Aging Concerns: New Solutions with Today's Technology

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Just because your patients are aging, doesn't mean you have to use old technology!

People who are aging with a disability have the right to maximize their health and independence using today's technology!

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The Aging Process

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Aging

- Aging INTO disability
- acquire conditions and limitations as the person grows old.

- Aging WITH a disability
- Face unique healthcare needs and challenge conventional notions of 'healthy aging'

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Healthy Aging and Age-Related Changes

- Movement Functions
- Sensory Function
- Skin and Tissues
- Cognitive Function
- Immune Function
- Sexuality

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Multimorbidity: The presence of multiple chronic conditions at the same time

- Movement/musculoskeletal
- Sensory
- Cognitive
- Immune
- Skin
- Cardio-pulmonary
- CVA
- Falls/orthopedic issues
- COPD
- Parkinson's disease
- RA
- Diabetes
- Alzheimer's/dementia

Multiple diseases lead to disease interaction and polypharmacy, which leads to further disability

World Report of Ageing and Health, World Health Organization, 2015
https://apps.who.int/iris/bitstream/handle/10665/186463/9789240694811_eng.pdf?sequence=1

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Healthy Ageing

- **Process of developing and maintaining the functional ability that enables well-being in older age**
- Functional ability-health related attributes and interaction of capacity and environment
- Intrinsic capacity-physical and mental capacities
- Environments-all factors in the extrinsic world
- Well Being- happiness, satisfaction, fulfillment

World Report of Ageing and Health, World Health Organization, 2015
https://apps.who.int/iris/bitstream/handle/10665/186463/9789240694811_eng.pdf?sequence=1

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Accelerated Aging

- Altered aging trajectory where the rate and the effects of aging are accelerated
- Health conditions occur *earlier and/or more frequently* than would otherwise be observed, leading to a narrow margin of health.
  - Due to physiologic changes due to SCI and impairments that lead to immediate and long term effects on the body
  - Susceptibility of those with SCI to numerous medical conditions that impart a health hazard
  - Disproportionate % of deaths as a result of preventable causes, including septicemia

Groah, et al. *Am. J. Phys. Med. Rehabil*. Vol 91, No 1, Jan 2012

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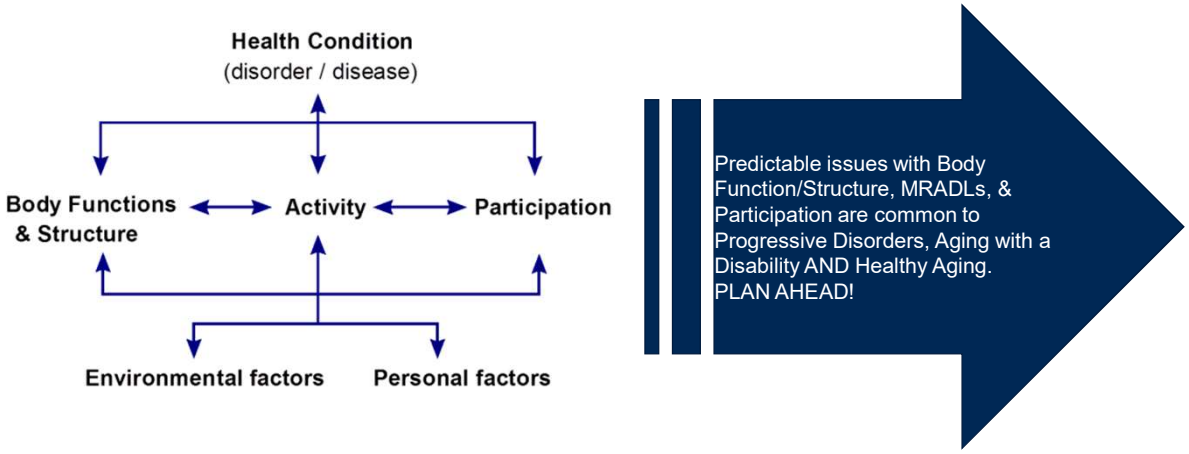
Plan Ahead!



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- "The consequences of poorly fitted equipment can cause an accelerated decline in function, pain and fatigue from poor posture, and increase in need for caregiver assistance or alternate mobility devices…"
- Requejo,.P.S. et al. *Top Geriatric Rehabil 2015;31(1):26-41*

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- Seating Considerations
- Manual Mobility Considerations
- Power Assist Considerations
- Power Mobility Considerations
- Training Considerations

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Seating Considerations: Posture, Skin and Tissue

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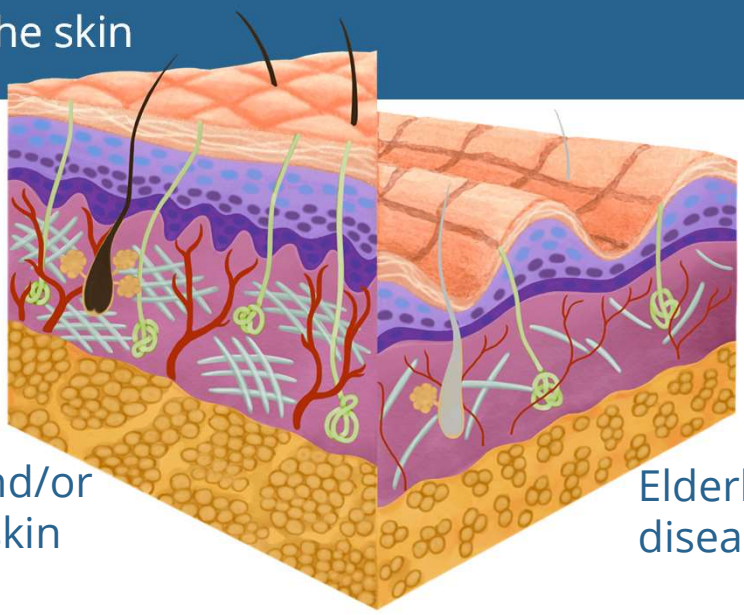
Layers of the skin



Young and/or healthy skin

Elderly and/or diseased skin

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Skin layer changes and related risks

Thinning of layers	Decreased vascularization	Loss of viscoelasticity	Nerve Ending changes	Decreased glands, fatty layer, connective tissue
• Slower healing time (30-50%)	• Decreased blood flow, O2 and nutrients to tissues	• Weaker tissue. Deep tissue at more risk for shear and deformation	• Less effectiveness to perceive input from pressure, heat and cold	• Brittle skin, looser skin, decreased thermoregulation

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Incontinence and mobility

- "Impaired mobility can promote urge and mixed urinary incontinence."

- Women with impaired mobility take longer to reach the toilet, increasing the risk of leakage when the urge to urinate is strong
- Women with urge incontinence may be more likely to limit their activities so that they are always near a toilet

Fritel X, Lachal L, Cassou B, Fauconnier A, Dargent-Molina P. Mobility impairment is associated with urge but not stress urinary incontinence in community-dwelling older women: results from the Ossébo study [published online ahead of print June 10, 2013]. BJOG. doi:10.1111/1471-0528.12316.

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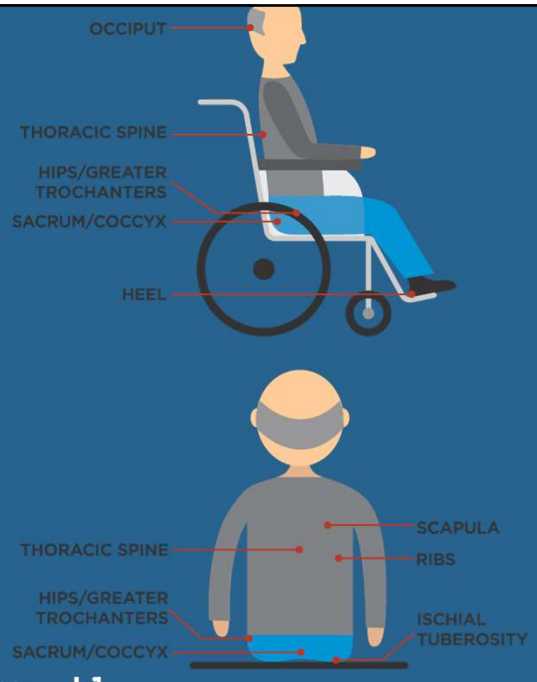

Common Areas of Skin/Tissue Breakdown

- Wound development at any of these areas can be classified in one of the stages of pressure injuries as defined by the NPIAP

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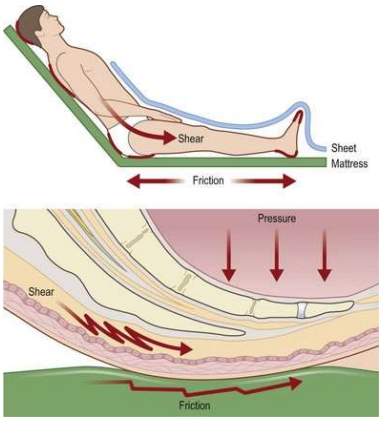
Shear and Friction in Bed

Friction = Force caused when two touching surfaces move in opposite directions

Shear effect = Skin stays in one place as the deep fascia & skeletal muscle slide down with gravity



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Seating System impact on posture and function

Cushion+

Back Support +

Mobility Base

= Optimal Seating System

- Together they allow for maximum contact with the seat and back surface to:
  - Achieve postural **stability**
  - Allow for **pressure redistribution**
  - Attain postural **alignment**
  - Allow for **optimal mobility**

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Seating Components

'Clients area able to participate in more numerous and challenging activities if they have hands-free balance, feel stable in their seating and mobility base, and can reach beyond the limits of their arm length"

Lange, Minkel, 2018

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Postural Stability and Alignment

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Wheelchair Seating is more than just the cushion

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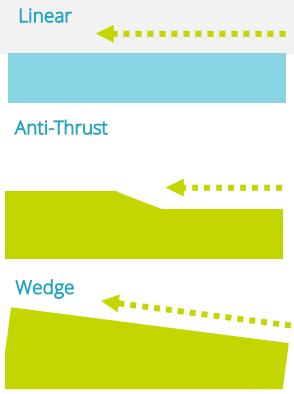
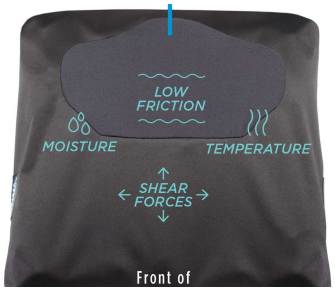
Cushion Design, Material, Cover





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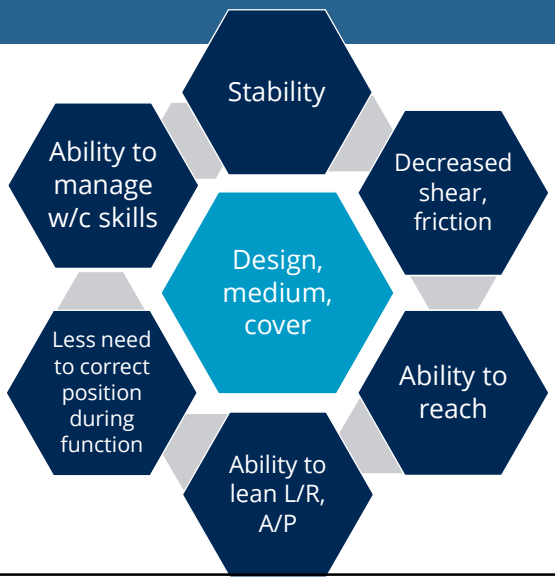
Cushion features → function



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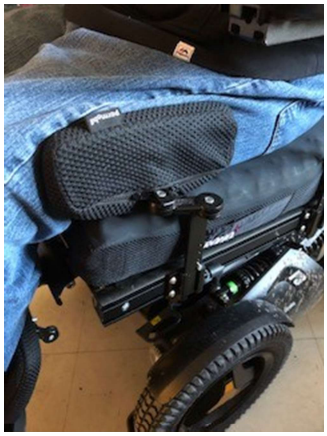
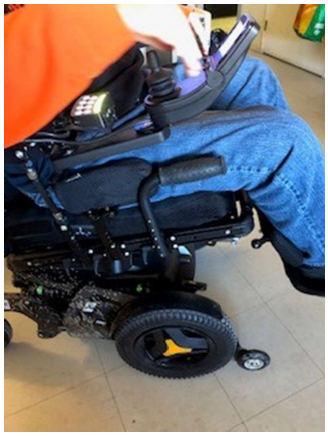

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What features of the chair does the client need to reposition themselves independently?

Steve:
ROHO Quadtro Select Cushion
Transfer handles
Slight power tilt

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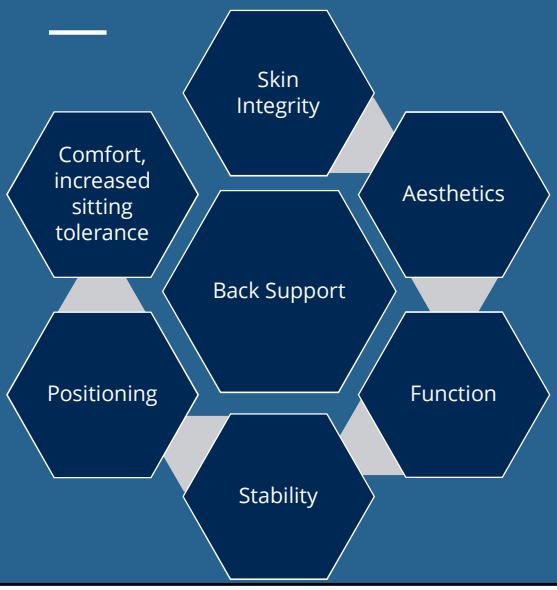
Back Supports



Back Support Features

Angle
Depth
Height/Length
Contour
Medium

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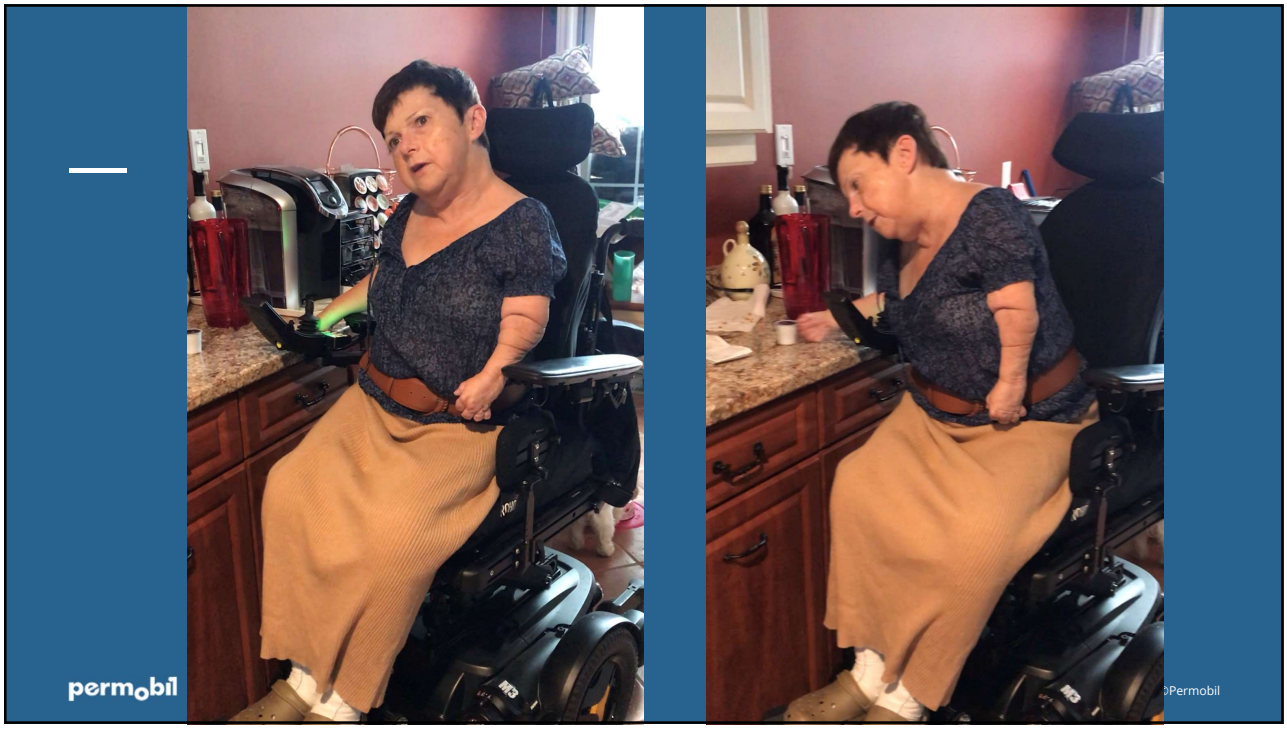

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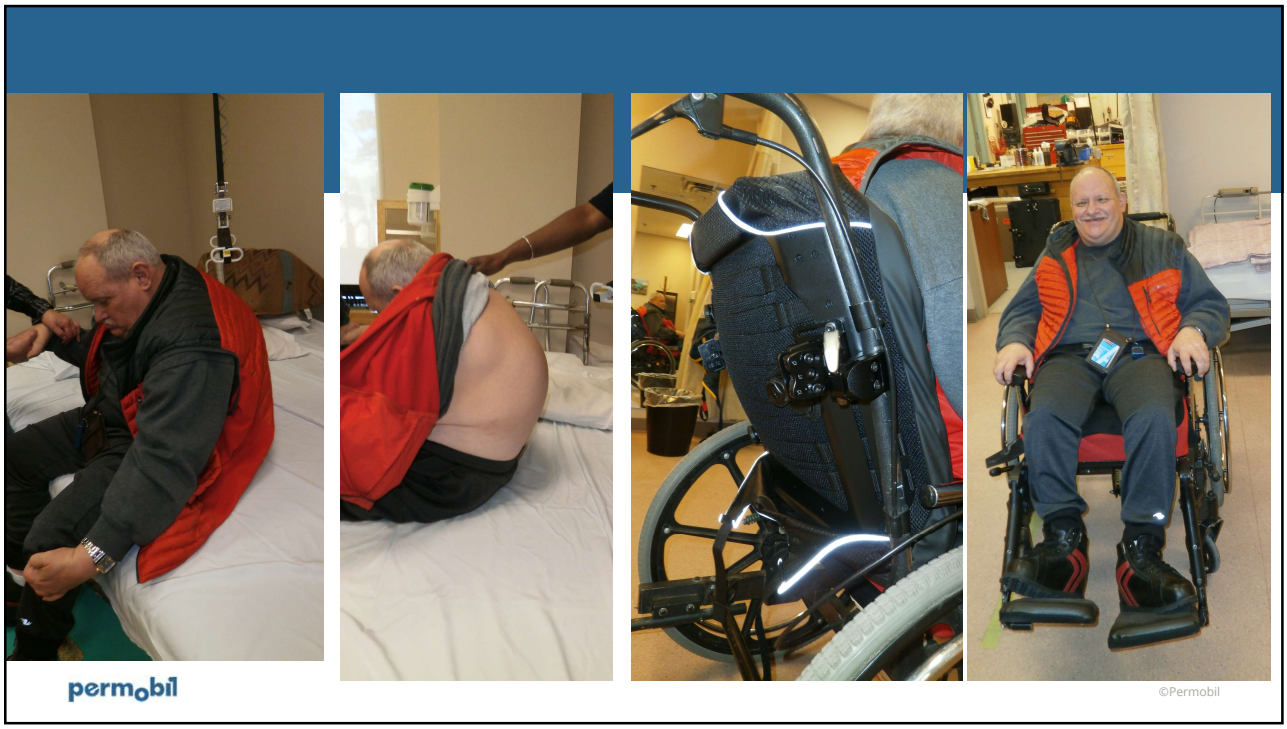

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Secondary Supports

- Stability
- Shear/friction
- Ability to move to propel
- Ability to reach and lean

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Manual Mobility

"independence in mobility is a key factor in life satisfaction ad contributes to maintaining the quality of life for the elderly and aging MWC user"

Requejo, R.S. et al, 2015

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Benefits of optimally configured MWC

- Reduce pain level
- Increase activity level
- Extend number of active years in a MWC

If it's not equally configured, it's not equally effective!

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Manual Wheelchair Frame Materials

STEEL ALUMINUM TITANIUM

DECREASES IN

- Weight
- Fatigue
- Corrosion
- Vibration

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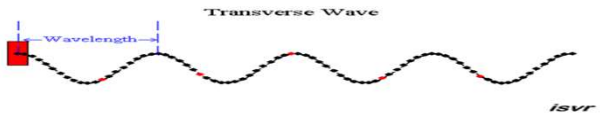
Clinical/Function Implications of Frame Materials

Chenier & Aissaoui, 2014

- Most WCs users experienced more than the acceptable standard of vibration

Wolf et al. 2007

- Whole body vibrations can cause low back pain, neck pain, fatigue, muscle ache



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Rotational inertia is correlated with mass and w/c configuration

- Mass distribution changes
  - Heavier mag wheels, which focus mass toward outer edges of chair, increase the inertia and have an even greater impact than the accessories on rotational inertia
- Removing the accessories
  - Decreases mass of the chair
- Changing the axle position from rearward to forward
  - Caspall 2013

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Struggling to move .....

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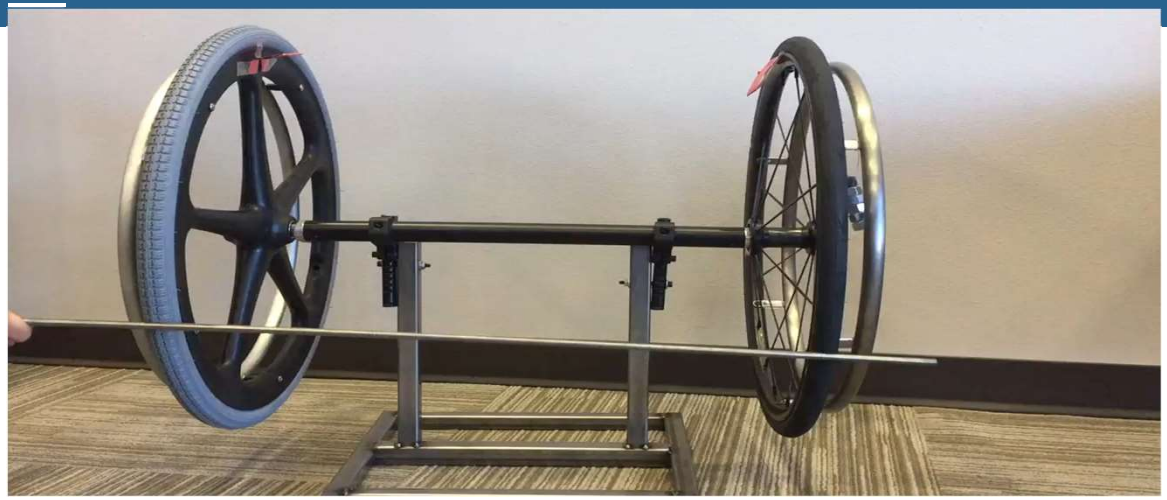
...vs. ease of movement



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What Impacts Rolling Resistance

- Surface interaction
  - Hard Smooth surface vs. Carpet
- Material of tire
  - Durometer (hardness of materials)
    - Solid
    - Pneumatic with airless inserts (foam)
    - Pneumatic – regular vs. high pressure
- Tread Profile
  - Lower tread profile = lower rolling resistance.
- Camber – increased camber decreases rolling resistance
- Weight of Tire
  - Increased material weight leads to increased deformation/strain
- Deformation
  - Increased deformation = higher rolling resistance
  - Deformation includes the weight of the client.
  - More mass…harder to push
  - Solid tires wear faster with load increases

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Manual Wheelchair Configuration

- Seat depth/seat width
- Frame depth
- Center of Gravity- horizontal and vertical
- Seat to floor height- front and rear (seat slope)

- "a wheelchair that is poorly matched to the individual, adversely affects potential activities and participation, lifestyle goals, health status and are costly."
- Requejo R.S. et al, 2015

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"Participants who received individualized MWC found they had less difficulty independently propelling their wheelchairs and improved postural stability, which increase their ability to lean forward and reach"
Requejo, P.S. et al, 2015

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Navigating the Barriers of the HealthCare System

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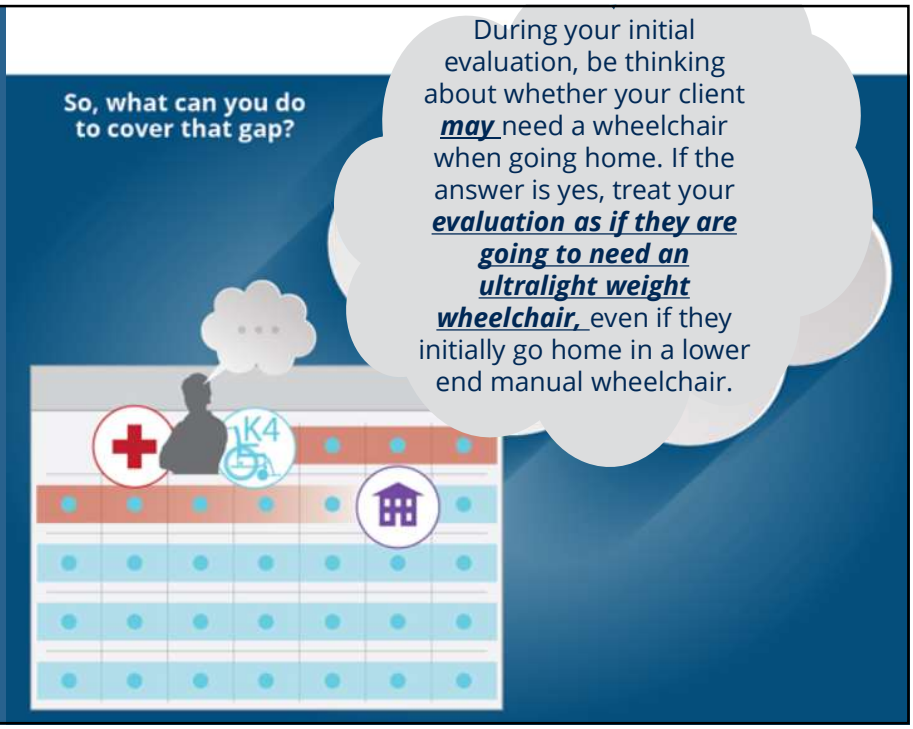
Plan for your client to have better outcomes



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Important Facts

If you do nothing..... 5-year rule

- Putting a patient in a lower end chair that isn't going to afford them the best outcomes is not the most beneficial option to the patient.
- It is the path of least resistance for the clinician and the provider.
- With useful lifetime rules, a patient must remain in the same wheelchair for at least 5 years, unless they have a change in medical condition that warrants another new chair.

Criteria

- Qualification for an ultra-lightweight w/c is **functionally based**, not diagnosis based. The person must require the MWC full time for all MRADLs, OR require individualized configuration and adjustments not available on a lesser MWC.

Process

- Evaluation from PT or OT for the w/c. Provider must be RESNA certified ATP, Or specific process depending on funding agency.

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So what do I do?

Plan of Care

- If the client will be d/c'd prior to receiving the ultra-lightweight w/c, the clinician must include in the Plan of Care for the client to follow up with the next clinician in the continuum and the supplier to obtain the ultra-lightweight MWC that is recommended

Educate your client

- Empower your client by explaining that they are going home in a rental MWC that will turn into a purchase in the next 12 months
- Encourage client to follow up with plan and the next therapist in the continuum about getting a better ultra-lightweight MWC

Document

- Rule out lesser wheelchairs as not effective. If it's not equally configured it's not equally effective!

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Own the continuum!

Although shorter stays make it challenging to provide clients with the most appropriate wheelchairs, IT IS POSSIBLE when we learn the process and communicate across the continuum of care and empower our clients!

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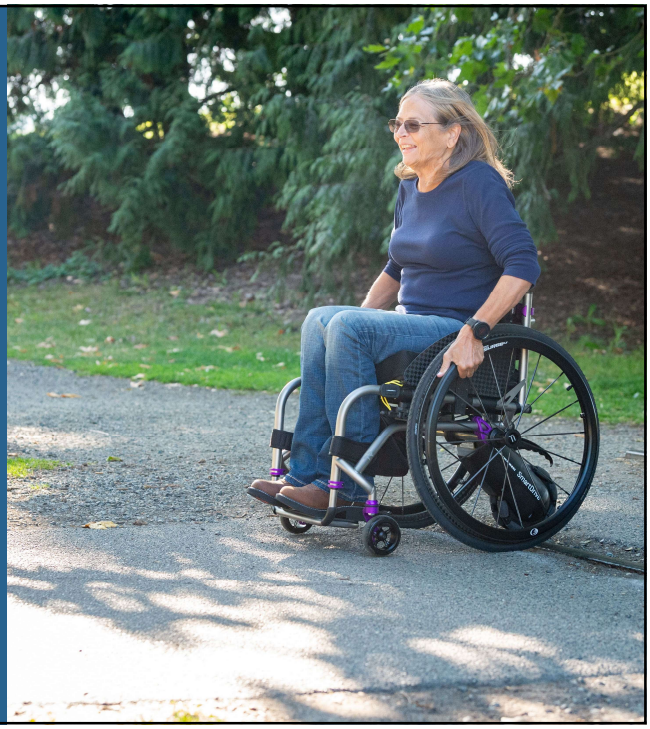
Power Assist Solutions



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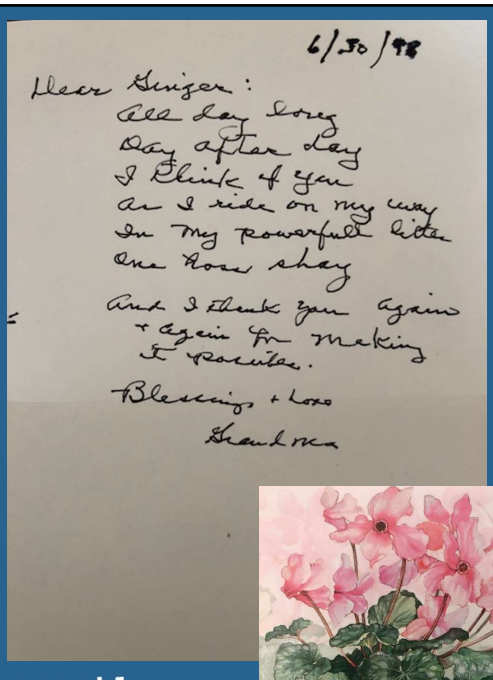

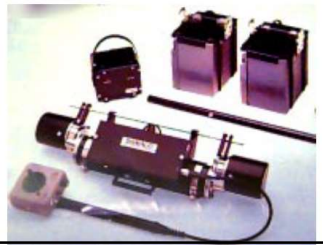

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Power Assist

The mobility challenges are the same.

The technology has come a long way!

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Better solution with today's technology

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Meet Alvin

- 90-years-old
- Right AKA
- Limited upper extremity range of motion – so much that he was unable to independently propel MWC
- Anything more then a few feet, and he was dependent on caregiver
- He didn't want a powerchair because he had no way of transporting it

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Meet Alvin

- TiLite AeroX with SmartDrive
- The switch control option has given him independent mobility!
- He was not able to use the SD with just the PushTracker.

- When asked what he liked most about the SD, he said, "I don't have to push the damn wheels anymore!"

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When to consider power assist

Body Function & Structures	Activity	Participation	Environmental Factors	Personal Factors
Pain Neuromusculoskeletal • Range of motion • Strength • Muscle tone • Coordination Cognitive Functions Fatigue Cardiovascular Respiration Postural Impairment Shoulder joint integrity	Mobility • Carrying or pushing items while propelling • Using transportation • Driving Self-care Domestic Life • Shopping • Housework	Work School Recreation Life roles Relationships	Ramps Hills Distances Varied terrain Transportation Support Attitudes	Gender Age Fitness Lifestyle Life experiences….

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Questions to consider

	No	Yes
1. Will the client be a long-term manual wheelchair user?		
2. Does the client have a history of upper limb pain or dysfunction?		
3. Does the client experience fatigue that limits participation in daily life?		
4. Does the client experience changes in oxygen saturation with increased physical activity?		
5. Does the client require more than manual mobility for independence in all environments, but does not wish to pursue a power wheelchair?		
6. Does inefficiency in manual wheelchair propulsion inhibit participation in mobility related activities of daily living? Consider varying propulsion techniques including hemi-propulsion.		
7. Is the client dependent for mobility, and the caregiver is having a difficult time pushing the wheelchair in necessary environments/terrains?		
8. Is the client at risk for development of postural asymmetry over time, and does posture during propulsion increase this risk?		

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Challenges inherent to hemi propulsion

- Many persons post-stroke utilize unilateral upper & lower extremity propulsion
- Kirby, et al (2005) – whether an individual had a neurologic impairment or not, for skills that had a higher rolling resistance or a high balance demand, the hemi propulsion style was difficult

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Switch control for power assist

- Momentary switch control for foot propulsion or hemi propulsion
- Positive Impact on posture with effort of foot or hemi-propulsion

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Manual tilt-in-space

- Caregivers can also benefit

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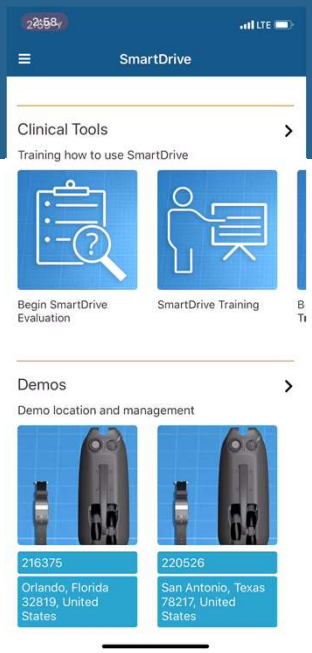
Justification for Power Assist Use Objective & MRADL examples

[CLIENT] requires the use of SmartDrive power assist to accomplish the following Mobility Related Activities of Daily Living (MRADLs):

[SELECT THOSE THAT APPLY]: taking out the garbage, doing laundry, navigating small thresholds to enter the bathroom/garage/front door, ramp negotiation, childcare, housecleaning, meal preparation, propelling on carpet, etc.]



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Example – objective justification of power assist

With the use of the SmartDrive power assist, client is also able to complete MRADLs in a timely and efficient manner, as demonstrated by:

- Ex: to take laundry to the laundry room, it took 7 minutes and 25 pushes; however with the SmartDrive, it took 2 minutes and 4 pushes
- Ex: In addition, without the SmartDrive, client had to reposition the laundry basket 5 times and with the SmartDrive, there was no need to stop and reposition the basket.

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BM1

Justification Tips

- Connect impairment in body functions and structures to inability to fully participate in MRADLs and life participation
- Include objective measures in justification:
  - Wheelchair Skills Test
  - Wheelchair Propulsion Test
  - Oxygen saturation
  - Fatigue Severity Scale
  - Pain scale

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Power Wheelchair Mobility and Power Seat Functions

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Slide 59

BM1 Brenlee Mogul-Rotman, 2020-01-21

1968

Plumber, Al Theime invented the Amigo scooter in his garage in Michigan for a family member with MS

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Nothing has changed much since… at least with POVs

- Limited seating options
- Stability issues
- Transfer challenges
- Table access issues
- Turning radius for in-home use?
- Ability to meet long term needs considering diagnosis/prognosis?

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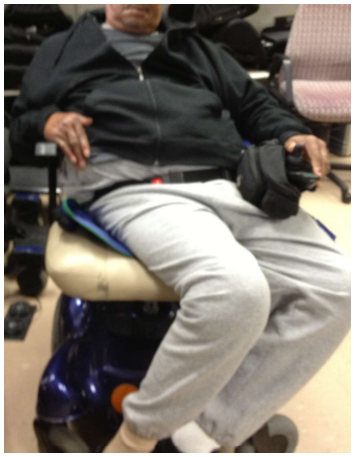
What about captain's seat power wheelchairs?

- Poor posture
- Decreased sitting tolerance
- Increased risk for Pain & PI
- Poor position for function
- Decreased independence
- Decreased participation
- Less time up in the chair



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Power Seat Functions

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Actuators

SMART	NON-SMART
Position Feedback Sensors	Housing limit/Soft pontentiometer
Infinite position sensing	Binary position sensing
Allows for position limiting	Allows for position limiting
Allows for memory positioning	Cannot do memory positioning

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Smart Actuator Functional Implications

- Memory seating
- Anterior sequence
- Standing sequence
- Independent repositioning sequence (IRM)
- Latched or Momentary
- Assign short cut key
- Ability to read & coach actuator position in real time

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Sequential
35º of tilt
135º legrest extension
120º recline
(Kreutz,1997)

Muscle versus skin reperfusion (Jan et al., 2013)

Significant muscle reperfusion achieved by:
≥ 25° tilt and 120° recline;
Unable to be achieved with 35° tilt alone

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Memory Positions

Save a frequently accessed position

Function
- MRADLs
- Functional Reach
- Transfers

Positioning
- Tone Management

Communication

Participation

Short Cut Keys!

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Falls and Wheelchair Users

- Elderly w/c users in SNF fall frequently due to:
  - Their general impairment
  - Inability to compensate for environmental barriers
  - Unavailability of caregiver at the time of fall

    Kiely, DK, Kiel, DP, Burrows, AB, Lipsitz, LA. (1998)

- Fall circumstances are multifactoral – action related (transferring); location related (bathroom); or fall attributions (surface conditions)
- Fall prevention strategies must be multifactorial – includes interdisciplinary assessment, transfer and driver skill education, seated postural control, appropriate match of technology solution

  Rice, L, et al. (2017)

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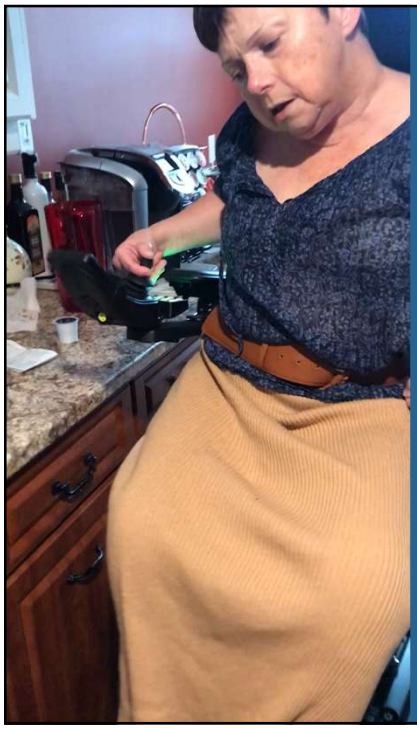

Practice activities of daily living

PWC skills training can be provided to address some of the challenges new users face and to mitigate the potential risk to the user or others in his or her environment.

(Smith 2019, Canadian Journal of OT; Kirby, 1995)

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Self-care – getting clothes in/out of the closet

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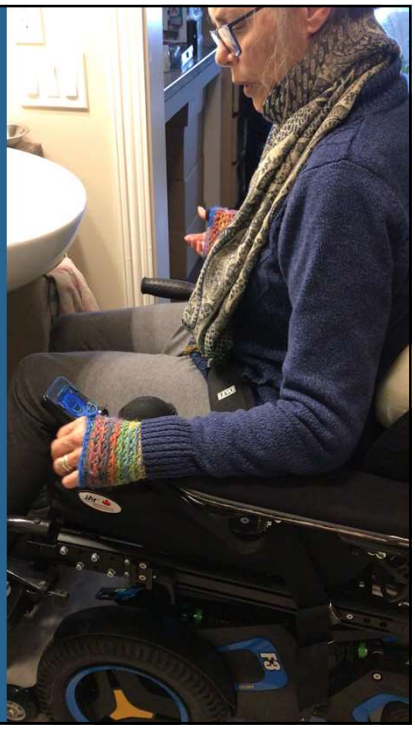
Meet Anne

Self Care
- Sink access
- Brushing Teeth
- Washing face



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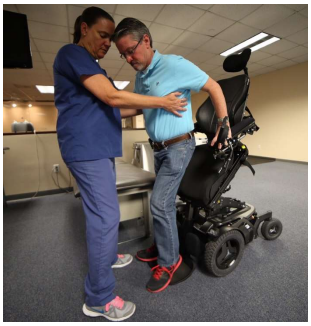
Smart Actuators
Program transfer position & assign short cut switch





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Wheelchair Skills Training for the Older Adult

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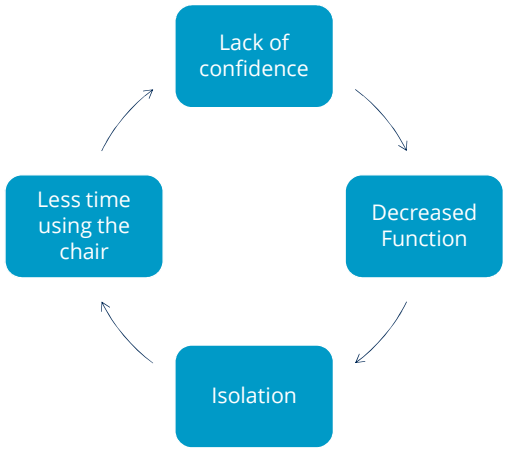
Wheelchair Self Efficacy and Life Space Mobility

- Wheelchair skills accounted for 91.3% of the direct effect of self-efficacy on life-space mobility
- Self-efficacy is the belief that people have in their ability to use wheelchairs in various situations.

Sakakibara, et al 2015



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Power wheelchair driving challenges – wheelchair user's perspective

Difficulties with indoor mobility
- Moving in a constrained space
- Doorways
- Maneuvering around obstacles/people
- Carrying things while maneuvering

Maneuvering on streets, sidewalks
- Curb cuts, gaps, uneven surfaces
- Ramps
- Crowds
- Accessing transportation

Maneuvering for specific tasks
- Accessing sinks
- Activities of daily living

Managing unforeseen barriers
- Most difficulties reported were specific to the execution of a daily task and/or to the environmental context.

Torkia, C, et al 2015, Disabil Rehabil Assist Technol.

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Training Considerations

CONTENT	TECHNIQUIES	DOSE	MODIFICATIONS
WHAT TO TEACH	HOW TO TEACH	HOW MUCH & HOW OFTEN	ADDRESS TRAINING CHALLENGES
Chair operation Basic driving skills Community driving skills Cognitive and perceptual skills related to driving Social skills related to driving Problem solving	Demonstration Trial-and-Error Games Verbal and visual cueing Grading Chaining Limiting Chair Functions Feedback	Client-centred approach Depends on learning needs Several times per week Individual sessions Consider fatigue Time of day Sitting tolerance Length of total training Consider learning needs	Memory, cognition needs? Progressive condition? Correct drive configuration? Access method? Optimal positioning? Do they have anxiety? Programming needs?

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(Smith, 2019)

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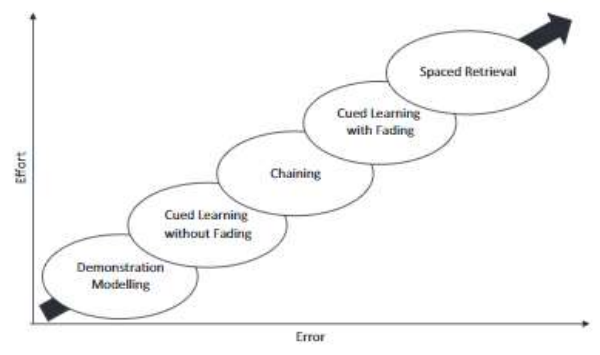
Training for people with cognitive or memory impairment



Smith, 2019. Feasibility RCT protocol evaluating a powered-wheelchair training program for older adults. Canadian Journal of Occupational Therapy. Vol 86 (3) 232-242.

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- PWC skills training based in trial-and-error methods may not provide the best learning opportunities for individuals with cognitive and memory impairments
- *Errorless learning and shared control strategies* may provide opportunities for safe and effective powered wheelchair skills training

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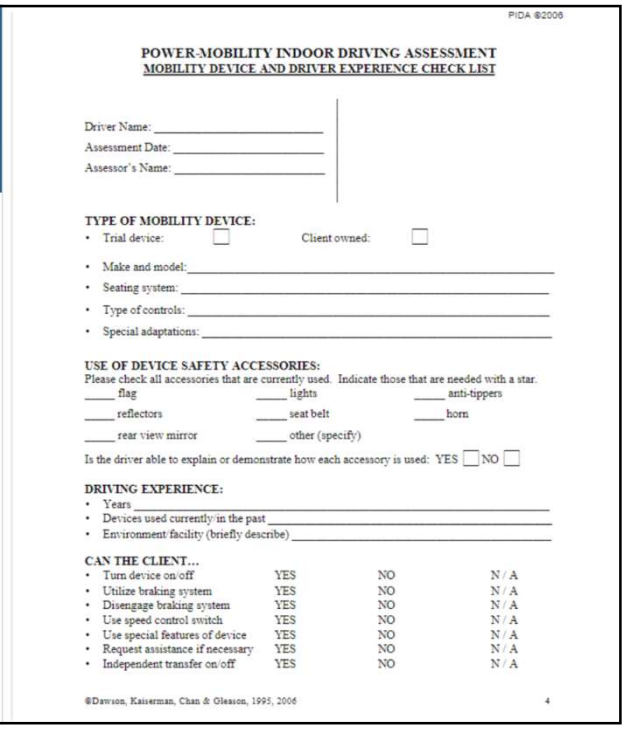
Outcome Measurements

- FIM
- WST-P
- WST-Q
- PIDA

http://www.fhs.mcmaster.ca/powermobility/pida.htm



PIDA ©2006

POWER-MOBILITY INDOOR DRIVING ASSESSMENT
MOBILITY DEVICE AND DRIVER EXPERIENCE CHECK LIST

Driver Name: _____
Assessment Date: _____
Assessor's Name: _____

TYPE OF MOBILITY DEVICE:
- Trial device: ☐ Client owned: ☐
- Make and model: _____
- Seating system: _____
- Type of controls: _____
- Special adaptations: _____

USE OF DEVICE SAFETY ACCESSORIES:
Please check all accessories that are currently used. Indicate those that are needed with a star.
_____ flag _____ lights _____ anti-tippers
_____ reflectors _____ seat belt _____ horn
_____ rear view mirror _____ other (specify)
Is the driver able to explain or demonstrate how each accessory is used: YES ☐ NO ☐

DRIVING EXPERIENCE:
- Years _____
- Devices used currently/in the past _____
- Environment/facility (briefly describe) _____

CAN THE CLIENT…

• Turn device on/off	YES	NO	N / A
• Utilize braking system	YES	NO	N / A
• Disengage braking system	YES	NO	N / A
• Use speed control switch	YES	NO	N / A
• Use special features of device	YES	NO	N / A
• Request assistance if necessary	YES	NO	N / A
• Independent transfer on/off	YES	NO	N / A

©Dawson, Kaiserman, Chan & Gleason, 1995, 2006 4

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Power Mobility Indoor Driving Assessment (PIDA)

- Assesses indoor mobility of patients utilizing power wheelchairs and scooters.
- Allows for ongoing evaluation of the patients/clients driving abilities
- Includes situations such as: bed access transfers, bathroom access, parking, ramp control, and obstacle course.
- *Does not cover self care tasks*

$$\frac{\textit{Sum of scores for each item} \times 100}{4 \times (\text{Number applicable items})} = \_\_\_\ \%$$

Total % score indicates performance over time

http://www.fhs.mcmaster.ca/powermobility/pida.htm
(Dawson, Kaiserman, Chan, & Gleason, 1995, 2006)

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Elderly and aging wheelchair users have increased risk for accelerated loss of function and mobility that greatly limits independence and affects quality of life.

Requejo, et al, 2015

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Thank you for attending today's webinar!

Questions?

Please contact ***education@permobil.com*** with webinar questions and inquiries

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