WeHab System

- Nintendo Wii Balance Boards provide accurate, low-cost center-of-pressure (CoP) sensing.
- Custom software enables visual feedback during standard balance therapy activities.
- Lateral weight shifting tasks offer unique insight into balance recovery post-stroke.

*Kennedy et al., IEEE Healthcom 2011, 162-168.*

Optimizing Feedback

- Increased filtering of CoP feedback results in young, healthy controls executing faster lateral weight shifts with stronger initial shift forces.
- Non-minimum phase (NMP) behavior of CoP is a measure of the strength of shift initiation.
- Clinicians may select level of filtering to encourage faster shifts with larger forces.

*Kennedy et al., in review, Exp Brain Res.*

Modeling Balance Control

- Inverted pendulum model captures dynamics of lateral weight shifting.
- PD gains for age-matched healthy and rehabilitation subjects are similar, but differ from those of young healthy subjects.
- Planned shift times differ across all three groups.

*Kennedy et al., Gait Posture 40:134-139, 2014.*

Clinical Implementation

- 105 balance rehabilitation patients (age 55.7 ± 21.1) across 3 non-research facilities.
- All subjects complete 60 sec. static balance and dynamic weight shifting assessments at the start of each session.
- Therapists choose appropriate activities from weight shifting, sit-to-stand, stepping, and free form options.

*Bockstege et al., in review, Comput Ind.*

Ongoing Work

- Confirming feedback optimization results with age-matched healthy subjects.
- Investigating optimization of auditory feedback for use with patients having visual field cuts.
- Pursuing optimal control model of lateral weight shifting to compare objectives in young healthy, age-matched, and clinical subjects.
- Using text analysis to quantify the effects of visual feedback on patient-therapist interactions during balance rehabilitation.
- Predicting scores on evaluative functional tests based on measured performance during therapeutic activities.

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