


The 36th International Seating Symposium
 March 4, 2020
 The Westin Bayshore, Vancouver, BC, Canada


Entering the World of Power Assist Devices for Manual Wheelchairs Who, Why, When?




Presented by:
Christie Hamstra, PT, DPT, ATP,
Olivia Tefera, PT, DPT and
Motion Composites

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Course Handouts




- Request handouts using one of the following:
 - Capture the QR code using your mobile device
 - Visit <https://t2m.io/7e7nkuyp>



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Faculty Disclosure



Christie Hamstra, PT, DPT, ATP

- Physical Therapist 20 years
 - Acute Rehab, Long Term Care, School-based, and Outpatient Pediatric Seating Clinic
- Implemented a movement-based curriculum for students with severe multiple impairments
- Two years employed as ATP for independent dealer in Michigan
- Invited guest lecturer at Oakland University and Andrews University
- Currently Clinical Education Specialist for Motion Composites
- Lives in Dearborn Heights, Michigan



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Faculty Disclosure



Olivia Tefera, PT, DPT

- Through education and sales efforts, I aim to cultivate a more informed consumer in the mobility marketplace
- Motion Composites North American Clinical Educator
- Served Texas, Oklahoma & Arkansas as a DME rep
- Former South Texas Veterans HCS Spinal Cord Injury Center Physical Therapist, San Antonio, TX
- B.S. Biology Baylor University, Waco, TX
- D.P.T. Bellarmine University, Louisville, KY
- Licensed Texas Physical Therapist residing in Dallas



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Course Objectives



By the end of the presentation, participants will be able to:

- Describe two specific clinical situations how manual wheelchair power assist may enhance a client's functional ability
- Contrast three different types of manual wheelchair power assisted mobility
- List three specifics in a wheelchair assessment which must be considered to determine eligibility for a manual wheelchair power assist device

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Evidence Based Practice



"Integrating individual clinical expertise with the best available external clinical evidence from systematic research."

David Sackett 1996



Slide compliments of Duke University Medical Center Library and the Health Sciences Library at the University of North Carolina at Chapel Hill

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The Clientele: Manual Wheelchair Users



- Manual wheelchair most common wheelchair used
- 2000-4000 pushes per day
- Addition strength requirements for ADLs
 - Pressure relief
 - Transfers
- Prolonged use leads to shoulder pain/dysfunction
- Reviewing the research
 - 42-66% of full-time users will have shoulder pain (Ramirez et al 2017)
 - Increases to 100% after 20 years of use (Sawatzky et al 2004)



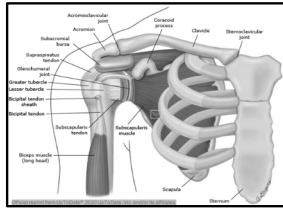
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The Clientele



- Most Common Injuries
 - Rotator cuff impairment
 - Impingement syndrome
 - Carpal tunnel syndrome(Lighthall-Haubert et al 2009)



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So What Can Be Done?



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Proactive Approach



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Prevention Through Prescription



Optimum wheelchair set up

- Weight of chair as light as possible
- Center of gravity as far forward as possible without compromising stability of user
- Proper vertical wheel height



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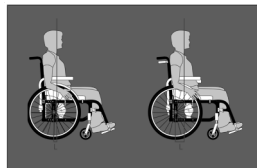
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Prevention Through Prescription



Optimum wheelchair set up

- Weight of chair as light as possible
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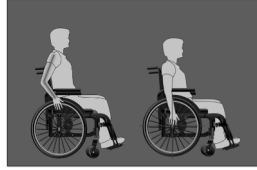
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Prevention Through Prescription



Optimum wheelchair set up

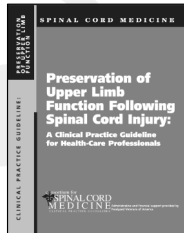
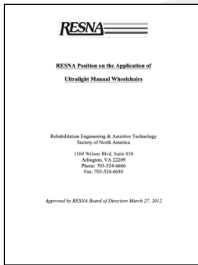
- Weight of chair as light as possible
- Center of gravity as far forward as possible without compromising stability of user
- Proper vertical wheel height



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Guidelines and Recommendations



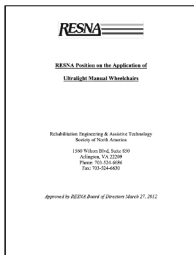
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Guidelines and Recommendations




RESNA



<https://t2m.io/ud0XVmcv>

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What About Power Add on Devices?



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Physiologic Benefits of Power Assist




- Decreased Vo₂ measurements and RPE noted with pushrim activated power assist studies
(Levy et al 2010)
- Decreased muscle activity in shoulders via EMG
- Pectoralis major, anterior deltoid, infraspinatus, supraspinatus
(Lighthall-Haubert et al 2009)
- Increased distance travelled vs without Power Assist
- Overall decreased repetitive muscle strain
(Ramirez et al 2017)


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Why Not a Power Wheelchair?



- Environmental access
- Transportation
- Independence
- Stigma



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Power Assist Intended Population



- History/current UE pain/dysfunction
- Reports of fatigue
- Decline in independent mobility
- Diagnosis driven changes in function
- Caregiver abilities and needs
- Unmet goals



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Education & The Team Approach



- Bring up power assist add on early in the wheelchair prescription process
 - Even if not prescribing at this time
- Often not even discussed in prevention (Ramirez et al 2017)
- May help to prevent/delay injury if used properly and early

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Clinical Assessments

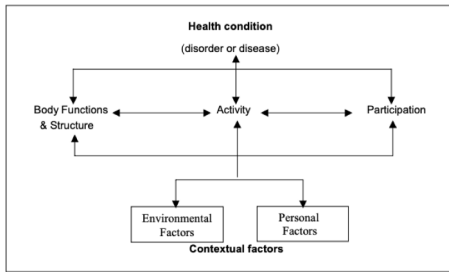


Putting it all Together

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The International Classification of Functioning, Disability and Health Model



Courtesy of World Health Organization, 2002

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Why Assessments?



- Objective measures demonstrate medical benefits
- Clinical assessments aid in medical justification for funding
- Full clinical picture required to determine appropriateness
- Person
 - Physical
 - Cognitive
 - Goals
- Environment
- Equipment

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Physical Assessment



- Determine client's capabilities and limitations
 - Reaction time
 - Sitting evaluation
 - o In the chair
 - o Out of the chair
 - Supine evaluation
 - Use a team approach
 - o Therapist & ATP
 - Rating of Perceived Exertion and O2 use

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Physical Assessment



- Range of Motion
 - Document limitations of AROM to ensure appropriate device selection
- Strength
 - Document asymmetries to ensure appropriate device selection
 - o Some devices allow for asymmetrical sensitivity
 - o Consider attaching and detaching device
- Postural balance
 - Document static and dynamic balance

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Outcome Measures



- Transfer Ability
 - How to transfer in and out of device
- Wheelchair Propulsion Test (WPT)
 - First trial performed in client's current equipment
 - Second trial performed with simulated power assist device
 - Objective measurement of differences in propulsion can be used to justify power add on device
- Wheelchair Skills Test
 - For additional justification, utilize WST as another standardized assessment
 - www.WheelchairSkillsProgram.ca



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Outcome Measures



- Power-Mobility Community Driving Assessment (PCDA)
- Power-Mobility Indoor Driving Assessment
- Wheelchair Skills Test (PIDA)

POWER-MOBILITY COMMUNITY DRIVING ASSESSMENT (PCDA) FORM

SECTION A: ASSESSMENT

NAME: _____ DATE: _____

SECTION B: ASSESSMENT and Driver Experience Checklist

ALL POWER-MOBILITY DRIVING EXPERIENCE

Time driving in community of area: _____

Power mobility training (operator & device): _____

Driver age: _____

SECTION C: ASSESSMENT

Power Wheelchair: Seated Walk & Stand

Seat: None Length of Time: _____

Driving Surface: _____

Type of Control: _____

Special Equipment: _____

Comments: _____

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Person – Screening Tool



1. How long have you been pushing a MWC?
 - < 1 year on record = deal breaker
2. What difficulties do you have pushing your MWC?
 - Endurance, pain, function, too slow?
3. Do you have pain with pushing your MWC?
 - 24-hour picture of pain, during week, exacerbating movements?
 - Are you on pain meds?
 - o What, if any, ADLs has your pain affected?
 - o What, if any, activities have you stopped doing because of pain?

(Boinger et al, 2005)

Courtesy of Mary Shea, MA, OTR, ATP & Cathy H Carver, MS, PT, ATP/SMS

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Person – Screening Tool



4. Have you seen an MD about your pain?
5. If you had power assist right now, how would it help you?
 - How would you use it?
6. What if you don't get power assist? How will that affect you?
7. Tell me why you need the power assist vs. a dedicated PWC?
8. Are you willing to come in for a trial and follow up with training?

(Boinger et al, 2005)

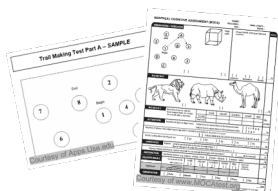
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Cognitive Assessment



- Extremely important in power add on selection
 - "Learning curve"
 - Conduct as needed
- Informal Interviews
- Assess
 - Processing
 - Ability to follow directions
 - Adaptive to new situations
- Trail Making Test – A & B
- Montreal Cognitive Assessment (MoCA)



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Goals Assessment



- Informal Interview
- Wheelchair Outcome Measure (WhOM)
- Pay attention to environments

Category	1	2	3	4	5
Transfer					
Propulsion					
Maneuverability					
Stability					
Control					
Comfort					
Appearance					
Weight					
Portability					
Reliability					
Cost					
Accessibility					
Compliance					
Other					
Total					

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Variations in Power Assist



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Types of Power Assist Device



- Front add on
- Push rim activated
- Rear add on
- Common features
 - Batteries
 - Mounting hardware
 - Motor(s)
 - Wheel(s)
 - Software
- Use results from assessments to match client to the appropriate device

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Key Features of Power Assist Devices



- Weight capacity
- Weight of device
- Speed settings
- Distance per charge
- Unilateral or bilateral control
- Compatibility with wheelchair
- Charging method



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Key Features of Power Assist Devices



- Programmability
- Sensitivity settings
- Backward movement
- Automatic breaking – downhill
- Side slope control
- Hill holder capability
- Alternate drive controls
- Esthetics



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Push Rim Activated



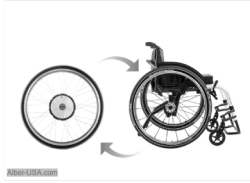
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Push Rim Activated



- Used in majority of power assist research
- Amplifies effect of manual pushing
- Replaces existing rear wheels with set that has battery & motor in the hub
- Sensors in the handrim
- Rigid & folding frame compatible
 - If existing axle cannot be used, an additional axle is added to frame



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Push Rim Activated



Benefits

- Momentum is magnified
 - Enhances push
 - Less energy exerted
- Decrease stroke frequency
- Improves energy conservation
- Limits repetitive strain/UE injury
- Smartphone applications to track data
- Customized programming
- Transfers not affected
- Minimalistic design
- Accommodates acceleration changes
- Recognized by funding sources



Courtesy of Sunrise Medical

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Push Rim Activated



Limitations

- Heavier than traditional wheels
 - ~18lbs/wheel
 - Require assistance to install
 - Burden of increased overall weight
- Sensors can be damaged
- Increase time to master use
- Travel with 2 pairs of wheels
- Limited wheel sizes
- Humming noise
- Difficulty mounting
 - Due to balancing of wheelchair
 - Client must transfer out first



Alber-USA.com

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Push Rim Activated



Examples

- Invacare/Alber
 - Twion
 - eMotion
- Sunrise Medical
 - Quickie Xtender
 - Wheeldriver
 - Only available on Sunrise chairs
- Yamaha
 - NAVIGONE
 - NAVIGO



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Rear Add-on



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Rear Add On



- Replace manual pushing with power
 - "Drives" or pushes chair once engaged
- Upper extremities used primarily to steer & stop
- Attaches to
 - Camber tube on rigid
 - Mounted bar on folding
- Options for input control
- Smartphone applications
- Empowers active lifestyle



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Rear Add On



Benefits

- No continuous push needed
- Relatively lightweight
- Easily removed & transported
- Low residual weight with non-use
- Customized programable options
 - some switch control input
- Connectivity via Bluetooth
- Smartphone applications
- Much easier one-arm drive option
- Recognized by funding sources
- Compatible with front mount wheel accessory



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Rear Add On



Limitations

- Appropriate cognitive function and reaction times required
 - Starting/stopping methods are altered
- Rough terrain
- Wheelies and environmental accessibility
- Camber tube material compatibility
- Balancing of wheelchair



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Rear Add On



Examples


- Permobil
 - Maxx Mobility Smart Drive MX2+
- Spinergy
 - ZX-1 (utilizes joystick)
- Invacare/Alber
 - Smoov



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Front Add-on




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Front Add On

- Replaces manual pushing with scooter style powered mobility
- Typically attaches to receiver that remains on chair
- Lifts casters off the ground
- “Pulls” chair along
- Compatible with rigid or folding
 - Dependant on linking design



Courtesy of Kiercon Mobility


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Front Add On

Benefits

- Operable with minimal hand function
- No use of handrims
- Raised casters allow user to traverse uneven terrain
- Usually higher rates of speed than other power assist add ons
- Easy learning curve



Courtesy of Kiercon Mobility

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Front Add On



Limitations

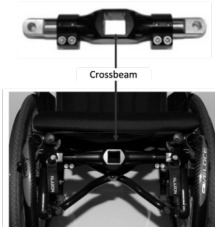
- Limited programming capability
- Shoulder ROM required to control tiller
- Device weight
 - Ability to attach, detach, and transport
- Overall footprint
- Lateral stability
- Funding limitations



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How to Install a Front Add On



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Front Add On



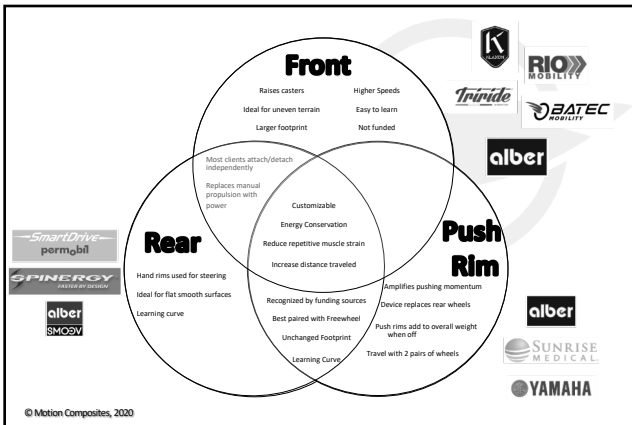
Examples

- Motion Composites
 - Klaxon Klick
- Rio Mobility
 - Firefly
- Triride
- Batec Mobility
- Alber
 - E-Pilot



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Equipment Trials

- Must trial recommended devices
 - Transfers
 - Control
 - Environmental access
 - Independence
 - Mounting

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What does a user look for with Power Assist?



Physical barriers & functional accessibility are most important to the user

• Indoor

- Changes to width of the chair
- Weight of device when not activated



• Outdoor

- Long distances
- Slopes
- Rough Terrain



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Questions?



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Thank You for Attending



For more information contact:

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