Preliminary Results for a Dynamic Analysis of RGO Users

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Background & Purpose

What is a RGO?

- Reciprocating Gait Orthosis
- Assistive device that enables people with lower limb paralysis to stand and walk with the assistance of crutches
- Characterized by a mechanical link between hips that forces one hip into flexion when the other is in extension and vice versa

Why Study RGO’s

- Walking with RGO’s is slow and exhausting
- Very little has been published on the gait mechanics of RGO users
- The purpose of this study is to quantify the gait dynamics of RGO users in order to guide future efforts to improve RGO’s

Methods

- Recruited 4 RGO users over the age of 6 to walk in the VA Chicago Motion Analysis Laboratory (VACMARL)
- Used 8 infrared cameras and passive reflective markers to quantify the motion of body segments
- Used 6 (AMTI) force plates imbedded in the floor to measure the ground reaction force acting on the subjects’ feet and walking aids
- Used collected data to calculate joint angles, the moments and minimal forces acting at the joint, and the mechanical energy of the trunk

Results

Results

- All subjects walked with a flexed trunk for almost the entire gait cycle. All of them extended their trunks during the single support phase of stance (Fig 1)
- During portions of single support phase, all subjects bore less than half of their body weight on their legs, while their arms bore more than half of their weight (Fig 2 & 3)
- Forces acting at the hip during single support tended to flex the trunk, while forces acting at the shoulders tended to extend the trunk. (Fig 4)
- Subjects who lacked hip flexors had extension moments at their hip during swing phase (Fig 5)
- Changes in the kinetic energy of the trunk were less than changes in the potential energy of the trunk for all subjects (Fig 6)

Discussion

- Bearing weight through the arms may be a cause of the high energy expenditure associated with using RGO’s
- Flexed trunk posture encourages arm loading. In that position, loading the shoulders and unloading the hips encourages the trunk extension that occurs during the single support phase.
- Poor energy conservation of the trunk may be another cause of high energy expenditure
- Extension moments at the hip during swing suggest that the reciprocal link may be inhibiting leg swing and, thus, may be another cause of high energy expenditure.

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