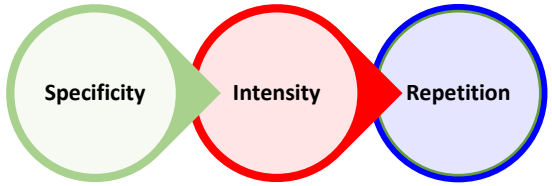
ACADEMY OF NEUROLOGIC PHYSICAL THERAPY

To improve walking function in ambulatory patients with stroke, incomplete spinal cord injury, and brain injury…

Should therapists focus on normalizing kinematics?

What does the data say?

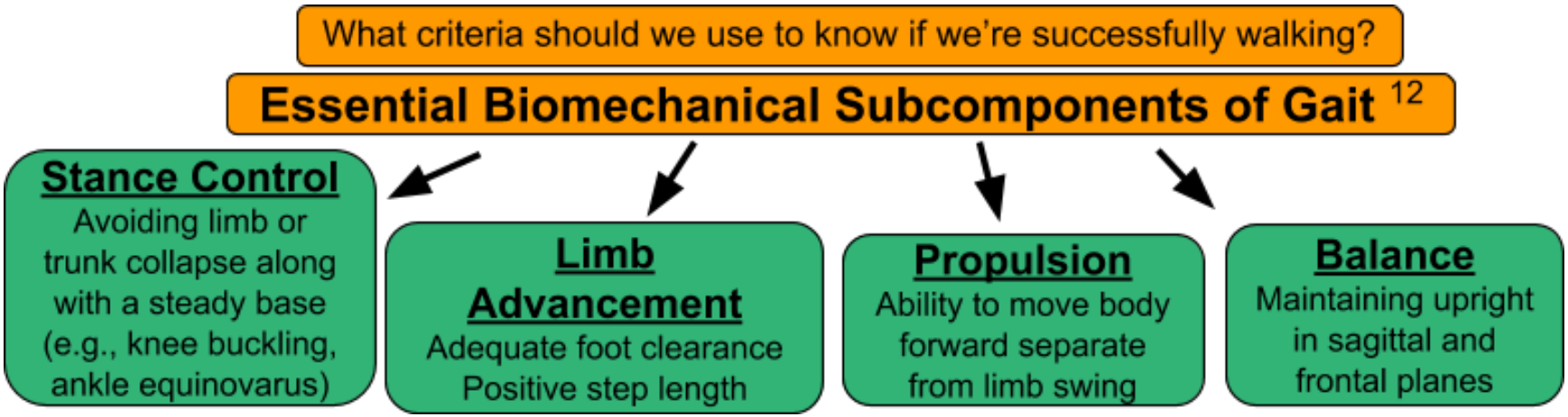
The locomotor CPG[1] recommends focusing on three active ingredients for our interventions. Recommended interventions are specific to gait, challenge aerobic intensity, in high repetitions. How does this recommendation compare to other approaches?



Paradigm	Theory	Method	Evidence	Active Ingredients?
Impairment-based treatment	Address underlying impairments leading to gait abnormalities	Standing balance and weight shifting exercises, lower extremity strength & transfer training.	• Poor and inconsistent carryover of impairment-based treatment into walking function.[1-4] • Less effective than High Intensity Gait Training (HIGT) for walking speed, distance, and quality.[3-6] • No more effective than HIGT for transfers & balance.[3-5]	Specificity..... ⊘ Intensity..... ? Repetition..... ⊘
Bobath / Neuro Developmental Treatment (NDT)	Sensory input is fundamental to motor control and normal movement patterns define success [7]	Movement analysis followed by part & whole task training that minimizes compensatory movements. Sensory input provided to facilitate desired movement quality.[7]	• Less effective than other interventions for improving gait speed, gait quality, and length of stay.[2] • Even with experienced and highly NDT-trained clinicians, gait quality or speed may not improve.[8]	Specificity..... ? Intensity..... ⊘ Repetition..... ⊘
Body Weight Supported Treadmill Training (BWSTT) *and* **Robotic Assisted Stepping (RAS)**	Use of sensory input to stimulate central pattern generators and activity-induced neuroplasticity [9]	Partial weight support provided while focusing on optimal kinematics, weight bearing, and sensory input with 2-3 therapists (BWSTT) or a robot (RAS).	• Neither BWSTT nor RAS is superior to traditional low intensity overground gait training or treadmill training with a single therapist.[1,9] • Both require additional personnel and equipment resources. • Excessive therapist or robotic assist limits intensity.[8] • Practicing normal movement patterns does not result in more normalized spatiotemporal patterns.[10]	Specificity..... ✓ Intensity..... ⊘ Repetition..... ✓
High Intensity Gait Training (HIGT)	High aerobic intensity and repetitive stepping in variable contexts may drive neuroplasticity and adaptations in cardiopulmonary fitness during gait training	Stepping practice at high aerobic intensities (70-85% HRmax), without specific focus on training normal movement, on a treadmill, overground, and stairs.[12] Successful defined by achieving essential Biomechanical Subcomponents (see reverse).	• Consistent improvements in walking speed & distance compared to conventional PT.[1,3-5] • Better outcomes than lower intensity walking practice.[11] • Better outcomes than high intensity impairment-based tx.[3] • Increases muscle activity but does not worsen spastic muscle behaviors.[13] • Improved walking function via recovery of more normalized kinematics, improved motor neuro pool selection, more consistent intralimb coordination, and increased non-paretic limb force generation and excursion.[6,14-15]	Specificity..... ✓ Intensity..... ✓ Repetition..... ✓

Evidence Summary

- Focusing on normalizing kinematics is **not** a critical training parameter and reduces the amount and intensity of task-specific walking practice.
- High Intensity Gait Training, despite not focusing on normal kinematics, improves gait quality better than conventional approaches while also achieving superior improvements in walking speed & distance.
- **Intensity Matters!**



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