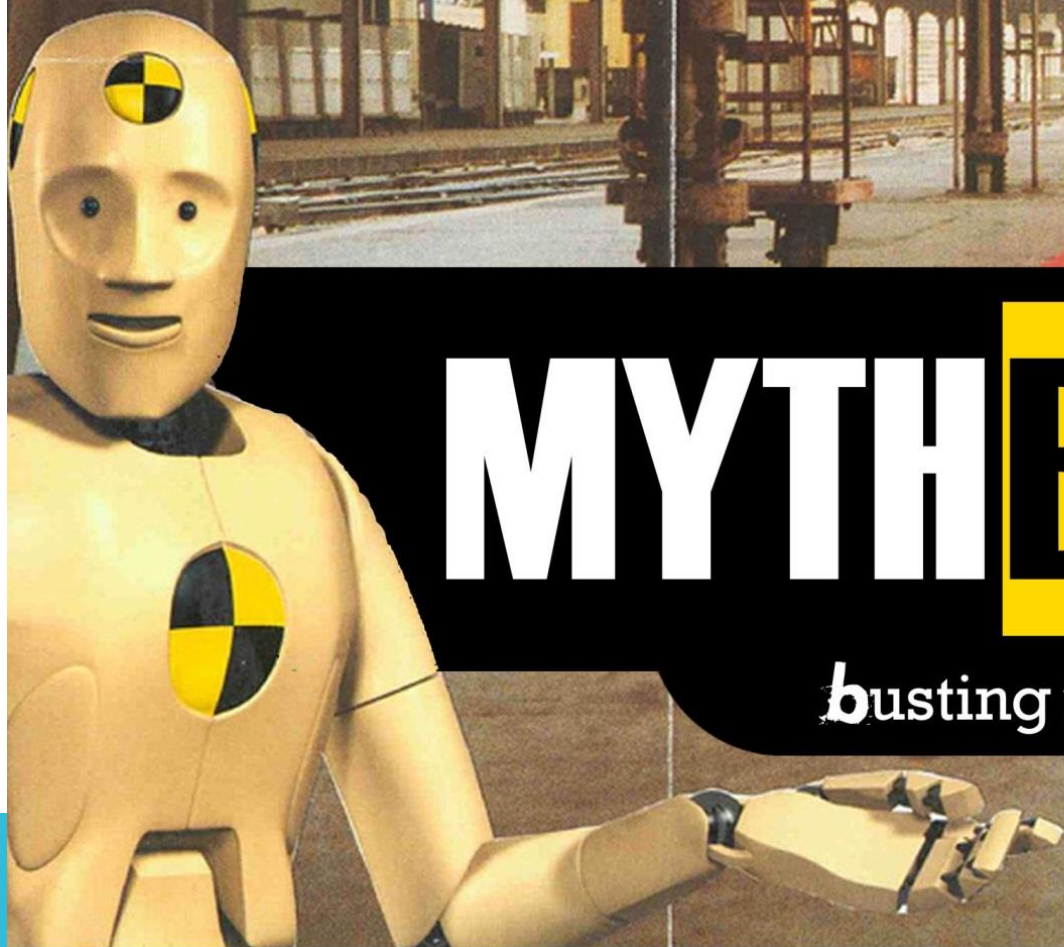
<https://www.youtube.com/watch?v=V9bEmVHE3zs>



# Wizzybug – custom modification

**designability**  
Bath Institute of Medical Engineering





# MYTH BUSTERS

busting life's myths.

# MythBusters

1. My child will regress in their motor skills due to use of powered mobility (Bottos et al 2001)
2. My child will become lazy
3. My child won't want to walk anymore
4. Children view the use of powered mobility negatively
5. Mobility and exercise are the same thing
6. IQ is a good determinant of a child's ability to operate a powered wheelchair.
7. Chronological age is the best indicator of ability to use a PMD



# “I’m just not ready!”

- The thought of a wheelchair is often harder than the reality.
- Avoid times of peak stress for families (?transitions)
- Opportunity in the natural environment
- Groups? Diads? Herd mentality
- Prolonging ambulation is important (parents value walking) Planning
- Emphasise +ves but acknowledge –ves



## Trial

- Seating required for trial
- Essential features for trial
- Accessories required for trial
- Trial to fail
- Time: 7 days
- Collate trial feedback.
- 3 day call

### Trial1

- MWD
- Q6Edge

### Trial2

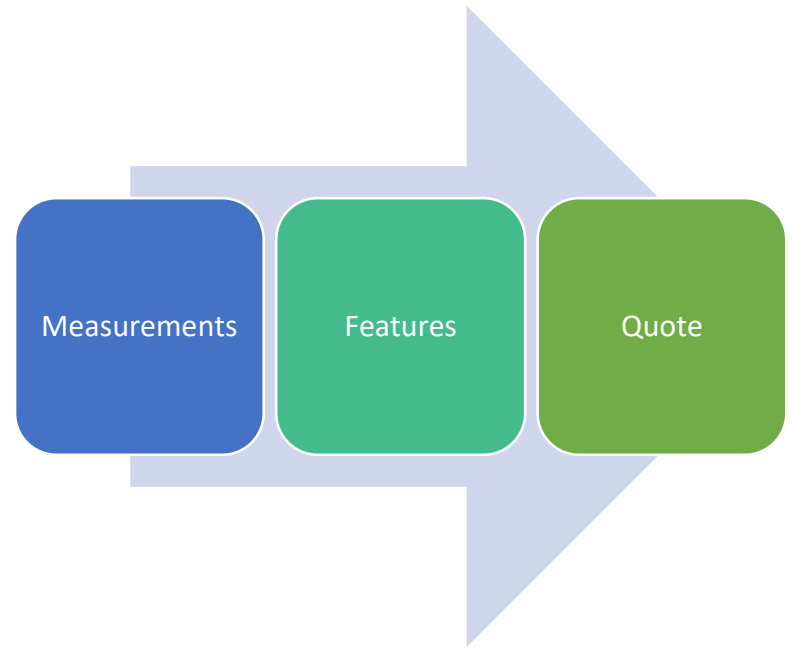
- RWD
- R44

### Conclude

- Script
- Feedback



# Scripting the device




## Tips

- Get the latest script form
- Measure twice, cut once!
- If you don't know what it is ask the supplier
- Have your own clinical rational and what you can justify!
- Not confident – get assistance





- 
- Order the chair ( 6-8 weeks to arrive)

- Check that you got what you scripted
- Review your previous notes

- Coordinate if any seating needs to be fitted
- Adjust chair specifications to client

- Program specifically to client

- Fitting clinic – chair goes out on trial with client  
(Provide with a trial form)

- Return from trial appointment if required.
- Complete outcomes

## Order and setup (retrial)

# Training/ Ax

- Identify areas of training (if required)

Tools ;

- ALP ( Durkin) Small incremental observations
- PIDA- Powered mobility Indoor Driving Assessment
- PICA- Powered mobility Community Driving Assessment

“Designed by [Occupational Therapists](#) and Drivers for use by Occupational Therapists, Drivers and Others”

(<http://fhs.mcmaster.ca/powermobility/>)

- PoMoDat (Unwin & Townsend) Structured functional review for reporting. Includes ‘Moca’ Cognitive Assessment component.

\*Other assessments available WST etc. (clinic & ‘real world’ based)

- **Consider need for;**

- 1) Supervision
- 2) Programming of chair
- 3) ‘Dignity of risk’
- 4) Safety



(creativeuncut.com)



NDIS  
(Not a swear  
word but  
close)



What does the  
legislation say?

Task modification

Pricing/feature/function  
hierarchy

Task Achievement-  
Partial /Full

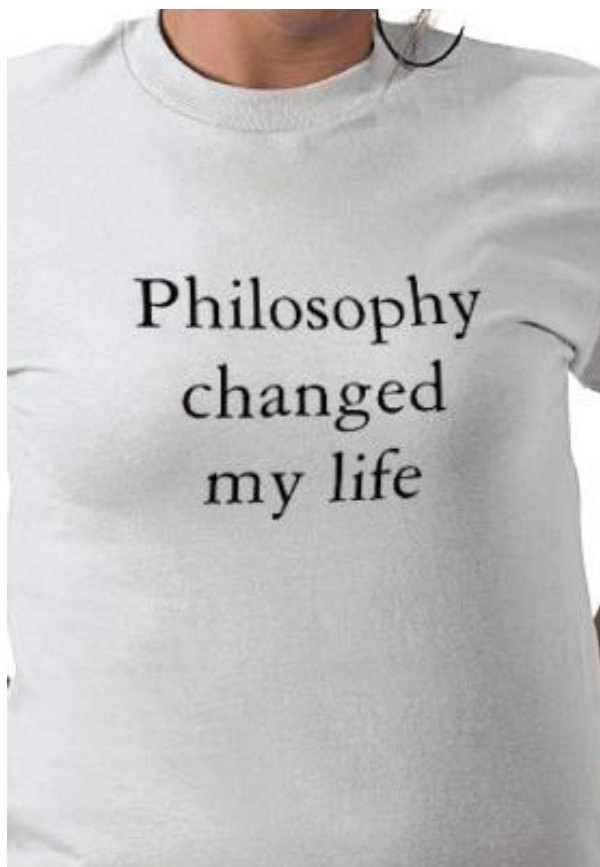
Value for money

Impact on supports  
(cost benefit)

Communication and  
timeframes

Advocacy and follow up





# Powered Mobility: Philosophy

OTs can provide.

- Where mobility is developing or restricting, PM (powered mobility) can provide an interface.
- Powered mobility shall be equated to walking in its importance to provide equal access to participate.
- The use of powered mobility can be presented as a positive option throughout the lifespan.
- Powered mobility is a therapeutic tool in its own right.
- Powered mobility is not purely about 'readiness' or 'eligibility', but rather an opportunity
- Powered mobility shall not be considered a 'last resort option'



- Today we have reviewed *some* of the evidence and looked at the process of considering, assessing for, trialing, scripting and training a child using powered and other mobility devices.
- PM and AT in general is an expensive assistive technology that can bring independence and empowerment to a wide client audience.
- The person needs to be matched to their technology, not the other way around.



Case Studies if time.....

Any questions?

Scott Langmead

Clinical Lead Occupational Therapist

AbilityWA/ Ability TECH

[scott.langmead@abilitywa.com.au](mailto:scott.langmead@abilitywa.com.au)

**And remember.....**

**“mobility ...is an inherent characteristic  
of being human” (Kangas, 1997)**

Thank-you





CREDIT: LYNN JOHNSON,  
NATIONAL GEOGRAPHIC





Ability<sup>★</sup>  
**TECH**  
CUSTOMISED SOLUTIONS

Ability<sup>★</sup>  
WA



# AT Clinical Advisor Ability TECH

- Internal and external focus
- One off consults
- Quoting assistance
- Clinical problem solving
- Materials science and resource selection
- Product awareness
- Improving Ability TECH access



## Short Term Hire of AT



- Mobility devices
- ADL bath and shower chairs
- Alternate seating
- Wizzybugs and powered mobility devices
- Varying levels of complexity of AT
- Loan/Hire may be waived as program is supported by Telethon.



# New Starter programme

- Two year structured program for New graduates of therapists new to disability sector
- Relevant training, peer mentoring, shadowing appointments and communities of practice to gain skills and confidence to work in field of disability.



# Assistive Technology Career Path

- Suits therapist minimum of 2 years into career
- Passion for Assistive Technology
- 3 Streams
  - Posture and mobility
  - Sleep and Positioning
  - Communication and Access and Technology
- Structured program facilitated by AT Lead
- Access to professional development, shadowing experienced therapists, peer mentoring and customer caseload in area of choice.



# Tours – Ability TECH



A part of Ability WA

337 Victoria Road Malaga

Available on request



**Connect with  
heart**



**Achieve  
together**



**Think  
differently**



**Make things  
happen**

