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Wexner Medical Center

Welcome

TAASC Introduction:
https://www.youtube.com/watch?v=3HrlbdAKA1A

TAASC Channel:
https://www.youtube.com/channel/UCwlz4BzWRFogjF0Bh2Mtj3w

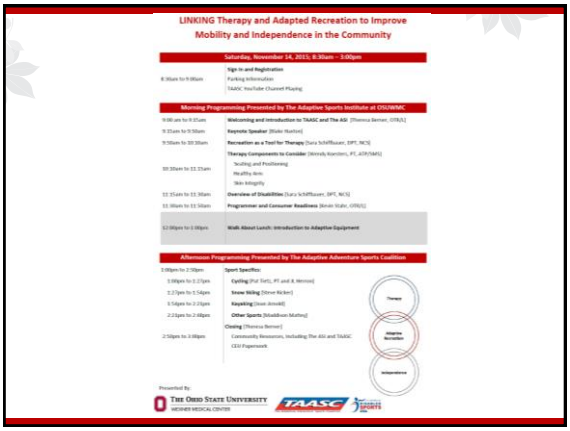
Linking Therapy and Adapted Recreation

Improving Mobility and Independence in the Community

Presented By:

The Ohio State University Wexner Medical Center

TAASC



LINKING Therapy and Adapted Recreation to Improve Mobility and Independence in the Community

Saturday, November 14, 2015; 8:30am – 3:00pm

Sign In and Registration
Parking Information
TAASC YouTube Channel Playing

Morning Programming Presented by The Adaptive Sports Institute at OSUWMC

Welcoming and Introduction to TAASC and The ASI [Theresa Berner, OTR/L]
Keynote Speaker [Blake Hanlon]
Recreation as a Tool for Therapy [Sara Schiffbauer, DPT, NCS]
Therapy Components to Consider [Wendy Koerdern, PT, ATP/SMS]
Seating and Positioning
Healthy Arm
Skin Integrity
Overview of Disabilities [Sara Schiffbauer, DPT, NCS]
Programmer and Consumer Readiness [Kevin Stahr, OTR/L]
Walk About Lunch: Introduction to Adaptive Equipment

Afternoon Programming Presented by The Adaptive Adventure Sports Coalition

Sport Specifics:
Cycling [Pat Tutt, PT and A. Henson]
Snow Skiing [Steve Ricker]
Kayaking [Jean Arnold]
Other Sports [Maddison Matter]
Closing [Theresa Berner]
Community Resources, including The ASI and TAASC
CEU Paperwork

Therapy
Adaptive Recreation
Independence

Presented By:
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Conference Objectives

Identify three research proven values for promoting the involvement in outdoor adaptive adventure sports

Verbalize the role of therapists in supporting patient involve in community adaptive recreation and sports

Identify special considerations related to sports involvement for at least four disabling conditions

Identify appropriate referrals for community adaptive recreation and sports

Justify the need for communication between therapists and community organizations

Be able to educate the individuals they work with in appropriate readiness for their activity to improve independence and decrease risk of secondary complications

Demonstrate awareness of associated secondary complications, (such as autonomic dysreflexia or skin breakdown) that may affect an individual's ability to safely participate in recreational activities

Demonstrate knowledge of least three strategies to improve an individual's participation in any recreational activity, as related to equipment needs

Be knowledgeable in at least four strategies to adapt four outdoor adventure sports

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Recreation and Sport as a Tool for Therapy

Evidence and Promotion

Sara Schiffbauer, PT, DPT, NCS

Outpatient Rehabilitation at OSUWMC

sara.schiffbauer@osumc.edu

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Objectives

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"**Sport** is a term encompassing a broad spectrum of experiences that include the social, recreational and competitive"

(Johnson et al 2004)

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A Paradigm Shift

"…sport is the most natural form of remedial exercise, restoring physical fitness, strength, coordination, speed, endurance and overcoming fatigue."

- Dr. Ludwig Guttmann

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Challenges to Community Reintegration and Participation in Recreation

- Physical inactivity occurs disproportionately among people with disabilities (Cooper et al 1999)
- Environmental barriers reported by subjects with SCI include: the natural environment, transportation, help at home, healthcare and government policy (Whiteneck et al, 2004)
- Limited access and the accessibility of recreation facilities (Rimmer and Henley, 2013)
- When beginning recreation activities after injury: equipment access and difficulty learning new skills (Wu and Williams, 2000)

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Overcoming the Challenges

- The best predictor of most long-term outcomes is **not** the severity of an injury (Whiteneck et al, 2004 and O'Toole et al, 2008)
- Most important resource are sport peers with disabilities (Wu SK and Williams T, 2001)
- Reasons for continuing participation in wheelchair athletics (Hanson et al, 2001):
  - Competition,
  - Health,
  - Fitness,
  - Fun and
  - Socializing

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Benefits of Recreation and Sport:

- Physiological
- Psychosocial
- Economical

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Physical Benefits

Johnson, 2004
Heath and Fentem, 1997
Peters et al, 2001

General Fitness
Maintaining a Healthy Weight
Cardiopulmonary Endurance
Vascular Improvements
GI Motility
Stamina
Muscle strength
Flexibility

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Psychosocial Benefits

Kliebler et al, 1995
Heath and Fentem, 1997
Blinde EM and McClung LR, 1997
Blauwet and Willick, 2012

- Improved motivation
- Improved self-confidence and self-esteem
- Personal adjustment
- Reduced anxiety
- Reduced tendency to withdraw
- Sense of control

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Economic Benefits

Lastuka A and Cottingham M, 2015
Krane D and Orkis K, 2009

- Employment
- Healthcare Costs

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Skin Protection and Sports

Matt Yankie, PT, DPT
The Assistive Technology Center at OSUWMC
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Forces

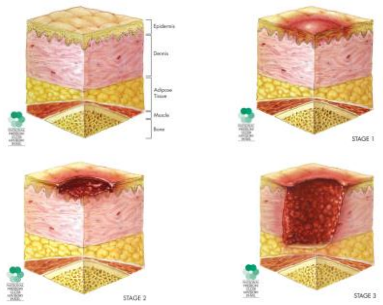
- Compression forces act toward each other
- Shearing forces are parallel to each other
- Pressure force is applied over a surface area
  - A force applied over a very small area generates more pressure than the same force applied over a large

Other factors that contribute to Pressure Ulcer Development

- Mobility
- Spinal Cord Injury
- Body Type
- Nutrition
- Infection
- Age
- Sitting posture
- Microclimate at seat/buttock interface
- Transfers and handling technique
- Out of chair activities

International Pressure Ulcer Classification System

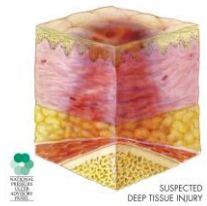
- Category/Stage I: Non-blanchable erythemia
- Category/Stage II: Partial thickness
- Category/Stage III: Full thickness skin loss
- Category/Stage IV: Full thickness tissue loss



Additional Categories/Stages for the USA

- Unstageable/ Unclassified: Full thickness skin or tissue loss – depth unknown
- Suspected Deep Tissue Injury – depth unknown
  - Purple or maroon localized area of discolored intact skin or blood-filled blister due to damage of underlying soft tissue from pressure and/or ***shear.***
  - The area may be preceded by tissue that is painful, firm, mushy, boggy, warmer or cooler as compared to adjacent tissue.
  - Deep tissue injury may be difficult to detect in individuals with dark skin tones. Evolution may include a thin blister over a dark wound bed. The wound may further evolve and become covered by thin eschar.
  - Evolution may be rapid exposing additional layers of tissue even with optimal treatment.

Deep Tissue Injury



http://www.npuap.org/images/NPUAP-SuspectDTI.jpg

Pressure Sore Risk/Prevalence

- Populations with increased risk for pressure sores include:
  - Elderly persons
  - **Persons with physical impairments**
  - **Persons with decreased sensation**
- 0.4% to 38% in acute care
- 2.2% to 23.9% in long-term care (LTC),
- 0% to 17% in home care

Prevention and Treatment of Pressure Ulcers

- Model SCI System
  - 24% experience a PU during their rehab hospital stay
  - 15 % experience a PU within the 1st year
  - Between 50% and 85% will develop a PU in their lifetime
- Pressure is the defining causative factor in the development of Pus, but factors such as shear friction, heat, and moisture also contribute to make the tissues vulnerable to breakdown.
- Tolerance of tissue to external loading varies widely across people and the anatomical site
  - PU prevention strategies must be based upon individual evaluation

(Rappl LM, Sprigle SH, Lane RT)

Prevention and Treatment of Pressure Ulcers

- Shearing forces cause distortion in tissues.
  - Results in undermining and tunneling
- Seat and backrest dimension and angles affect postural stability
  - Leads to increases in pressure and shear.
- Temperature and moisture can contribute to tissue damage.
- PUs are staged according to the depth of tissue involvement. Ulcers should not be reverse-staged.
- Photographs of posture before and after intervention graphically demonstrate the need for the prescribed equipment and proper use of that equipment.

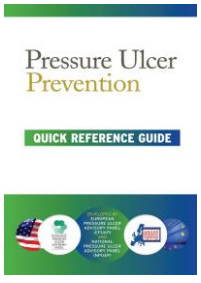
(Rappl et al)

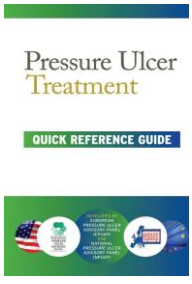
Prevalence and recommendations

Prevalence for "sitting-acquired pressure ulcers" for wheelchair users between 17.9-23 percent (Hollington 2013)

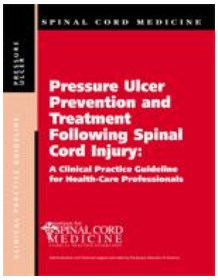
The guidelines for individuals with current pressure ulcers (PU) recommend: (Brienza et al, 2010)

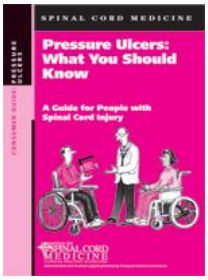
1. Refer individuals to a specialist seating professional for evaluation if sitting is unavoidable
2. Select a cushion that effectively redistributes the pressure away from the pressure ulcer





http://www.npuap.org/resources.htm





www.pva.org

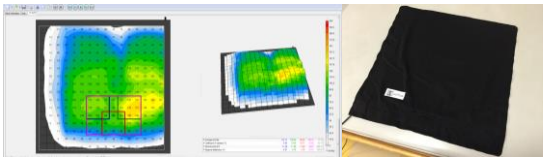
Preventing Pressure Ulcers: A Systematic Review

- Using appropriate support surfaces
- Insuring appropriate nutrition
- Keeping sacral area well moisturized
- In addition they mention repositioning, but no definitive stipulations on frequency was found

(Madhuri et al)

Pressure Mapping

- A tool used to assess pressure distribution over a surface
- A thin mat is placed between the athlete and the seated surface
- A computer generated image displays the amount pressure using color, numbers and a 3D image



Clinical Application of Pressure Mapping

- Standardize the way you look at your results
  - Peak
    - At anatomical landmarks
  - **Peak Pressure Index**
    - Average of the peak value + the 8 cells surrounding the peak (3x3 grid)
    - At anatomical landmarks
  - **Contact Area**
    - <2 mmHg or <5 mmHg
  - **Dispersion Index (area)**
    - Ratio of the IT/Sacral loading to total loading
  - **Coefficient of variation**
    - Numerical value for difference seen between high and low areas

(Sprigle and Davis, 2008)

OSU's Clinical Application of Pressure Mapping

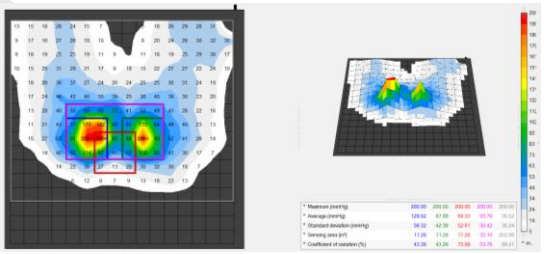
- Record the Data after 30 sec to 1 min of client being placed on the mat table
- Record baseline on the mat table for relative comparison
- Place client on their cushion in their chair
- Make recommendations/modifications to seating system and repeat pressure mapping to compare results

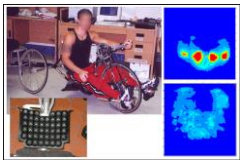
Interface Pressure Mapping is Relative

- Does not measure internal tissue risk
- Assesses contact between the body and cushion.
- We are unable with current research findings to state each individual's degree of pressure that will/can cause a wound.

- Springer, "To date, research has not identified a specific threshold at which loads can be deemed harmful across people or sites on the body. Tissue's tolerance to load varies according to the condition of the tissue and its location, age, hydration, and metabolism. All the factors common to PU risk assessment tools tend to influence how the tissue distributes the loading and its ability to withstand load."

OSU's Clinical Application of Pressure Mapping





The Athlete and The Seating Interface

- Athletic Stance – Able bodied athletes use this to communicate with the ground, and "push" ground away
  - Feet shoulder width apart
  - Shoulders over knees
  - Knees over toes

(Hetzel et al)

The Athlete and The Seating Interface

- Challenges supporting athletes with disabilities:
  - Power must be transferred through the pelvis in seated athletes
  - Power must travel through the equipment to the ground
- This limits sensation and feedback to the ground

Photo: Ride Designs, Matt Updike

The Athlete and The Seating Interface

Solutions:

- Reduce/eliminate pressure and shear at high risk areas
- Elevate forces of support at contact areas tolerant of pressure and shear
- Use materials with consistent performance throughout the range of temperature, moisture conditions
- Provide consistent and repeatable positioning
- Optimize balance and orientation

Successful Solutions

- Understand the history
  - Get a good history to understand the problem
- Complete full supine evaluation
- Inspect skin at assessment
- Palpate bony prominences
- Before you transfer back, inspect the cushion
- Get your hands on the seated surface

Our assessments should take into consideration current risk factors and functional aspects to skin protection, pain control, and mobility independence

(Brienza et al 2010)

Example screening prior to pressure mapping

Subjective

- Date of onset:
- PMH:
- Present condition/complaint:
- Pain
- Client goals with referral to seating clinic:
- Client's perception of wound onset and/or difficulty with healing:
- Current wheelchair and problems with equipment:
- DME:
  - Bed:
    - How long do you spend per day in bed vs. chair:
    - What position spent in bed/activities:
  - Commode
  - Shower seat:
  - Transportation:
- Living situation, transportation, social support:

Screening continued

Objective

- Height and weight
- Risk factors for shear: Transfer method and positioning in wheelchair
- Moisture/Temperature risk factors:
- Pressure relief strategies current:

Functional Status

- Mobility Status:
- Transfer status:
- ADL Status:
- Cognition/judgment

Screening continued

Physical Assessment

- Posture:
- Strength/endurance:
- Sitting balance/trunk strength
- Muscle tone:
- Flexibility:
- Sensation:
- Skin Integrity/ability to reposition:

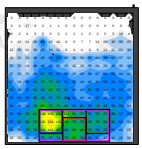
Case studies: Doug

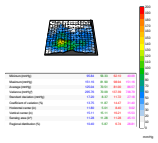
- 31 year old male
- Complete T6 SCI
- Wheelchair user since 1992
- Skin history: PMH wounds with skin graft 12 year ago left IT and right hip.
  - Most recent breakdown with prolonged hospitalization left IT
- Pressure relieving strategy *push up 3-4 x per day.*
- Posture: *left inferior obliquity*, hyper lordotic, left shoulder elevated, bilateral hip abduction- right greater than left. Fair trunk stability with arms elevated. No contact with current back support at lumbar spine due to degree of hyper lordosis

Case Study by Wendy Koesters PT, ATP/SMS

Key points with initial screening

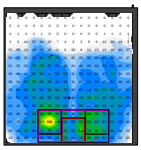
- Length of time since injury
- Recent sore with prior history of sores
- Low frequency of pressure relief.
- Postural deficits = asymmetric loading with pelvic obliquity
- He reports low confidence in self assessing cushion inflation.

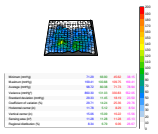




Original presentation:

Roho locked.



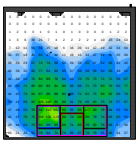


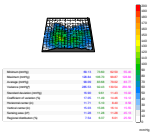
Unlocked cushion valve reducing left peak pressure

No negative impact to balance or transfers

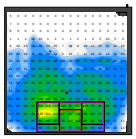
Alterations to cushion for pelvic obliquity

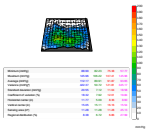
http://www.clinical-corner.com/2011/03/practical-seating-considerations-pelvic-obliquity/





Correction:
by adding air left

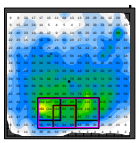


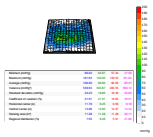


Accommodating:
increase in air on right

Modification of seating system

- Use of ***Roho contour solid seat*** insert with valve unlocked
  - Results in better symmetry of pressure right to left



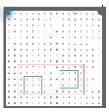


Unable to alter dump of seat due to challenges with transfers. He was not open to trial of solid back support.

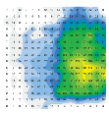
Education from results of pressure mapping:

1. Most effective pressure distribution with valve unlocked= green pushed center.
   - Advocate for use of Roho contour solid seat insert for better pressure distribution=plan to pursue funding for this
2. You are properly inflating your cushion. No change to air amount. Open valve allows for better immersion into cushion.
3. Education on how/when to check air in cushion:
   - YouTube search: Roho Quadtro

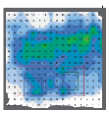
Pressure relief strategies. Use pressure mapping to aide in training:



- Pressure relief via push up effective but high strain to shoulders.
  - Education: protect those shoulders by reducing how often you complete a push up in the future



- Effective pressure relief via right lean.



- Effective pressure relief with forward lean

Take Home Message

- Verify that client knows how to maintain and monitor their equipment.
- Pressure mapping great tool to assist in education on best strategies.
- Pressure management- not just the cushion but seating configuration also make an impact.
  - Balance, strength and transfer independence limit seating changes.

Questions?

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The Healthy Arm

Focus on Propulsion

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Objectives

- Literature Review on Upper Extremity Injury and Injury Prevention
- Equipment considerations
- Propulsion assessment of manual wheelchair
- Case Studies

It's all about….functional independence and upper extremity preservation

- According to the Consortium for Spinal Cord Injuries Clinical Practice Guidelines 2005 (Surveys and Cross Sectional Studies) it is estimated to be up to **60%** incidence in SCI
- Shoulder pain is a problem in up to **86%** of persons with spinal cord injury (Eriks-Hoogland et al, 2014)
- General Population:
  - Prevalence = up to **25%**
  - Rotator cuff tendinopathies affect 20-30% of the general population (Weis et al, 2005)

Kilbane, 2014

More stats

- Only 2% of this population undergoes shoulder surgery treatment for rotator cuff tear and shoulder disability (out of 60% who reported pain).

(Pellegrini et al, 2012)

- Reduction in shoulder pain were related to significant increases and social participation and improvements in quality of life in people with long term paraplegia.

(Kemp et al, 2011)

(Kilbane, 2014)

Resources on UE preservation

- Rehabilitation Engineering and Assistive Technology Society of North America (RESNA) Position on the Application of Ultralight Manual Wheelchairs
  - DiGiovine et al, 2012
- Preservation of Upper Limb Function Following Spinal Cord Injury: A Clinical Practice Guideline for Healthcare Professionals, 2005
  - Boninger et al, 2005
- The need for updated clinical practice guidelines for preservation of upper extremities in manual wheelchair users: a position paper
  - Sawatzky et al, 2015
- Pushrim biomechanics and injury prevention in spinal cord injury: recommendations based on CULP-SCI investigations, 2005
  - Boninger et al, 2005

Key considerations for UE preservation:

1. Medical diagnosis
   Long term disability and overuse injury
2. Predisposing factors to new injury
3. Biomechanical factors
4. Equipment use

Evaluation of current equipment daily use or sport

- Prioritize goals (survey)
- Gather data:
  - Wheelchair user's shoulder pain index
  - Manual wheelchair skills test- establishing a baseline
  - Grip strength with dynamometer
  - Smart wheel
  - Measures of current chair

Key questions

- Transfer style- floor, uneven height, approach angle
- Lifestyle needs: work, children, access to tables/desks
- Driving and transfer style/goal
- Fears- stability
- Active in community, sports
- Where is chair used majority of time-aka terrain?
- Impact of spasticity on hip and foot positioning?
- How to you reach for things at home and office?
- Skin integrity-current and history
- Pressure relief strategy and independence in monitoring

Considerations of frames

1. Cantilever
2. Hybrid
3. Box
4. Folding

Client's choice is priority!

Assessing balance when modifying or completing new configuration choices:

- Hand to mouth
- Forward and lateral
- Reach to floor
- Tippy Test
- Wheelie ability

Targets with wheelchair configuration:

- Balance
- Wheel access for arms
- Weight distribution
- stability on ramps
- Minimize weight:
  - Components of chair
  - No back pack hanging off the back

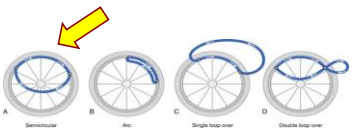
Skill training: "How do you push?"

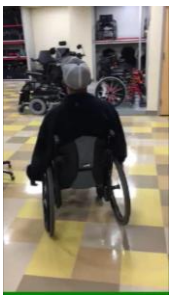
- CPG recommendations to pushing-
  - Use long, smooth strokes that limit high forces on the hand rim
  - Minimize frequency of repetitive upper limb tasks
  - Minimize forces required to complete upper limb

Preservation of Upper Limb Function Following Spinal Cord Injury: A Clinical Practice Guideline for Healthcare Professionals, 2005

Optimal stroke:

- "long stroke"





- Semi circular technique

http://clinicalgate.com/wheelchairs-and-seating-systems/

Propulsion assessment:

- Wheelchair skills test manual and power
  - Includes transfers (even to floor), ramps 2x of ADA requirement, wheelies, curbs
- Wheelchair propulsion test (speed, push frequency, and efficiency)
- SmartWheel: blue tooth computerized wheel sensor assessing
  - Speed
  - Push frequency
  - Force/braking
  - Push length

SmartWheel

- Gives valuable visual and measured data to provide education on current ability and assess changes to target areas of deficit
- Establish baseline for comparison in future if skill level declines from overuse
  - Examples:
    - If short stroke and frequent braking, assess if balance can be improved
    - If too low of force, can access to wheel be improved or skill training on propulsion style
    - Data to support power add on to manual wheelchair or transition to power

Manual wheelchair add ons:

- Free wheel
- Smart drive
- Emotion
- Dragonfly
- Widget





Sport specific chairs

"Basic principles of sports wheelchair design are universal across sports and include fit; minimizing weight while maintaining high stiffness; minimizing rolling resistance; and optimizing the sports-specific design of the chair. However, a well designed and fitted wheelchair is not sufficient for optimal sports performance; the athlete must be well trained, skilled and use effective biomechanics…"

Cooper and De Luigi, 2014

Role of specialists at OSUWMC:

1. Optimize biomechanics, strength and flexibility
2. Equipment fitting and skill of use
3. Injury intervention and prevention

Case study: Intervention

- 59 yo Female
- DX
  - Spinal Cord Injury (30+ years post injury)
  - Rotator Cuff sprain
  - Arthritis of shoulders
  - Bilateral shoulder pain
  - Muscle weakness
- Goal
  - MWC vs Power add on vs PWC
  - Preserve shoulders for continued employment and wellness

Use of smart wheel

	January 2015 - Invacare MVP - Current WC	August 2015 - Invacare MVP - Current WC	August 2015 - TiLite Aero Z Evaluation with Java Back	Database Average †‡	Database Top 25% ‡
Speed [m/s]	1.2	1.3	1.3	1.29	1.73
Push Frequency [1/s]	1.1	1.1	1.1	0.91	1.05
Push Length [degree]	49.5	65.9	64.2	74.48	82.90
Force (Weight Normalized) %	7.1	9.4	6.8	11.32	12.95

Results

- Pro's and con's of equipment choices to be independent in community, enter exit van, and continue working in a productive manner
- Smartwheel and eval data to educate on the deficits in her arms and therefore functional level
- Wheelchair configuration adaptions
- PT intervention: specific home program training for strength, pain management, and activity modification
- Referral to TAASC for cycling

Case study - prevention

- 22 year old male
- T7 complete SCI within past 6 months
- Denies any pain
- Referred to AT center by out patient therapists OT/PT

Establish baseline with new para

- Tile-"normal speed"

	Client Session 1	Client Session 2			Database Average †‡	Database Top 25% ‡
Speed [m/s]	1.6	1.6			1.29	1.73
Push Frequency [1/s]	1.0	1.0			0.91	1.05
Push Length [degree]	85.5	94.2			74.48	82.90
Force (Weight Normalized) %	7.1	8.8			11.32	12.95

Tile- fast speed

	Client Session 1	Client Session 2			Database Average †‡	Database Top 25% ‡
Speed [m/s]	2.6	2.7			1.29	1.73
Push Frequency [1/s]	1.7	1.7			0.91	1.05
Push Length [degree]	96.5	100.8			74.48	82.90
Force (Weight Normalized) %	18.2	16.7			11.32	12.95

Carpet

	Client Session 1	Client Session 2			Database Average †‡	Database Top 25% ‡
Speed [m/s]	1.6	1.8			1.10	1.62
Push Frequency [1/s]	1.0	1.1			0.97	1.11
Push Length [degree]	96.9	100.1			80.85	88.87
Force (Weight Normalized) %	11.1	12.5			14.67	15.39

Assessment

- Propulsion assessment and skill level all functional and adequate for injury prevention.
- Wheelchair configuration: Education that shoulder integrity optimized with higher seat to floor to decrease elbow flex at top of rim and decreased risk of impingement (decreasing shoulder IR).

Education

- Education on spotting and how to progress to stairs and escalators.
- Educated on you tube videos and work with PT on transfer wheelchair to and from floor
- Education on "add ons to chair" to optimize community mobility.
- Education on maintenance of chair: air tire, castor care
- He states understanding of resources and use of AT center in future.
- Recommendations and resources given for adaptive sports

Questions?

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Healthy Arm

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Objectives

- The learner will be to list common overuse injuries to arm with wheelchair use.
- The learner will understand treatment options and appropriate referrals for their consumers.
- Identify special considerations related to sports involvement for disabling conditions.

Statistics of Arm Injuries in Adaptive Athletics

- In the 2012 Paralympics the injury rate was 12.7 per 1,000 athlete days. This injury rate is slightly higher as compared to elite able bodied sports participants.
- Sports with the most injuries include goalball, football (5 to a side), wheelchair rugby, power lifting, and wheelchair fencing.
- Safest sports were shooting, sailing, and rowing.
- Most injuries were in the shoulder, elbow, wrist and hand.

Statistics of Arm Injuries in Adaptive Athletics and Recreation

- 35% of injuries of the 2012 Paralympics were to the arm and the most common were to the shoulder 17%.

How to keep the arm healthy

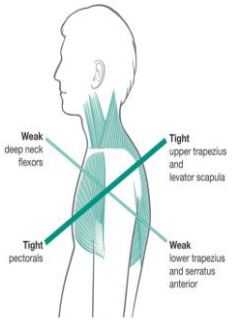
- Posture is very important to arm health
- Forward rounded shoulders and forward head decreases the ability to use an arm with power and with proper motion.

Predisposing factors for injury for wheelchair users:

- Poor posture
- Muscle imbalance
- Weight bearing upper extremity
- Improper wheelchair configuration: rear wheel position, poor balance, too wide

Posture issues

- Leads to tightness in the pectoral major and minor, upper trapezius and levator
- Leads to weakness in the deep neck flexors, lower traps, and serratus anterior
- RESULT: decreased shoulder stability and increased weakness in the shoulders



Most common injuries from repetitive strain:

- Carpal Tunnel Syndrome
- Rotator Cuff tear
- Impingement syndrome of shoulder
- Chronic pain syndromes cervical and thoracic spine
- Bicep tendonitis
- Tennis elbow

Boninger et al, 2005

Biomechanical factors linked to injuries:

- High frequency tasks
- Forces required to complete tasks
- Extreme positions
  - Of wrist
  - Hand above shoulder
  - Extreme shoulder internal rotation and abduction

Boininger et al, 2005

Warning signs:

- Pain with palpation
- Active movement or stretching of involved tissue
- Pain with overhead activities
- Difficulty with repetitive arm motions
- Difficulty with upper body dressing
- Impaired sleep- particularly sidelying

Upper extremity pain result in:

- Additional loss in function
- Increased caregiver assistance
- Decreased community mobility
- Disuse and increased risk of cardiovascular disease
- Increased cost in medical management
- Lower quality of life scores on outcome measures
  - Sport, wellness, work

Pain

- *Type of discomfort*- ache, sharp pain at rest or when exercising
- *Onset*- during exercise or within 24 hours of activity
- *Duration*-May linger if not addressed
- *Location*- muscles or joints
- *Improves with*- ice, rest
- *Worsens with*-continued activity
- *Appropriate action*- consult with medical professional if pain is extreme or last longer than 1-2 weeks

Muscle soreness

- *Type of discomfort*- tender when touching muscle, tired, or burning feeling when exercising, dull, tight, and ach
- *Onset*- during exercise or 24-72 hours after activity
- *Duration*- 2-3 days
- *Location*- muscle
- *Improves with*- stretching, following movement
- *Worsens with*- sitting still
- *Appropriate action*- resume offending activity once soreness subsides

When to seek medical care

- Urgent medical care is needed when there is immediate swelling, loss of motion, weakness, and or deformity

Injury Types

Hand injuries that require medical attention

- The most common types of injuries to the hand are trauma and overuse.
- The most common type of traumatic injuries are:

Hand injuries that require medical attention

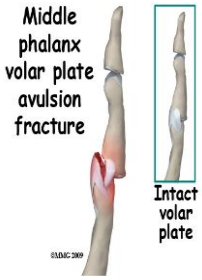
- *Thumb MCP collateral ligament (skiers thumb)*
- Will have pain, swelling, reduced ROM, and reduced strength

Hand injuries that require medical attention

- *Bennett's fracture*- Fall on flexed thumb
- Will have pain, swelling, reduced ROM, and reduced strength

Hand injuries that require medical attention

- *Volar plate avulsion fractures*- often from forced hyper extension of the finger. Most common in ball sports.
- Will have pain, swelling, reduced ROM, and reduced strength.

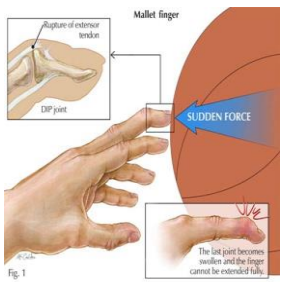


Hand injuries that require medical attention

- *FDP avulsion fracture*- often from forced finger flexion against finger extension (jersey finger). Most often in the 4th finger
- Will have pain, swelling, reduced ROM, and reduced strength

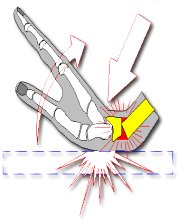
Hand injuries that require medical attention

- *Mallet finger*- avulsion fracture of the distal slip of the extensor tendon- most common injured with force to the tip of the finger.



Wrist fracture

- *Colles fracture*- mode of injury is usually a fall on an out stretched hand. Injury often has a dinner fork deformity.

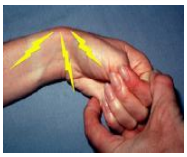


Wrist fracture

- *Scaphoid fracture*- Mode o injury is most often from a fall on an outstretched hand.
- There is pain in the anatomical snuff box
- When there is pain in the snuff box it is considered a fracture until proven not with testing

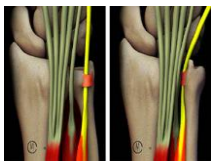
Overuse injuries to the hand/wrist

- *deQuervain's tenosynovitis* syndrome-Most common overuse injury at the wrist. Pain and swelling at the base of the thumb.
- Treatment is rest, ice, and splinting.



Overuse injuries to the hand/wrist

- *Extensor carpi ulnaris tendonitis*- Most common in racquet sports
- Treatment is rest, ice, and splinting.

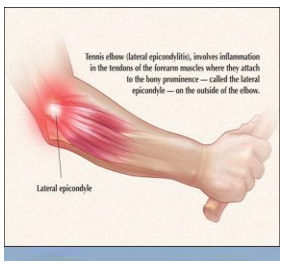


Overuse injuries to the wrist and hand

- *Carpal tunnel* syndrome-Numbness, burning, tingling or pain in the hand or fingers.
- Worst at night or in the morning
- Temporary symptom relief when "shaking out" the hands

Elbow problems

- *Lateral epicondylitis* or tennis elbow
- Most common problem at the elbow
- Signs/symptoms- difficulty holding items, pinching, or gripping items.
- Point tenderness at the medial elbow

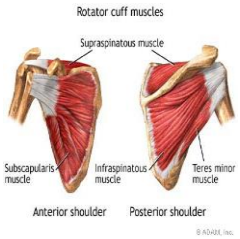


Shoulder injuries

- *Shoulder dislocation*-modes of injury include a fall on an outstretched arm that is forced overhead, a direct blow on the shoulder, or forced external rotation.
- Must be reduced quickly to avoid nerve injury

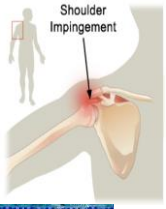
Rotator cuff problems

- *Rotator cuff tendinitis*- is inflammation to any of the 4 tendons of the rotator cuff
- The most common injured are the supraspinatus and infraspinatus
- Most commonly irritated in overhead sports



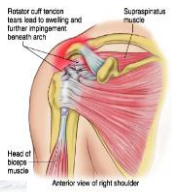
Rotator cuff injuries

- *Rotator cuff impingement*- Is most often caused by repeated overhead activity
- This can cause the rotator cuff to contact the acromion causing the cuff to be pinched
- Treatment is rest, ice and therapy



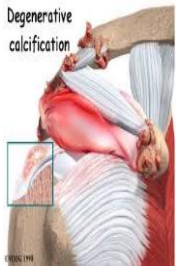
Rotator cuff tear acute

- Acute- from a fall on an outstretched arm or from lifting something too heavy with a quick jerking type motion
- Acute injuries may have another injury in conjunction



Degenerative rotator cuff tear

- Progressive degeneration or wear and tear of the tendon tissue. Repetitive overhead activity, heavy lifting over a prolonged period of time, and the development of bone spurs in the bones around the shoulder may irritate or damage the tendon.

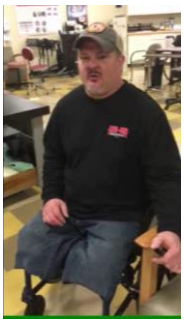


Prevention and Intervention

Prevention

- Decrease or modify high frequency tasks
- Decrease forces required to complete tasks
- Avoid extreme positions

Daily use: "It's a lifestyle…."



Therapy intervention

- Activity modification of self care techniques
- Joint protection
- Energy conservation
- Taping and/or modalities for pain management
- Individualized home program for strength and flexibility

Therapy continued:

- Desk configuration
- Propulsion assessment
- Wheelchair configuration changes
- Power add ons

Intervention specific to sport for wheelchairs:

- Carefully fit chair for balance, shrouds, wheel covers for prevention of abrasions, contusion and musculoskeletal injuries from reducing impact injuries and falls.
- How to decrease overuse and repetitive strain:
  - keep weight and rolling resistance to a minimum
  - place large wheels for propulsion as close to the center of mass as practical
  - use high pressure tires that are fully inflated
  - work on stamina-strength-flexibility of arms and shoulder
  - apply proper training and sports performance technique
  - avoid increases in body weight.

(Cooper and De Luigi, 2014)

Our Mission

The Ohio State University Adapted Sports Institute supports individuals with disabilities in developing a healthy lifestyle. We strive to unite and support organizations that provide opportunities for individuals to develop independence, confidence and fitness. We provide innovative and integrated ***evidence based treatment strategies***, excellence in patient care, ***education***, and research in rehab, ***injury prevention and*** **performance** in adapted sports.

Questions?

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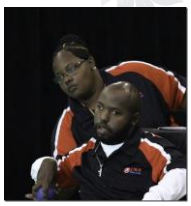
Websites

- Wheelchair Skills Program
  - http://www.wheelchairskillsprogram.ca/eng/
- Wheelchair Skills Test
  - http://www.wheelchairskillsprogram.ca/eng/testers.php
- Wheelchair Propulsion Test
  - http://www.wheelchairskillsprogram.ca/eng/propulsion_test.php

Case Study

"I want to compete!"

Maintaining champion status



Overview of Disabilities

Awareness During Recreation

Sara Schiffbauer, PT, DPT, NCS

Outpatient Rehabilitation at OSUWMC

sara.schiffbauer@osumc.edu

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Objectives

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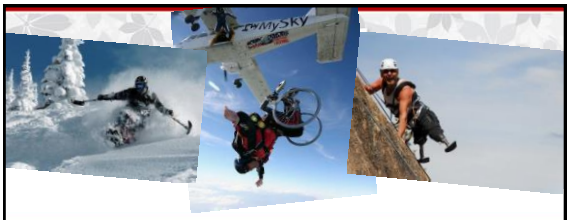

"Security is mostly a superstition. It does not exist in nature. Avoiding danger is no safer in the long run than outright exposure. Life is a daring adventure or nothing at all."

- Helen Keller

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Classification of Disabilities

Paralympic Movement

- Amputee
- Cerebral Palsy
- Visual impairment
- Spinal cord injuries
- Intellectual disability
- Les autres

http://www.paralympic.org/

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Amputee

Partial or total loss of at least one limb

Total or partial absence of the bones or joints as a consequence of trauma, illness or congenital limb deficiency

(Johnson, 2004)

Associated Considerations, Impairments and Sequelae

- Compromised skin integrity
- Temperature regulation
- Imbalance
- Gait deviations
- Type of prosthesis
- Osteoarthritis
- Presence of co-morbidities
  - Diabetes
  - Peripheral vascular disease

(Johnson et al, 2004 and Matthews et al 2014)

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Cerebral Palsy

Non-progressive brain damage

Cerebral Palsy
Traumatic Brain Injury
Stroke
Similar disabilities

Affect muscle control, motor planning, balance or coordination

Associated Considerations, Impairments and Sequelae

- Seizure disorders
- Knee injury in ambulatory individuals
- Shoulder and upper extremity injuries similar to spinal cord injured athletes
- Spasticity
- Associated visual impairments, including neglect
- Cognition, attention and focus

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Seizures

Richter et al, 1998

Knowles and Pleacher, 2012

- Hypersynchronous discharge of cerebral neurons
- Factors increasing incidence of seizures:
  - Dehydration
  - Stress
  - Hypoglycemia
  - Hyperventilation
  - Electrolyte imbalance
- The physical and psychosocial benefits outweigh the risk

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Intellectual Disability

Intellectual or adaptive behavior impairments

Autism Spectrum Disorders
Down Syndrome
Other genetic disorders

Associated Considerations, Impairments and Sequelae

- Hypermobility and greater risk of orthopedic complications
- Contractures and significantly limited mobility
- Ability to understand multi-step commands
- Safety awareness
- Difficulty with new social and personal contexts
- Impaired sensory integration
- Social skills
- Caregiver involvement

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Spinal Cord Injury

Any lesion to the spinal cord

Inflammation
Lesions resulting from trauma
Spina bifida
Stenosis
Tumors or abnormal growths

Associated Considerations, Impairments and Sequelae

- Skin integrity
- Impaired balance
- Postural dysfunction
- Spasticity
- Alterations in bowel and bladder routine
- Osteoporosis
- Presence of tracheostomy tube
- Hydrocephalus
- Autonomic dysreflexia

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Autonomic Dysreflexia

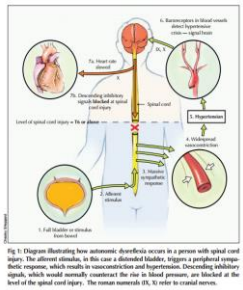

Fig 1: Diagram illustrating how autonomic dysreflexia occurs in a person with spinal cord injury. The afferent stimulus, in this case a distended bladder, triggers a peripheral sympathetic response, which results in vasoconstriction and hypertension. Descending inhibitory signals, which would normally counteract the rise in blood pressure, are blocked at the level of the spinal cord injury. The roman numerals (IX, X) refer to cranial nerves.

"An acute syndrome of excessive, uncontrolled sympathetic output that can occur in patients who have had an injury to the spinal cord... The condition can nearly always be managed successfully, but prompt recognition is essential — without treatment there may be dire consequences, including death"

(Blackmer , 2003)

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COMMON SIGNS & SYMPTOMS

ABOVE LEVEL OF INJURY
- Hypertension (*A fast increase in blood pressure, 20-40 mm Hg systolic higher than usual*)
- Bradycardia (*slow heart rate*) or Tachycardia (*fast heart rate*)
- Pounding headache
- Apprehension/anxiety/ uneasy feeling
- Changes in vision
- Nasal congestion
- Sweating
- Flushed skin
- Goosebumps
- Tingling sensation

BELOW LEVEL OF INJURY
- Nausea
- Chills without fever
- Clammy
- Cool
- Pale

WHAT TO DO

Sit up—Sit up or raise your head 90 degrees.

IMPORTANT: Stay sitting up upright until blood pressure is normal.

Take off—Take off or loosen anything tight or restrictive.

Check blood pressure—Monitor your blood pressure every 5 minutes if greater than 20 mm Hg over your baseline. Be sure to use an appropriate size cuff.

Check bladder—Empty your bladder (i.e., catheterize your bladder). If you have an indwelling catheter, check for kinks and blockages.

Check bowel—Disimpact bowel after inserting anesthetic jelly or ointment.

Check skin—Examine skin for new wounds, pressure ulcers, burns, cuts, insect bites, etc.

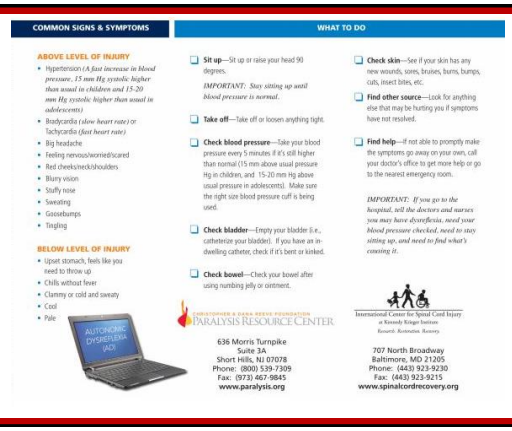
Find other source—Assess for any other possible source of harmful/painful stimuli or irritant if symptoms have not resolved.

Find help—If not able to promptly resolve symptoms on your own, call your healthcare provider for further assistance or go to your nearest emergency room.

IMPORTANT: Tell staff you may have dysreflexia, need your blood pressure checked, need to remain sitting up, and need causes of the problem sought.

CHRISTOPHER & DANA REEVE FOUNDATION PARALYSIS RESOURCE CENTER
636 Morris Turnpike
Suite 3A
Short Hills, NJ 07078
Phone: (800) 539-7309
Fax: (973) 467-9845
www.paralysis.org

International Center for Spinal Cord Injury at Kennedy Krieger Institute
Research. Restoration. Recovery.
707 North Broadway
Baltimore, MD 21205
Phone: (443) 923-9230
Fax: (443) 923-9215
www.spinalcordrecovery.org



COMMON SIGNS & SYMPTOMS

ABOVE LEVEL OF INJURY
- Hypertension (*A fast increase in blood pressure, 15 mm Hg systolic higher than usual in children and 15-20 mm Hg systolic higher than usual in adolescents*)
- Bradycardia (*slow heart rate*) or Tachycardia (*fast heart rate*)
- Big headache
- Feeling nervous/worried/scared
- Red cheeks/neck/shoulders
- Blurry vision
- Stuffy nose
- Sweating
- Goosebumps
- Tingling

BELOW LEVEL OF INJURY
- Upset stomach, feels like you need to throw up
- Chills without fever
- Clammy or cold and sweaty
- Cool
- Pale

WHAT TO DO

Sit up—Sit up or raise your head 90 degrees.

IMPORTANT: Stay sitting up until blood pressure is normal.

Take off—Take off or loosen anything tight.

Check blood pressure—Take your blood pressure every 5 minutes if it's still higher than normal (15 mm above usual pressure Hg in children, and 15-20 mm Hg above usual pressure in adolescents). Make sure the right size blood pressure cuff is being used.

Check bladder—Empty your bladder (i.e., catheterize your bladder). If you have an indwelling catheter, check if it's bent or kinked.

Check bowel—Check your bowel after using numbing jelly or ointment.

Check skin—See if your skin has any new wounds, sores, bruises, burns, bumps, cuts, insect bites, etc.

Find other source—Look for anything else that may be hurting you if symptoms have not resolved.

Find help—If not able to promptly make the symptoms go away on your own, call your doctor's office to get more help or go to the nearest emergency room.

IMPORTANT: If you go to the hospital, tell the doctors and nurses you may have dysreflexia, need your blood pressure checked, need to stay sitting up, and need to find what's causing it.

AUTONOMIC DYSREFLEXIA (AD)

CHRISTOPHER & DANA REEVE FOUNDATION PARALYSIS RESOURCE CENTER
636 Morris Turnpike
Suite 3A
Short Hills, NJ 07078
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Fax: (973) 467-9845
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Fax: (443) 923-9215
www.spinalcordrecovery.org

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Visual Impairments

Partial or complete

- Childhood blindness
- Infections
- Cataracts
- Macular degeneration
- Diabetic retinopathy
- Optic neuritis
- Cortical visual impairment

Associated Considerations, Impairments and Sequelae

- Degree of vision loss
- Use of a guide
- Changes in biomechanics
- Balance
- Ability or inability to compensate with other senses
- Energy expenditure

(Johnson et al, 2004; Ferrara and Peterson, 2000)

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Les Autres

The others

Dwarfism
Multiple Sclerosis
Muscular Dystrophy
Friedreich's Ataxia
Arthrogryposis
Osteogenesis Imperfecta
Ehlers-Danlos Syndrome
Congenital deformities of the limbs

Associated Considerations, Impairments and Sequelae

- Fatigability
- Overuse syndrome
- Posture
- Balance
- Gait deviations
- Energy expenditure

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Heat Stress

- Awareness of the nature of the sport and environment
- Events at greater risk for heat stress on the athletes are those where the athlete is:
  - Extensively exposed to environmental heat and humidity
  - Prolonged period of time
  - Duration and intensity of movement
  - Availability of fluids
- Each one degree increase (Celsius) in environment increases fluid loss by 13%
- Early signs

(Johnson et al, 2004)

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Hydration

- Drink at least 8 – 16oz of fluid 2 hours before exercise
- Drink 8 – 16oz of 6-8% carbohydrate beverage before the event
- Drink at least 4 – 8oz of fluid every 15 min of exercise
- Drink at least 8 – 16oz of fluid immediately after exercise
- Don't rely on thirst as an indicator
- Awareness of medications with a diuretic effect

(Johnson et al, 2004)

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Consumer & Programmer Readiness

Preparation for Recreation and Sport

Kevin Stahr OTR/L, AT
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Readiness: Being Prepared

4 key components for readiness

1. Assess
2. Plan
3. Evaluate
4. Implement

(Horan, 2015)

1. Assess

Programmer

- Identify potential consumers
- Identify the potential value

Consumer

- Does this sport or activity meet my goals?

Horan 2015

Potential consumers

6 groups in Paralympic movement:

- Amputee
- Cerebral palsy
- Visual impairment
- Spinal cord injuries
- Intellectual disabilities
- Les Autres "the others"

(De Luigi et al 2011)

2. Plan

Programmer

- Injury prevention
- Volunteer training

Consumer

- Emergency preparedness
- Self-care needs
  - Go Bag

Horan, 2015

Prevalence of injury among athletes with disabilities

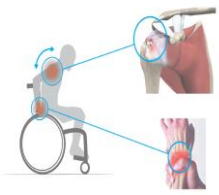
- The majority of medical conditions encountered with adapted athletes are the **same** as with able bodied athletes

(De Luigi et al, 2011)

Injury rates among athletes with disabilities

- Same for able bodied athletes
- However the consequences may be greater

(De Luigi et al, 2011)



Prevalence of injury among athletes with disabilities

- Musculoskeletal injuries
  - Fractures, dislocations, & soft tissues/visceral
- Dermatologic
  - Lacerations, pressure ulcers, rashes, abrasions, callus formation
- Environmental
  - Temperature regulation, dehydration, heat exhaustion / heat stroke, altitude illness

(De Luigi et al, 2011)

Injury prevention

- Pre activity stretching & warm-up
- Post exercise cool down & stretching
- Equipment selection
- Wearing proper clothing
- Regular fitness program

(BlazeSports, 2004)

Engage in conversations about…

- Prosthetics / orthotics
- Seizures
- Spasticity
- Pressure ulcers
- Osteoporosis
- Autonomic dysreflexia
  - Boosting
- Neurogenic bowel
- Neurogenic bladder

Blaze sports 2004

Ask before helping

Join the conversation and talk like you would with anyone else

You don't always have to kneel or go down to eye level; but it is helpful for lengthy conversations

Only push or lean on a wheelchair with permission

Speak directly to the person, not only to their companion

Develop a plan together

Programmer

- Take time to educate participates on common injuries & emergencies readiness for your activity or sport

Consumer

- Educate programmers & volunteers on the secondary complications associated with your injury or condition

Injury surveillance system

- 2015-2016 Buckeye Blitz
- OSU Adaptive Sports Institute

Key Points

1. The majority of medical conditions encountered with adapted athletes are the same as with able bodied athletes
2. The consequences may be greater for athletes with disabilities
3. Implementing an injury surveillance system can assist in understanding and preventing injuries in your program

(De Luigi et al 2011)

Emergency preparedness

- 'Go Bag'
  - A 'go bag' consists of all of your **self-care** & **safety** items that you may need in the community.
  - Having everything you need for medical appointments, family events, social & recreational activities
  - Considerations for school, work & sports

'Go Bag'

- Create a checklist
- Personalize your bag
- Consider travel
- Brainstorm with medical team
- Share ideas with peers

Don't let self-care needs dictate your daily routine, your relationships, or your life

My 'Go Bag'

- Catheter supplies
- Extra leg bag & supplies
- Small bungee cord
- Hand wipes & sanitizer
- Water bottle
- Garbage bag
- Change of clothes
- Extra underwear
- 4 pairs of medical gloves
- Lubricant/suppository
- MWC gloves
- Medical Hx list
- AD wallet card
- Business cards
  - Physicians, therapists, vendors, supply companies
- Spare tube
- Small tool kit
- Spare cushion cover
- Ted hose
- AE for meals
- Sunglasses

Cell phone apps

WheelMate

CathNow

3. Implement

arsgoco

SLED HOCKEY

Adaptive Sports Program of Ohio
ASPO
Dream. Excel. Inspire.

ADAPTIVE ROWING PROGRAM

COLUMBUS
MICHAEL B. COLEMAN, MAYOR
RECREATION AND PARKS

THE OHIO STATE UNIVERSITY
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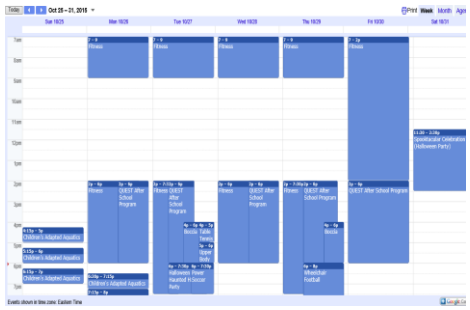
Calendar



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Lets talk about transfers

Programmers

- The consumer is in charge
- Use previous experience
- Talk it through
- Protect yourself
- 2 person technique

Consumers

- Direct your care

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Transfers

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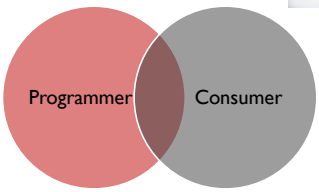
4. Evaluate



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Questions?

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ADAPTIVE ROWING PROGRAM

COLUMBUS
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RECREATION AND PARKS

arsgoco

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Adapted Cycling

Pat Tietz, PT, MS

LEARNING OBJECTIVES

- State the therapeutic & recreational benefits of cycling for persons with disabilities
- Become familiar with the selection of appropriate cycles
- Identify the cycling programs available through TAASC
- Identify the process for obtaining therapeutic tricycles for recreational use by clients

Recreational & Therapeutic Cycling For Persons with a Disability

- Provides a means of independent mobility
- Provides meaningful exercise
- Offers a sense of achievement
- Cycling is fun

"The bicycle makes the eyes smile."

Comments about cycling by elderly male cyclist in Italy. (Whitaker, 2005)

Recreational & Therapeutic Cycling: Beneficial for Persons of All Ages

- Down Syndrome
- CP
- Autism
- Multiple Sclerosis
- Spinal Cord Injury
- Traumatic Brain Injury
- Stroke
- Amputation

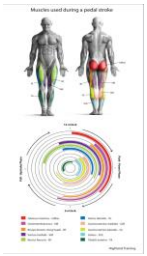
Therapeutic Advantage of Cycling

- Almost 70% of body weight is distributed to the seat, handlebars & pedals, so forces that act as a result of body weight during walking are reduced. (Cavil & Davis)
- Cycling is less dependent on balance, coordination and motor control than walking and running.
- Tricycles & bicycles are efficient in transferring human energy to motion & may promote higher speeds of movement.

Therapeutic Benefits of Cycling

- Improves range of motion
- Improves muscle strength
- Improves motor coordination
- Improves motor control
- Improves balance
- Improves functional abilities
- Improves bilateral upper extremity use in children
- Improves cardiorespiratory fitness
- Improves emotional well-being through opportunities for recreation & socialization

Therapeutic Benefits of Cycling



- Muscle Activation During Cycling
  - Have activation of all major LE muscle groups;
  - Predictable pattern of activation in healthy adults in uniarticulate muscles; greater variability in biarticulate mm.
  - Specific muscle activation is influenced by:
    - biomechanical factors
    - geographical factors
    - neurological factors

Diagram from online article: *The Primary Muscles Used for Cycling and How to Train Them,* Mike Schultz, TrainingPeaks, April 24, 2015

Therapeutic Benefits of Cycling

- Impact of Positioning of Rider on the Cycle
  - Crank arm length: Increased crank arm length increases the lever arm so user does not have to pedal as quickly to achieve the desired power output. (Found to be optimal for power at 41% of tibia length)
  - Seat height: Consider specific goals for individual to guide optimum seat height, e.g., energy conservation, ROM, strengthening, etc.
  - Position of foot on pedal: anterior position vs. posterior position; inversion or eversion
  - Recumbent vs. Upright

Johnston, Therese, *Biomechanical Considerations for Cycling Interventions in Rehabilitation, PHYS THER, 2007; 87: 1243-1252.*

Benefits of Outdoor "Green" Exercise

- Green exercise (physical activity taken outside while exposed to nature)
  - Helped participants recover from pre-existing stresses
  - Improved mood
  - Improved self-esteem
  - Increased concentration
  - Improved physiological markers: BP, HR & autonomic control
  - Adds variety which increases exercise adherence

Gladwell, et.al., Extreme Physiology & Medicine 2013: 2:3

Benefits of Sport Participation

- Study by Whilhite & Shank looked at benefits of sport participation as a mechanism for health among disabled. Results identified through interview:
  - Enhanced functional capacity
  - Health promotion
  - Relationship Development
  - Increased optimism
  - Increased inclusion

- <u>TAASC Cycling Programs</u>
  - Ambucs Amtrykes Program
  - Evaluations for Adaptive Cycles - Evaluations for Amtrykes along with evaluations for higher end adaptive recreational & racing bikes
  - Strider Learn to Ride Bike Camp

- TAASC Cycling Programs, cont.
  - Monthly Group Rides - Persons with disabilities participate in group rides with TAASC volunteers for support
  - Participation in Group Events
    - Pedal with Pete
    - Pedal, Paddle and Picnic

- TAASC-Ambucs of Columbus, Ohio
  - Trains therapists in evaluation for therapeutic trikes
  - Fits therapeutic tricycles for children and adults
  - Helps persons to obtain the adaptive tricycles by raising funds for the tricycles.

AmTryke®
The therapeutic tricycle for people with disabilities

- AMBUCS produces and distributes a line of 20 different adapted tricycles for children and adults.
- Provide 3 Different Propulsion Styles
  - **Hand/Foot Cycles**
  - **Foot Cycles**
  - **Hand Cycles**

Therapeutic Tricycle Selection

- Foot propelled therapeutic tricycles
  - ProSeries Adapted Tricycles:
    - Offers either single speed positive drive or 3-speed options
    - Provides for varying wheel size options for children or adults (XL for adults up to 6'4")
    - Has option for rear-steering and hand brake for caregiver
    - Offers a variety of seating options, trunk supports and other adaptations

Therapeutic Tricycle Selection

- Foot propelled therapeutic tricycles
  - JT2000 – for more advanced riders
    - Recumbant cycle: underseat or above seat steering
    - 21 speed Shimano hub control
    - Rear disc & front caliper hand brake


Therapeutic Tricycle Selection

- Amtryke 2700 Series
  - Offers single speed & 7 speed options
  - Offers seat and back support options


Therapeutic Tricycle Selection

- **Foot propelled tricycle considerations:**
  - **Seat height for transfers & stability, seat angle, leg/foot position, length of crank arm**
- **Many types & providers for adapted cycles:**
  http://www.disabledsportsusa.org/resources/adaptive equipment/cycling-resources



KMX

  - **Freedom Concepts Adapted Cycles**




Therapeutic Tricycle Selection

- Hand propelled therapeutic tricycle
  - HP 1000: 7-speed, rear disc & front caliper brakes

  - 1424: 24" wheels, 3 speed; front caliper brakes

Therapeutic Tricycle Selection

- Hand propelled therapeutic tricycles
  - Invacare Top End Excelerator - 7-speed

  - Quickie Shark by Sunrise Medical: 27 speed, adjustable arm-crank

Therapeutic Tricycle Selection

- Tandem Bikes
  - Steer-from-rear tandems

Nijland Nindo & Nanda


  - Steer-from-rear with front rider seat vs. Saddle

Hase Pino bike


  - Buddy Bike

Therapeutic Tricycle Selection

- Side by Side Bikes

- Wheelchair Bikes

Duet bike

Wheelchair bike by VanRaam

Accessories & Supports

- Crank Shortener
- Footplates
- Calf & Leg Supports
- Fully Supported Backrests (with lateral support)
- H-harness
- Head rest
- Comfort Saddle, tractor or bench style seats
- Knee Separator
- Knee Adductor Positioning Straps
- Counterweighted Pedal
- Pedal leveler pulley
- Pedals with Toe-Clips
- Parent Handle for Pushing/ Steering/Braking
- Wrist Wraps
- Wrist brace Holding Mit

Funding Therapeutic Tricycles

- Insurance: Letter of Medical Necessity
  - List Therapeutic Benefits (Medical & Social) & document use as therapeutic mobility aid or device
  - List Reasons child/adult can't ride regular tricycle/bicycle
  - Describe equipment components needed & adjustments for growth
- Crowdfunding: Web-based fundraising (e.g., GoFundMe, Razoo)
- VA
- Service & Religious Organizations
- DSACO
- Waivers
- FCBDD Family Resources
- TAASC

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Steve Ricker

Adapted Alpine Skiing

Adaptive Disciplines

- Mono-Ski
- Bi-Ski
- 3 Track
- 4 Track
- Blind
- Cognitive
- Snowboard

Tethering

Tethering is using long rope to help control a skier. They may be used as to help with direction control or slowing down the student.

Mono-Ski

- A mono-skier is a skier who skis in a seated positon, has good upper body strength, balance, and trunk mobility.
- The skier sits in a molded shell mounted above a single ski. Two outriggers are used for balance and turning. The design of the mono-ski allows the skier to use the ski dynamically
- A self loading mechanism provides the skier to have an independent ski experience.

Mono skis

Mono-Ski

Bi-Ski

- The bi-ski was developed for individuals who ski in a sitting position. This may include those with multiple sclerosis, muscular dystrophy, cerebral palsy, spina bifida, or individuals with a spinal cord injury
- A bi-skier sits in a molded fiberglass shell above two specially designed skis. The two skis give a wider base and better balance than a mono-ski. Two handheld outriggers or fixed outriggers may be used.

Bi-Ski

Bi-skis

Dual skis

3-Track

- 3-trackers use a full size ski and two outriggers, giving them three points of contact on the snow.
- 3-trackers are generally individuals who have amputations.

3-Track

4-Track

- 4-trackers use two skis and two outriggers giving them four points of contact.
- 4-tracking is for individuals with cerebral palsy, spina bifida, spinal cord injuries, multiple sclerosis, or those who have lower extremity amputations and choose to ski with their prosthetic on.
- Almost anyone who walks with canes or crutches can 4-track.

4 track

4 Track Slider

Blind skiers and riders

Cognitive Adaptations

Adaptive Snowboard Equipment

Adaptive snowboard equipment

Adaptive snowboard equipment

Ski Bike

Maddison Mattey

Adaptive Waterskiing

Sit Down Waterskiing

Sit Down Waterskiing

- Sit down water-skiers use a singlewide ski to which a metal-framed cage is attached. The skier sits in a canvas sling that can be adjusted up or down to change the skiers center of balance and comes in a variety of models to suit the skiers ability level

Safety

- Quick Release
  - A mechanism that disconnects the skier from the boat in the event of a crash. This is operated by a volunteer in the boat.
- Chase Boat
  - A second boat follows behind the skier, and when the skier falls, jumpers from the chase boat assist the skier back into their ski and help them to start their next pull.

Outriggers

- Stand-up water skis that have been cut short and mounted to a steel frame. The frame mounts to the cage and the ski and adds an impressive amount of stability.

Quad-Back Cage

- Metal frame mounted to the cage and used when students do not have the torso stability necessary to stay balance in the ski

Knot in Block

- For skiers without the strength to hold the rope during the start, or for beginners, the tow rope can be placed in a starting block.
- The handle can be fixed or hidden from the student for students with low strength for beginners.
- If the student has sufficient arm strength, she may pull the handle from the block after the ski is flat on the surface of the water and traveling in a straight line. The student now has a greater ability to turn and control the ski.

Stand Up Waterskiing

- Triple Bar

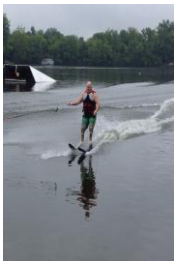
Skiing Off The Boom

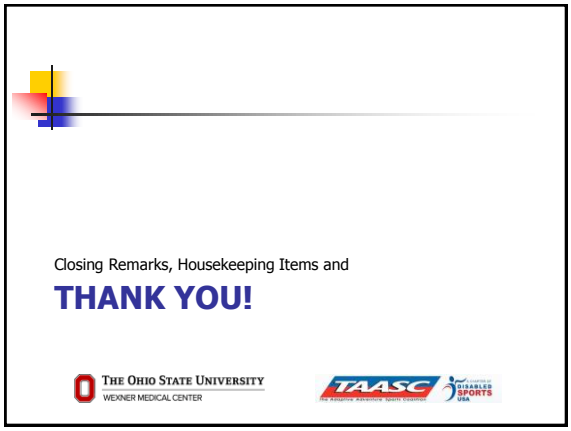
Single Arm

- Below Elbow
  - If the residual limb is strong enough to resist the pull of the boat, a ½" nylon webbing loop can be made and attached to the handle. The loop must be large enough to
- Above Elbow
  - Delgar Arm Sling

Skiing With a Prosthetic

- Below knee amputees may choose to ski with prosthetics on, but they should be attached well and able to float!




Closing Remarks, Housekeeping Items and
THANK YOU!
The Ohio State University
Wexner Medical Center
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