In order to support the growth of the ECHO movement, Project ECHO® collects participation data for each teleECHO™ program. This data allows Project ECHO to measure, analyze, and report on the movement’s reach. It is used in reports, on maps and visualizations, for research, for communications and surveys, for data quality assurance activities, and for decision-making related to new initiatives.
The Impact of Malnutrition on the Musculoskeletal System & the Role of Physical Therapy

Nicole Sobotka, PT, DPT, CEDS, PCES
Physical Therapist
St. Mark’s Outpatient Therapy Clinic
Disclosure

The content of this presentation does not relate to any product of a commercial entity; therefore, I have no relationships to report.

Off-label indications will not be discussed.
At the conclusion of this activity, participants should be able to successfully:

1. Describe at least two changes to the musculoskeletal system that occur as a result of malnutrition.
2. Understand the role that Physical Therapy can play in the treatment of Eating Disorders.
3. Recall a resource to assess for signs of energy deficits related to malnutrition and/or over-exercise.
Polling Questions

1. Constipation and bowel continence always resolves on its own after weight restoration for patients with eating disorders. (False)
2. Yoga is always a safe activity for people with eating disorders to participate in. (False)
3. Sensory processing differences often persist in people with eating disorders after weight restoration. (True)
4. Select the physical manifestations of energy deficit related to malnutrition/over-exercise:
   a. Decreased glycogen reserves
   b. Increased risk of injury
   c. Decreased bone mineral density
   d. All of the above
5. How many urinary voids/day is healthy for the average adult?
   a. 5 or less
   b. 12 - 15
   c. > 15
   d. 5 – 8
BONE DENSITY
Contributing Factors$^{1-5, 45}$

- Lower levels of estrogen and testosterone
- Resistance to growth hormones
- Decreased leptin
- Higher levels of cortisol
- Gelatinous marrow transformation
- Decreased bone turnover
- Negatively impacted by amenorrhea
- Changes to muscular pathophysiology
- Lifestyle factors
Manifestations$^{3-5, 7-9}$

- 90% of adolescents and young women with AN-R and AN-BP have decreased BMD
  - 40% develop osteoporosis
- AN increases fracture occurrence by seven times
- AN causes three times higher long-term fracture risk
- BN also impacts BMD
  - lower weighted individuals
  - history of AN
Physical Therapy Intervention\textsuperscript{1-5, 10-11}

- Appropriate Exercise Prescription
- Body Mechanics
- Fall Prevention
Muscular Changes
Pathophysiology\textsuperscript{12-15}

- Selective Type II muscle fiber atrophy
- Abnormal accumulation of glycogen in muscle cells
- Decreased lactate response to exercise
- Decreased serum carnosinase activity
- Z Band degeneration

- Excessive training and over-exercise may cause glucose dysregulation
Results 12-14

- Decreased force production
- Decreased endurance
- Increased muscular fatigability
- Altered patterns of contraction and relaxation
- Proximal weakness
Manifestations\textsuperscript{1-2, 11-19}

- Decreased bone density
- Increased fall risk
- Difficulty with basic mobility like stairs and getting off the ground
- Decreased grip strength
Manifestations$^1, 2, 12-14, 16, 20$

- **Postural impairments**
  - Decreased diaphragmatic activation and thus parasympathetic nervous system activation
- **Pain**
- **Decreased gut motility**
- **Pelvic floor muscle dysfunction**
Physical Therapy Intervention\textsuperscript{16, 20-25}

- Gentle movement
- Core strengthening
- Postural interventions
- Balance interventions
- Education regarding body mechanics and strategies to improve ease and safety with transfers, bed mobility, gait training, and stairs
Neurological Impacts

- Peripheral motor neuron injuries
  - Electrolyte, protein, and vitamin derangement
  - Mechanical injury due to decreased fat padding
- Paresthesias
  - B12 and folic acid deficiency
Pelvic Floor and Digestion
Pelvic Floor Anatomy and Function

- Urogenital triangle
- Anal triangle
- Pudendal Nerve (S2 – S4)
- Supportive
- Sexual
- Sphincteric
- Stabilizer
- Pressure manager
Abdominal Cannister$^{26, 32}$
Pelvic Floor Impairments

- Urinary and Fecal Incontinence
- Urinary Urgency & Frequency
- Bloating
- Constipation
- Prolapse
Physical Therapy Intervention\textsuperscript{26, 31-33}

- Education!
- Positioning
- Pelvic Floor and Transverse Abdominis strengthening
- Soft Tissue Mobilization and Trigger Point Release
- Pressure Management education and training
Physical Therapy Intervention\textsuperscript{26, 30-32, 34-37}

- **Bladder and Bowel retraining**
- **Urge Suppression Techniques**
- **Biofeedback**
- **Abdominal massage to facilitate motility and decrease bloating**
  - **Kinesiotape**
Disembodiment & Body Dysmorphia
Impairments 25, 33, 38-39

- Sensory Processing deficits
- Tactile Body Disturbance
- Decreased Interoception
Physical Therapy Intervention 20 - 25

- **Parasympathetic Nervous System activation**
  - Diaphragmatic breathing training
  - Vagus Nerve mobilization and activation
  - Stretching
  - Yoga
  - Manual physiological quieting techniques
  - Massage
Physical Therapy Intervention 20-25, 39

- Facilitated embodiment followed by debriefing
- Education on healthy movement
• Education on RED-S CAT

## Physical Therapy Intervention

### Level A
**Cardiovascular profile:**
- Resting HR <40 bpm or >120 bpm
- Postural hypotension >20 mmHg systolic (independent of symptoms)
- Systolic BP <90 mmHg
- Prolonged QTc interval >450 ms
- Arthritic pain
- Valvular cardiac disorder

**Biochemical profile:**
- Hypokalaemia <3.5 mmol/L
- Hypophosphataemia <0.7 mmol/L
- Hypomagnesaemia <0.7 mmol/L
- Hypocaemia <14 mmol/L
- Hypoalbuminaemia <30 g/L
- Hyperuricaemia >400 mmol/L

**Psychological profile:**
- Cognitive impairment

**Level B**
**Review fortnightly**
- Individual has cleared all prior risk markers and is also adhering to:
  - Weight management

**Level C**
**Review monthly**
- Individual has cleared all prior risk markers and is also adhering to:
  - Weight management

**Level D**
**Review as required**
- Individual has cleared all prior risk markers and is also adhering to:
  - Weight management

### SEES Recommendations:

<table>
<thead>
<tr>
<th>Level</th>
<th>Max Talk Test level</th>
<th>METS level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level A</td>
<td>2</td>
<td>3-5</td>
</tr>
<tr>
<td>Level B</td>
<td>5</td>
<td>6-9</td>
</tr>
<tr>
<td>Level C</td>
<td>60 mins max</td>
<td>30 mins max</td>
</tr>
</tbody>
</table>

**Individually prescribed**

**Static (without orthostatic compromise):**
- Indoor/Outdoor
- Low impact, social/games focus (excluding return to sport) e.g. gentle yoga and Pilates, table tennis, walking, swimming

**Moderate impact (excluding return to sport) e.g. cardio classes, jogging:**
- All resistance exercise e.g. weight lifting, weights classes

**High impact, return to sport e.g. rugby, football, martial arts, basketball, hockey:**
- All resistance exercise, may return to previously dysfunctional cardio exercise

**Medical supervision required**
- Identify unhealthy exercise beliefs
- Nutritional rehabilitation and counselling
- Ambulation assessment & injury prevention in daily living tasks (e.g. correct bending techniques)
- Breathing & body awareness tasks introduction
- Prone awareness
- Assessment of exercise habits prior to treatment & long-term exercise goals

**Medical CR friend/family:**
- Continue relevant/outstanding interventions and: Further challenge unhealthy exercise beliefs
- Continue exploring & practicing intuitive movement

**Flexible (social partner encouraged):**
- Continue relevant/outstanding interventions and: Increase exercise intensity in conjunction with body awareness
- Set future exercise goals

**Flexible, progressing to unsupervised:**
- Continue relevant/outstanding interventions and:
- Address remaining unhealthy aspects of exercise relationship, reconceiving & increasing autonomy
- Develop future exercise plan in accordance with treatment plan & activity goals including focus on exercise prevention

**Sees: A once above is met progress to SEES A Stage 1 non-contact/low impact sport or level D for contact/high impact sport**
Physical Therapy Intervention\textsuperscript{24, 40-42}

- Assessment of relationship with exercise through the Compulsive Exercise Test and the Exercise Dependence Scale
Physical Therapy Intervention^{20-22,24-25, 44}

• **Treatment of Pain**
  • Therapeutic Exercise and strengthening
  • Neuromuscular re-education for body mechanics, posture, positioning
  • Massage
  • Myofascial release
  • Functional Dry Needling
  • Joint mobilizations
  • Muscle Energy Techniques
  • Modalities
  • Wound care
Finding a Physical Therapist Near You

https://www.apta.org/advocacy/issues/direct-access-advocacy/direct-access-by-state

Bibliography/References

26. Lecture presented: Herman & Wallace Level 1 at Nebraska Medicine; May 1st, 2021; Omaha, NE.
Questions and Comments?