Current Physical Therapy Research for People with Bleeding Disorders

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Objectives

As a result of this 45 minute presentation, the participant will be able to:

- Give examples of:
  - Parametric and nonparametric types of physical therapy research related to bleeding disorders.
  - Valid and reliable functional assessment outcomes measures

- Briefly describe 8 current physical therapy research studies related to bleeding disorders
Types of Physical Therapy Outcomes Measures

- **Parametric Data:**
  - Range of motion
  - Timed events
  - Strength dynamometry
  - Motion analysis
  - Gait RITE™
  - BMI
  - Functional assessments

- **Nonparametric Data:**
  - Pain scales,
  - Oswestry Back Disability Index™
  - Quality of life survey
  - Functional assessments
Examples of Valid & Reliable Functional Assessments

- **Pediatrics:**
  - Bailey™,
  - Bruinix Osteretsky Motor Proficiency™

- **Adults:**
  - WOMACK™
  - Gait Assessment™
  - Oswestry Back Disability Index™
  - The 6 Minute Walk Time™

- **Geriatrics:**
  - Berg Balance Measures™
  - Functional Reach™
  - The Timed Up and Go™
  - ADL assessments
Examples of Team Research by HTC Staff

“The Effects of a 6-Week Supervised, Individualized Fitness Program for People with Bleeding Disorders”

- Physical Therapist:
  - GAITRite™,
  - 6 minute walk time™,
  - Strength dynamometry,
  - Range of motion,
  - Limb & joint circumference

- Clinic Nurse Coordinator*:
  - Body Mass Index
  - Factor usage
  - SF-36 ™
  - Blood pressure

- Medical Social Worker**:
  - Bleeding frequency records
  - Quality of life scales,
  - Pain scales

*Jan Tuller, RN; **Cathy Joyce, MSW
University of Tennessee, Memphis HTC
Examples of Current PT Research for People with Bleeding Disorders (PWBD)

1. Effects of a 6-week Fitness Program for PWBD
2. Motor Proficiency in PWBD Compared to Normals (BOT-2™)
3. Temporal/Spatial Gait Parameters of PWH Comp’d to Controls
4. Gait Parameters of Males with Hemophilia & Ankle Pain
5. A Comparison of Two Types of Ankle Supports in Men with Hemophilia and Unilateral Ankle Arthropathy
6. Effect of Orthotic Use Based on the International Classification of Functioning, Diseases, and Health (ICF) Model in PWH
7. Identifying Fall Risk in PWH
8. Efficacy of Strength Training for Elbow Joint ROM and Function
1. A 6-Week Supervised, Individualized Fitness Program for PWBD & Hemophilic Arthritis

Purpose:
To examine the feasibility, safety and efficacy of a professionally designed, individualized, supervised exercise program for PWBD.

Methods:
Subjects: 33 PWBD (2 mild, 5 moderate, 26 severe)
Pre & post intervention measures
Physical therapy evaluation, prescription & training of personal trainer to supervise exercises
6 weeks of fitness training

A 6-week Fitness Program for PWBD

Results:

1. 20 subjects (61%) completed the 12 sessions, 5 completed 11 sessions, 7 dropped out due to problems with transportation or illness.

2. No reported bleeds, injuries, or dissatisfaction.

Significant (p=<0.05) changes in the following:

1. 6 Minute Walk Time: improved speed, distance & cardio function.
2. Strength: Increased in all tested ms groups of upper & lower extremities.
3. Range of Motion: Increased in ankles, knees and elbows.

No significant changes in:

1. Limb & joint circumference: i.e. no swelling/no hypertrophy.
2. Parameters of gait (except velocity).

Mulvany et al. 2010
A 6-Week Fitness Program for PWBD

1. **Limitations:** Small sample size, co-existing illnesses, non-blinded examiner, scheduling and transportation problems.

2. **Future research:** A longitudinal study with larger sample size, blinded examiner and a control group.

2. **Conclusions:**
A professionally designed and supervised, individualized exercise program is feasible, safe and beneficial for PWBD, even in the presence of concomitant disease.

Mulvany et al. 2010
2. Motor Proficiency of PWBD, Ages 6-18, Compared to Norms Using the Bruininks-Oseretsky Test of Motor Proficiency 2nd Ed. (BOT-2 tm)

Introduction:

Vast improvements in medical management of BD necessitate a review of standard physical therapy goals and interventions, especially for younger PWBD.

Questions:

1. With the availability of factor and prophylactic care, are we safe in assuming that young people with bleeding disorders are functioning on the same level as their peers?

2. How should clinicians address sports, physical fitness & activity?

Purpose:

To improve consultation, education, and intervention, we must reassess the needs of young PWBD.

2. To investigate the impact of improved medical care and compare with the normal population.

3. To provide guidance health and fitness guidance to each subject based on his/her test results.
Motor Proficiency of PWBD

Subjects:

1. 49 PWBD, ages 7-18, at Camp Freedom, for children with BD in Tennessee.

2. Inclusion criteria: medical diagnosis of bleeding disorder

3. Exclusion criteria: an acute bleed or injury that would prevent participation
Motor Proficiency of PWBD

Methodology: Measurements and Data Collected:

1. The Bruininks Oseretsky Test of Motor Proficiency, BOT-2™*
   (5 out of 8 subtests)
   1. Upper extremity coordination
   2. Bilateral coordination
   3. Balance
   4. Speed and Agility
   5. Strength

2. Body Mass Index

3. Dynamometry Grip Strength

4. Range of Motion of elbows, knees, and ankles

5. Demographics and medical history, diagnosis, severity, inhibitors, and management (prophy, episodic)

Methodology:

1. Investigators: 1 PT and 5 Doctor of PT students.

2. IRB approval and signed consents from LAR’s and campers.

3. Collaboration with camp directors, nursing staff, and TN Hemophilia & Bleeding Disorders Fndn for consents assessment & exercise sessions.

4. 2 ½ days of data collection, approximately 1.5 hours per subject.

5. 2 ½ days of health and fitness education and exercise sessions.
Benefits for each camper

- Certificate of Achievement: Camp Freedom Olympic Trials
- Motor proficiency assessment
- General fitness program: The Fab 4
- Group health & wellness education.
- Letter to families outlining findings and providing general recommendations based on results. Referred back to their HTC to advise on specific suggestions.
Motor proficiency of PWBD

RESULTS BOT-2
A two-tailed independent t-test compared the mean values of the scaled scores from each of the 5 subtests between the following 3 groups: (p= <0.05)

1. Severe and Mild/Moderate PWBD
2. Severe PWBD and Normals,
3. All PWBD and Normals,

No statistical significance was seen between PW severe BD compared to PW mild/moderate BD

In 4/5 subtests there was a statistically significant difference (p=0.0001) between between All PWBD and normals and between PW Severe BD and normals.
Motor proficiency of PWBD

Results: Range of Motion

Compared to the average ROM reports for age-matched norms:

1. Hypermobility: Higher than average in some joints.
2. Hypomobility: Less than average ROM in some joints.
3. Normal ROM: approximately 30-50% had WNL ROM.
Example: 7-9 y/o subjects  N = 18

10 Hemophilia:   Severe = 6; Mod = 3; Mild = 1
7 vWD, Carrier, “Other”  Severe = 7; Mod = 2; Mild = 2
1 Ehler’s Danlos

6 joints measured in 18 subjects = Total of 108 joints

- Normal Range : 41%
- Limited Range (Hypomobile) : 7%
- Excessive Range (Hypermobile) : 53%
Motor proficiency of PWBD

Results: BMI
Consistent with overweight and obesity in normal population

Results: Grip strength
Generally below age matched norms at all age groups

Study Limitations:
Small sample size
Acute bleeds limited testing in some subtests
Fear of injury among some participants
Shoe wear may have affected performance of some subjects

Discussion:
Significantly lower level of motor proficiency except for strength.
Hyper and Hypo mobility in joints of some subjects.
Severity of BD and use of prophylaxis did not reveal statistically different results in outcomes.
Motor proficiency of PWBD

Conclusions: These results suggest that:

1. Children ages 6-18 may not be functioning at the same level of motor proficiency as their peers and may have different joint range of motion.

2. A multi-faceted fitness training program may be most beneficial for PWBD.

3. PTs should expand protocols to include balance, speed, agility, and coordination.

4. Issues of hypermobility should be investigated and protocols for stabilization and joint protection should be developed.

5. Beighton scores should be routinely collected on males and females in HTCs especially on all children and carriers.

6. Further studies are needed on motor skills of PWBD.

Acknowledgements: Our thanks to the Tennessee Hemophilia and Bleeding Disorders Foundation and the Camp Freedom 2012 directors, staff, and campers.
Jennifer Newman, MSPT
North Carolina Hemophilia Treatment Center
Southeast Regional Meeting
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Current Physical Therapy Research (Continued)
3. Temporal and Spatial Gait Parameters of People with Hemophilia as Compared to Controls

Nancy Durben PT, MSPT, PCS, David Oleson PT, PCS, Michael Recht MD, PhD, Liz Adams PhD
Oregon Health and Science University
Mountain States Hemophilia Network
Temporal and Spatial Gait Parameters of People with Hemophilia as Compared to Controls

- **Purpose:**
  
  To identify gait deficits across the life course of PWH as compared to age matched controls.

- **Subjects:**
  
  People with hemophilia A or B were recruited.
  
  The control group was subjects without hemophilia.
  
  Due to small sample sizes, mild and moderate hemophilia were combined and only ages 7-12 yo, 13-21 yo, and 22-29 yo were used in comparison to control subjects.
Temporal and Spatial Gait Parameters of People with Hemophilia as Compared to Controls

Conclusions:

1. PWH demonstrate gait differences from control subjects in the age group 13-21 years old.

2. Further deficits occur over the age of 22 years.

3. These deficits include velocity, cadence, foot angle, step, stance, single and double support time.

4. Due to small sample sizes, more subjects need to be recruited for comparison to control across the life course.

5. The role of orthotics in improving gait efficiency and pain as well as the impact of ankle fusions, joint replacements and orthopedic procedures on temporal and spatial gait parameters are areas for future research.
4. Gait Parameters in Men and Boys with Hemophilia and Ankle Pain: A Pilot Study (study closed, 2011)

Jennifer Newman, MSPT; David Oleson, PT, PCS; Nancy Durben, PT, PCS; Laura Fox, PT, DPT; Elizabeth Adams, RD, PhD; Michael Recht, MD, PhD

The Hemophilia Center at Oregon Health & Science University, Portland, OR, USA
Introduction:

In men and boys with hemophilia, ankles commonly become target joints resulting in lasting, painful changes due to recurrent bleeding episodes.

Purpose:

To determine differences in gait parameters of men and boys with hemophilia and ankle pain compared to those unaffected by either condition as measured by the GaitRite® gait mat.

Subjects:

PW either hemophilia A or B and ankle pain were recruited.

The control group was comprised of individuals without hemophilia, ankle pain, or other conditions that affected gait with and without shoes.
Gait Parameters in Men and Boys with Hemophilia and Ankle Pain: A Pilot Study

RESULTS without shoes

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Controls</th>
<th>Men with Hemophilia</th>
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<tbody>
<tr>
<td>Velocity (cm/sec)</td>
<td></td>
<td></td>
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<tr>
<td>Stride Length (cm)</td>
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</tr>
<tr>
<td>Step Length (cm)</td>
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<tr>
<td>Heel to Heel BOS (cm)</td>
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<tr>
<td>Toe in/Toe Out (cm)</td>
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- Velocity: $p < 0.032$
- Stride Length: $p < 0.001$
- Step Length: $p < 0.001$
- Heel to Heel BOS: $p < 0.01$
- Toe in/Toe Out: $p = 0.14$
Gait Parameters in Men and Boys with Hemophilia and Ankle Pain: A Pilot Study

Results with shoes

- Velocity (cm/sec)
  - Controls: 140 cm/sec
  - Men with Hemophilia: 110 cm/sec
  - p < 0.01

- Stride Length (cm)
  - Controls: 120 cm
  - Men with Hemophilia: 150 cm
  - p < 0.001

- Step Length (cm)
  - Controls: 100 cm
  - Men with Hemophilia: 80 cm
  - p < 0.002

- Heel to Heel BOS (cm)
  - Controls: 13 cm
  - Men with Hemophilia: 10 cm
  - p = 0.08

- Toe in/Toe Out (cm)
  - Men with Hemophilia: 8 cm
  - p = 0.058
Conclusions:

- The gait of individuals with hemophilia and ankle pain was both slower and less efficient than the gait of those in the comparison group.

- Further study of orthotic devices or other interventions that improve velocity and stride length is indicated.
5. A Comparison of Two Types of Ankle Supports in Men with Hemophilia and Unilateral Ankle Arthropathy

David Oleson, PT, PCS, Laura Fox, PT DPT, PCS, Elizabeth Adams RD, PhD, Thuan Nguyen MD, PhD, Michael Recht MD, PhD

Oregon Hemophilia Treatment Center
A Comparison of Two Types of Ankle Supports in Men with Hemophilia and Unilateral Ankle Arthropathy
A Comparison of Two Types of Ankle Supports in Men with Hemophilia and Unilateral Ankle Arthropathy

Ankle Pain Relief
- Standard 0 to 10 analog pain scale

Gait Parameters
- Velocity
- Cadence
- Step Time
- Cycle Time
- HHBS
- Stance Time
- Swing Time
- Single Support Times
A Comparison of Two Types of Ankle Supports in Men with Hemophilia and Unilateral Ankle Arthropathy

Pain

Gait parameters unchanged from baseline with cf-AFO, pain equally relieved.
6. Effect of Orthotic Use Based on the International Classification of Functioning, Disease, and Health (ICF) Model in People with Hemophilia

Felicity Case PT, DPT; David Oleson PT, PCS; Michael Recht MD, PhD
Effect of Orthotic Use Based on ICF in PWH

Purpose:

to determine whether the use of an orthotic of any type:

1. decreases pain,
2. increases activity,
3. increases participation, and
4. improves satisfaction with activity level in PWH.

Method:

Participants completed a survey sent to them via e-mail or postal mail and were recruited from the Hemophilia Center at Oregon Health & Science University.
Effect of Orthotic Use Based on ICF in PWH

Results:

Significant decreased mean scores on:

1. total modified FFI using orthotics compared to without. (59.4 and 82.97 respectively; p>0.01).
2. the activity level of the ICF (33 with orthotics, 49.75 without; p<0.01),
3. the participation level of the ICF (11.4 with orthotics, 17.47 without; p<0.01), and
4. the separate satisfaction questions (7.2 with orthotics, 4.53 without; p=0.01).

Conclusion:

Activity level, participation, and individual satisfaction are significantly improved with the use of orthotics by people with hemophilia. They do, however, report similar levels of pain with and without orthotic use.
7. Identifying Fall Risk in Patients with Hemophilia

Lorraine M. Flaherty, PT
Puget Sound Blood Center
Hemophilia Care Program
Identifying Fall Risk in PWH

Purpose:

To identify who is at risk for falls in people with bleeding disorders and the incidence of falls.

Plan:

Goal of 150 subjects

Goal is 75 at Puget Sound Blood Center

Phoenix Children’s – signed on for 25!

Still hoping to get some other HTCs on board

Subjects:

- Recruitment began in January 2012
- 65 subjects to date completed phase 1
Identifying Fall Risk in PWH

Results:

- Fallers = 33.8%
  - Fall rate among community dwelling adults aged 65 and older in the US

- Average age of fallers = 46.2 yrs
  - Age range = 21 – 85 yrs

- Average age of non fallers = 39.3 yrs
  - Age range = 18 – 67 yrs

- Near Fallers = 67.7%

- Activity Restrictors = 13.8%

- % of falls resulting in injury or requiring treatment
  = 45.5%

- 15.4% of subjects suffered a fall related injury in past 12 mo.

- Rate of Nonfatal, Medically Consulted Fall Injury Episodes by Age Group - via CDC
  - 11.5% for 75 +
  - 5% for 65-74
  - 4% for 45-64
  - 2.5% for 18-44
Identifying Fall Risk in PWH

Interested in Participating?

Contact:
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• Don’t forget to ask: “When was the last time you fell?”
8. Efficacy of strength training for improving elbow joint range of motion and function in adults with Hemophilia

Hilary Smith PT, DPT, David Oleson PT, PCS, Nancy Durben PT, PCS, Michael Recht MD, PhD
Efficacy of strength training for improving elbow joint range of motion and function in adults with Hemophilia

Purpose:

- to investigate the effect of strength training on elbow range of motion and function for people with arthropathy secondary to hemophilia and recurrent bleeding.

Methods:

Outcome measures:

- Elbow range of motion (ROM)
- ADL related tasks
- Pain
- Upper arm girth.

Measurement intervals:

- Baseline
- Week 3-5
- Week 8
Efficacy of strength training for improving elbow joint range of motion and function in adults with Hemophilia

Intervention:

Exercise program consisting of pull-ups or modified pull-ups 3 times per week at home for 8 weeks.

Preliminary results:

6 subjects have been recruited.

• 5 of the subjects had elbow flexion and extension ROM that was > 2 SD below the mean.

• 4 subject’s supination ROM was > 2 SD below the mean.

• 2 subject’s pronation ROM was > 2 SD below the mean.

• All the subjects except one had difficulty obtaining desired position in at least one ADL related task.
Efficacy of strength training for improving elbow joint range of motion and function in adults with Hemophilia

Preliminary Results: (continued)

• 3 subjects have completed the 4 week follow-up visit
• 2 of the subjects demonstrate >10 degree increase in elbow flexion ROM
• 2 of the subjects demonstrate >10 degree decrease in elbow pronation ROM
• Results for elbow supination and extension is variable between all 3 subjects.
These studies are just the tip of the iceberg!

Thank you!