Update: Use of Body-Weight Support Treadmill Training in Adults with Poststroke Hemiparesis

Clinical Indications:
- Each year, stroke affects nearly 800,000 individuals
- Neurological and functional deficits
- Loss or difficulty of ambulation
  - Approximately 2/3 of acute hospitalized CVA patients cannot independently ambulate at admission
  - Restoration of gait often the primary goal of rehabilitation

Why BWSTT?
- Is Body-Weight Support Treadmill training superior to traditional gait training or other PT interventions?
  - Not sure:
    - "Treadmill training with body weight support and traditional gait training were equally effective.
    - "In patients that are able to ambulate with mild-moderate impairment, greater improvements are seen with therapist assisted BWSTT compared with robotic assisted locomotor training"
    - "Does not increase chance of walking independently but does increase walking velocity and endurance significantly."
Why BWSTT?

- Clinical implications:
  - Reduced number of clinicians needed to complete
  - High intensity, repetitive stepping training
  - Can easily increase difficulty and intensity with incline, speed, or reducing UE support
  - Eliminate falls risk during treatment
  - Improve quality of treatment sessions
  - On average, only 17 min. of each PT treatment session spent in standing or walking and only 2 min. spent at “high intensity”
  - Need for continued research with improved protocols

Gait Training Strategies

- Task specificity:
  - Stepping practice improves stepping performance

- Repetition:
  - Average number of practice trials to reach learning:
    - 1500 steps over 10 days (Steinbrock et al., 1997)
    - 1500 steps over 5 days (Kaplan et al., 1997)
    - 2400 steps over 4 days (Nudo et al., 1997)

- Intensity:
  - Age-predicted HRmax (APHRM):
    - 208 - (0.7 x age) Tanaka 2001
  - Karvonen formula
    - Heart rate reserve = X% (APHRM - Resting Heart Rate) + Resting Heart Rate
    - Decrease by 15 bpm if patient is on β-blockers

- Variability:
  - Need to have the right task for the right person

Parameters with BWSTT

- Body weight support
  - Necessary as SLs move improved most consistently at 15-30%

- Treadmill Speed:
  - Higher treadmill speeds (70-130% of subject’s comfortable walking speed) resulted in increased cadence, increased stride length, increased muscle activity, and improved metabolic efficiency

- Handrail hold:
  - Significantly lowered comfortable and maximum walking speeds and decreased steps/session when handrails were removed

- Frequency:
  - Evidence supports completing BWSTT as little as 3 or as many as 6 days/week

- Duration:
  - In order to achieve an aerobic exercise response that confers clinically meaningful health benefits, need to have a minimum of 20 min. of low intensity warm-up and cool down
Training to allow errors

1. Maximize repetitions of stepping practice
2. Targeting high aerobic intensities
3. Task demands
   - Perturbations applied to assist or challenge: Limb swing, Weight-bearing during stance, Propulsion, Sagittal/Frontal plane stability
Final thoughts

- BWSTT shouldn’t be used in isolation
- Over-ground gait training

BWSTT has also been shown to be useful in combination with other interventions:

- Superior results in swing symmetry, stride length, gait speed, and cadence when training subjects with FES to personal stance vs. BWSTT alone (Lindquist et al. 2007)
- Statistically higher improvements in gait speed, cadence, step length time, step length, and stride length on the hemiparetic limb in CVA patients when completing virtual dual-task T-mill training vs. BWSTT alone (Kim et al. 2015)

References


Winstein, Carolee J. et al. “Guidelines for Adult Stroke Rehabilitation and Recovery.” *Stroke* 47.6...