Training Device for Muscle Activation Patterns

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a system that specifically trains force direction to restore desired patterns of relative muscle activation in human limbs.

Overview

Movement of human limbs requires the coordination of multiple muscles. Such coordination is learned through extensive practice but can be disrupted by injuries or diseases such as traumatic brain injury, cerebral palsy, stroke or Parkinson's disease. Loss of coordination makes common tasks like walking difficult. Thus, an important objective of physical therapy is the retraining of neural control of limb muscles.

One component of control not adequately addressed by current therapies is the relative activation of muscles crossing multiple joints. For the arms and legs, this relative activation is reflected in the direction of the force generated by the hands and feet.

The Invention

UW-Madison researchers have developed a system that specifically trains force direction to restore desired patterns of relative muscle activation in human limbs. The system comprises a training device that includes support for the user, limb engaging surfaces such as handles and/or pedals, and multi axis force sensors to measure the direction and magnitude of applied forces. In addition, a controller provides visual, audio, or kinematic feedback based on the direction of force applied to the handles/pedals. This system also has applications in the enhancement of pedaling efficiency and the strengthening of various targeted muscles.

Applications

- Physical therapy to retrain a specific altered muscle coordination resulting from stroke
- Physical rehabilitation to protect specific tissues from re-injury while preventing atrophy in healthy tissues
- Athletes needing enhanced activity-specific strength training

Key Benefits

- Improves strength (force magnitude) and coordination (force direction)
- Separates force direction from force magnitude to provide specific feedback to the user regarding muscle coordination
- Feedback is a simple indication of the user's success in controlling force direction.
- Kinematic feedback via a controlled movement of handles or pedals offers a natural conduit for relearning patterns of muscle activation.
- Enables automatic training regimes in which the controller may prompt the user for certain actions and record the results.
- Provides a simple method of displaying and/or changing the direction of the target force the user will practice
- Suitable for different stages of rehabilitation because it allows gradual adjustment to require increased accuracy in force application

- User may be in either a recumbent or upright position
- Provides a more efficient means of targeting and strengthening desired muscle groups

Tech Fields

- Medical Devices : Accessibility

For current licensing status, please contact Jeanine Burmania at jeanine@warf.org or 608-960-9846