EXERCISES FOR AMPUTEES

Joanna Wojcik & Niki Marjerrison
Amputation

• A condition of disability resulting from the loss of one or more limbs
• 1.7 million people living with limb loss in the US (1 out of every 200 people)
• Can be congenital (present at birth), dysvascular (complications of the vascular system), or due to cancer or trauma.
• Rates of cancer and trauma-related amputations are decreasing, however dysvascular amputations are on the rise. Little/no change in congenital limb difference.

• 27.6% of lower limb dysvascular amputations were below the knee
Amputation Side Effects

- Depression rates between 20 and 30% in the years after amputation (world average: 5.8% in men, 9.5% in women)
  - Prevalent risk factors: negative body image, pain, prosthetic avoidance, lack of social support.
- Cardiovascular demands for a lower limb amputee are exponentially increased
  - Obesity would put additional stress on their cardiovascular system
Client Needs

• Help amputees adapt to their new condition
• Achieve optimal weight bearing on their prosthetic limb
• Improve balance and reaction to disturbances
• Restore the optimal gait pattern
• Reduce the energy needed to walk
• Teach them how to perform daily operations (sitting down, walking up and down stairs)
• Help them regain self confidence
Exercise Practices

• Build up gradually to reduce the risk of skin abrasions and consequent delays in the fitting process
• Progressive, step-by-step approach will minimize gait defects and help with functional restoration
Contradictions

- Muscle imbalances
  - Could lead to injury or unbalanced posture
- Position of amputated limb
  - Avoid positions that cause tightness/loss of ROM
  - Often get immobilized resulting in muscle atrophies
- Muscle balance similar between both limbs
- Lower energy levels
- Increased cardiac demand
Exercise Focus

• Core stabilization
• Balance
• Cardiovascular fitness
• Muscular strengthening
• Muscular balance
• Stretching
• Functionality
• Prevent compensation
• Psychological wellness
1. Weight Bearing and Balance

- Weight bearing (two-hand support; one-hand support; fingertip support; without support)
- Partial weight shift
- Pelvic rotation
- Sideward walking
- Full weight shift, front to back
2. Specific Gait Training

- Sound-leg step forward (and through)
- Sound-leg step backward (and through)
- Prosthetic-leg step forward (and through)
- Prosthetic-leg step backward (and through)
- Walking between the parallel bars
3. Functional Exercises

- Rising from a chair
  - Place the sound leg under the chair, flex the trunk

- Climbing a staircase
  - Start with the sound leg, follow with the prosthesis

- Descending a staircase: sound leg step through
  - Place the heel of the prosthesis on the edge of the first step down; step through with the sound leg

- Weight carrying
  - Carrying a weight on the prosthetic side
4. Advanced Exercises

- Balancing on the prosthesis
  - Flex the sound leg, trying to keep balance
- Walking on an uneven surface
- Going up and down a slope
- Jumping
  - Below-knee amputees only
  - Spread-leg to closed-leg position
- Running
Exercise Program

• Warm up, stretching
  • Variable

• Cardiovascular fitness
  • Walking, running, cycling, Tabata
  • Swimming is experience dependent

• Muscular strength
  • Most upper body exercises can be performed seated with little/no modifications

• Cool down, stretching
  • Variable
Straight Leg Raise

• Lie flat on back with arms extended beside the body and the residual limb on a foam roll. Raise sound-leg $45^\circ$ and hold for 3, and lower.
  
• Hip flexors, quadriceps, core muscles
  
• Helps amputees with going up stairs and stepping over objects
  
• Proper technique: keep knee extended through entire motion, keep foot in neutral position
  
• Role of the trainer: stand at the patient’s feet and guide their foot to $45^\circ$; ensure proper technique
Single Leg Bridge

• Lie flat on back with arms crossed, foam roll under residual limb, and sound-leg raised to a $90^\circ$ at the hip, and knee bent. Push the residual limb into the roll to raise hips by squeezing glutes. Hold for 3, and return.

• Gluteal muscles

• Improves posture, ability to get out of a chair, ascend stairs and slopes

• Helps the patient stabilize the prosthesis while walking

• Proper technique: keep hips level, do not compensate with back extensors, do not use sound leg to assist

• Role of the trainer: stand at the patient’s feet and support the foam roller; ensure proper technique
Prone Knee Flexion

- Lie on stomach with legs fully extended behind. Bend sound knee through full ROM, and return to starting position.
- Hamstring muscles
- Helps with overall walking
- Proper technique: hips on mat, back in neutral position, knee pointed into mat without rotating lower leg
- Role of the trainer: stand at the patient’s feet; ensure proper technique
Bosu Core Exercise

• Sit on Bosu ball, hold arms horizontal and twist from side to side
• Core (low back and abdominal)
• Helps amputee begin to use residual limb, improves balance and body awareness
• Proper technique: neutral posture, holding arms horizontal, twisting from core
• Role of the trainer: kneel beside patient, guide arms, assist with balance if needed
Additional Roles of the Trainer

- Daily hands-on, individual sessions are recommended in addition to group sessions
- Monitor intensity throughout sessions
  - Talk test, RPE
- Work closely with technical prosthetic personnel to assess the patient’s progress and analyze the causes of gait defects
Amputee Success Stories!

- [https://www.youtube.com/watch?v=51MIO9u-V2I](https://www.youtube.com/watch?v=51MIO9u-V2I)