# Galileo enhances neuromuscular recovery and improves exoskeleton walking.

Galileo® Training

## Bridging Bionics Foundation
## Able Bionics USA

**Training Product:** 2 Galileo TiltTables, Galileo Dumbbell

**Training Since:** October 2015

## The Facility

Bridging Bionics Foundation (BBF) is a nonprofit organization with a mission of providing funding, education, and advancing the research and development for exoskeletons and bionic technology to augment human mobility and capability. BBF envisions a time when exoskeletons and bionic technology are standard mobility options globally as we strive to improve the quality of people's lives.

Able Bionics USA is a charitable, community-focused program funded by Bridging Bionics Foundation. The program was created to help locals from Aspen, Snowmass, and Glenwood Springs, Colorado, who have mobility impairments regain mobility and walk again. Its goal is to provide access to cutting-edge technology such as the Galileo neuromuscular training systems and a bionic exoskeleton suit (EksoTM, manufactured by Ekso Bionics). These technologies are often cost prohibitive for individuals with mobility impairments. The program enables such individuals to exercise in an inclusive health club environment that promotes well-being with a primary goal of enhancing neuro-recovery and quality of life.

The nonprofit began training using the Galileo TiltTable in October 2015 as an adjunct treatment for clients preparing to use an exoskeleton for walking. That was just the start of the benefits Galileo Training would provide.

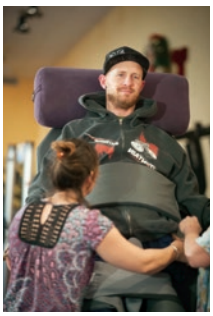
## The User Advantages

Debbie Weidemann is one of three physical therapists who use the Galileo TiltTable with clients who have varying neurological impairments, including spinal cord injuries and cerebral palsy, and are preparing to walk using a bionic exoskeleton. At first, the Galileo TiltTable was perceived as an adjunct treatment prior to exoskeleton use. That quickly changed. "Galileo Training makes all treatments and exercises more effective," Debbie explains.

In a client with cerebral palsy, Debbie notes decreased tone and increased flexibility. With training that featured 4 to 7, 3-minute sessions, this client went from not meeting EKSO use criteria to meeting the criteria and being able to walk using the high-tech tool. With continued Galileo Training, the client also stands taller when walking.

For individuals with varying neurological impairments including spinal cord injuries, Debbie turns to Galileo Training for spasticity reduction in minutes, to increase bone density, improve tolerance to an upright position, improve flexibility and circulation, and to increase body awareness.

Clients tell Debbie that in addition to gaining the strength and ability to tolerate standing in order to use the EKSO, they also note increased muscle bulk, increased leg strength, less numbness and even a decreased need for pain and sleeping medications.



"We have only hit the tip of the iceberg of what this device can do. We continue to try new things and we're finding the Galileo makes whatever exercises patients do more effective," Debbie explains.

At Bridging Bionics' Able Bionics USA program, the Galileo Dumbbell is being used to increase arm strength, decrease tone and increase grip in those with spinal cord injuries. Their higher-level cervical spinal cord injured clients use the Active Hands Gloves to help grip the dumbbell. Training for 1.5 minutes at 30 HZ with assisted movement in all neural planes has helped one client go from using a power wheelchair to using a manual chair.

(Continued on back)

*"Having the Galileo TiltTable for a patient with high-level needs gives me an extra set of hands and lets me get to the therapeutic piece of training almost immediately."*

**Debbie Weidemann**
PT, Able Bionics USA, Aspen Colorado

STIM designs

32683 Coast Ridge Drive
Carmel, CA 93923
831-222-0513

www.stimdesigns.com

## The Operational Advantages

Unlike other training used to help clients prepare for exoskeleton use, Galileo Training helps patients move quickly from warming up to using EKSO walking devices. "Galileo helps us leapfrog and get to the therapeutic piece of what I'm doing almost immediately. It gets you to a place where the person can participate quickly," Debbie explains.

Plus, in-between 3-minute Galileo muscle training sessions, clients can participate in additional functional exercises such as arm and core strengthening exercises to benefit overall health with

their bodies fully supported.

"While envisioned as a technique for prepping for the exoskeleton walking, we're finding the Galileo has benefits that are so varied and so huge like improved muscle firing and improved circulation. It's short training saves time, we have better outcomes and it makes therapy more efficient because we can accomplish more in a session".

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## Galileo Training Gains

### Patient 1

**Age:** 18
**Dx:** SCI T10 incomplete

**Galileo side-alternating neuromuscular training parameters:**

- 3 days a week for 8 months
- 18-24 Hz at 70°
- Amplitude 2.0
- 3 min bouts x3

**Position:** standing on Galileo TiltTable

**Short term outcomes:**

- Significant decreased spasticity immediately after session.

**Long term outcomes:**

- Patient able to ambulate 60 feet with a KAFO on left leg and independently controlling the right, using a walker for balance, vs. essentially hoping using 2 KAFO's and a walker.
- Able to reduce Baclofen intake from 80 mg/day to 40 mg/day due to tone reduction.
- Patient reported improved bowel sensation, increased LE circulation, improved sleep and decreased nerve pain.

(Galileo neuromuscular training system was always prior to walking in exoskeletion.)

### Patient 2

**Age:** 39
**Dx:** SCI C4 incomplete

**Galileo Dumbbell neuromuscular training parameters:**

- 1-2 times /week for 6 months
- 30 Hz
- 1.5 min bouts

**Position:** sitting in wheelchair, using Active Hands: biceps, triceps, forward and over head punch, internal and external rotation, pronation/supination.

**Short term outcomes:**

- Decreased UE spasticity for remaining of the day.

**Long term outcomes:**

- Trunk activation and increased strength and improved sitting balance.
- Significant improved bilateral UE strength L>R, symmetrical shoulders.
- Right shoulder frozen (shoulder) significant improvement.

**Galileo TiltTable neuromuscular training parameters:**

- 1-3 times per week for 8 months for 10 months
- 10-24 Hz at 25°-75°
- 3 min bouts x 3-6

**Position:** standing on Galileo TiltTable, some core work.

**Outcomes:**

- Decreased spasticity LE
- Improved ROM B ankles 0° DF, vs -5 bilateral. L knee -8, R knee -9 knee extension, vs -20 bilateral
- Improved standing tolerance
- Improved core and trunk stability
- Improved posture

(Patient was also doing other physical therapy training, mostly functional muscle training, 1 time per week during this time.)

### Patient 3

**Age:** 29
**Dx:** Cerebral Palsy

**Galileo TiltTable neuromuscular training parameters:**

- 1-2 times per week for 10 months
- 18-24 Hz at 50°-80°
- 3 min bouts x 4-6

**Position:** standing on Galileo TiltTable.

**Outcomes:**

- After 2 months patient decreased bilateral hip and knee contractures so that she met inclusion criteria for walking in Ekso Bionics exoskeleton.
- Spasticity reduction LE.
- Improved posture in standing and walking.
- Improved gait and speed when walking with walker.
- Patient self-reported improved bowel and bladder regularity, increased circulation LE, decreased muscular and joint pain, decreased nerve pain in feet, increased confidence.

(Galileo neuromuscular system training was often in combination with walking in exoskeleton.)

*"By using the Galileo neuromuscular training system with our SCI patients we have seen amazing results, in terms of almost complete reduction of muscle tone, just after a few rounds. This dramatically rapid treatment response is very useful to prepare our patient to walk in our exoskeleton."*

*"We have experienced impressive immediate and long term effects from working with the Galileo neuromuscular training system. Our clients have demonstrated significant decrease of muscle tone, increased ROM, increased muscle strength and functional gain, improved posture, improved gait, improved bowel and bladder regularity and increased confidence. The short treatment time and low impact are some of the advantages we really appreciate with this technology".*

**Maria Grufstedt,** PT, Able Bionics USA, Aspen Colorado