Efficacy of PedBot Lab on Strength and Range of Motion in Children with Cerebral Palsy

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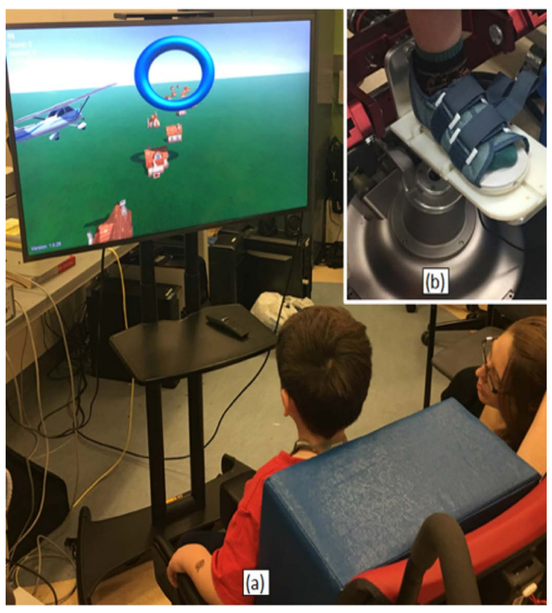
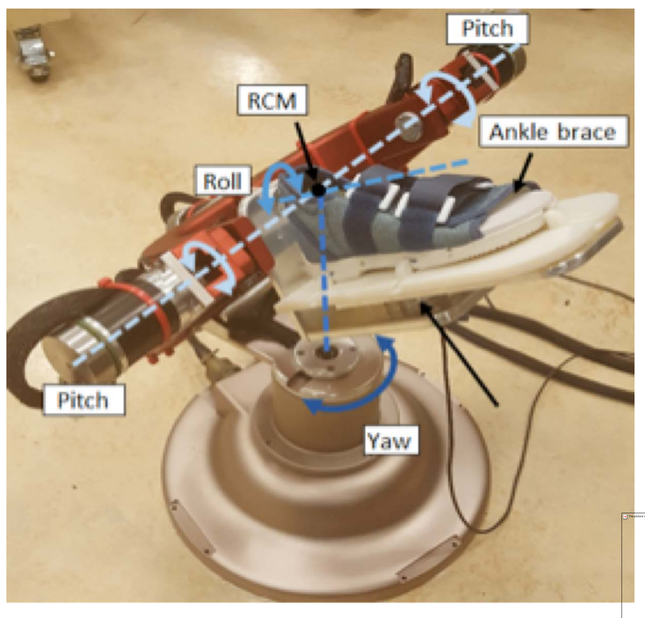
Background

- PedBot Lab is a three degree of freedom ankle rehabilitation robot designed and constructed at Children's National Health System
- Integrated motors allow for resist and assist modes
- Video game platform with airplane flight simulator
- Efficacy phase of testing: IRB approved protocol for children with ankle range of motion (ROM) and strength deficits secondary to a static neurological injury





Purpose

- Examine the effect of twice weekly sessions with PedBot Lab on ROM and strength in participants with static neurological injuries

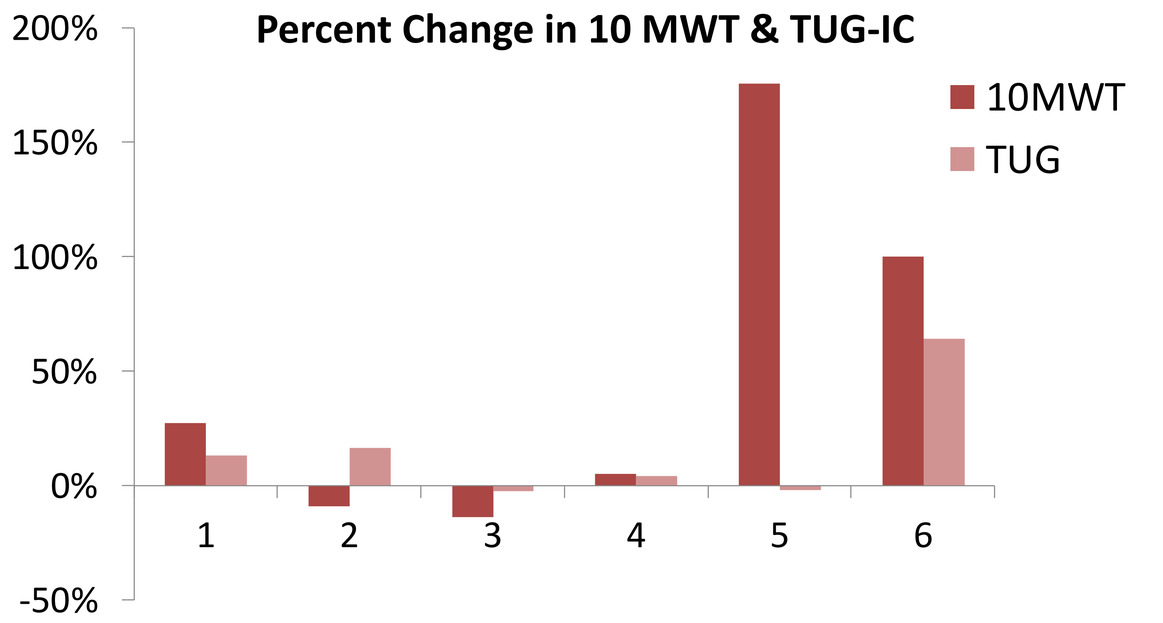
Methods

- Inclusion criteria: static neurological injury, ages 4-18, GMFCS I-III
- Exclusion criteria: inability to follow simple commands, PF contracture >10, inability to achieve subtalar neutral, GMFCS IV-V, previous pathological fractures due to impaired bone density
- Outcome measures: pre and post trial
  - Active and Passive ROM
  - 10 meter walk test (10MWT)
  - Timed up and go in Children (TUG-IC)
  - Strength (dynamometer)
- Frequency: 30 minutes, 2x/week for 20 sessions
- Physical Therapist modifies game parameters to challenge strength, ROM, and motor control

.

Subject #	Age	Sex	GMFCS
1	12	M	1
2	13	F	1
3	15	F	2
4	15	M	2
5	4	F	1
6	9	F	1

Results



Subj	Change in Strength (Kgf)			
	DF	PF	Inv	Ev
1	2.2	2	2.6	2.5
2	6.6	3.2	3.9	3.5
3	5.2	2.9	1.3	4
4	5.9	3.4	2.1	2.6
5	NT	NT	NT	NT
6	0.8	6.4	4.4	1.5

Change in Active Range of Motion (degrees)

Subj	DF w/ KF	DF w/ KE	PF	Inv	Ev
1	14*	8	0	4	10*
2	32*	18*	23	6	10*
3	4	3	2	2	7
4	12*	8	-5	3	3
5	30*	20*	2	5	15*
6	13*	25*	26	5	6

*= greater then or equal to minimal detectable change

Discussion

- Participants demonstrated improvements in strength and active range of motion
- Majority of participants improved gait speed
- Further investigation on improvements in gait quality and speed could demonstrate more meaningful functional improvement: plan to include 6 minute walk test and pediatric balance scale in future evaluations
- Home version (PedBot Home) beginning feasibility trials

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