

# The Sequential Combination of Bilateral and Unilateral Arm Training to Promote Arm and Hand Function in Patients with More Severe Paresis

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## Introduction:

- Recovery of useful arm and hand function after stroke is challenging in those with severe paresis
- Recovery mechanisms may differ from those with mild paresis
- Activation of the nonlesioned cortex may play a role in *priming the system for neural recovery*
- Bilateral or Unilateral training approaches in isolation have not demonstrated gains in functional use of the hand in those with severe paresis; Combination approaches may benefit those with severe paresis

**Purpose:** To present findings from pilot data on a single cohort of subjects with moderate severity paresis receiving a sequential combination of bilateral arm training using BATRAC and unilateral arm training using the Saeboflex training orthosis

**Hypothesis:** Combining bilateral training sequentially with unilateral training (assisted by use of the Saeboflex orthosis) will improve arm and hand function in subjects with moderate severity paresis

## Methods:

### Subjects:

10 patients with unilateral stroke with moderate severity paresis (FM 23.5, SD 7.3)

### Outcome measures:

- Fugl Meyer Upper Extremity Test
- Modified Wolf Motor Function Test
- Grasp strength
- University of Maryland Arm Questionnaire for Stroke
- Box and Blocks
- Motor control measures for Paretic and Nonparetic arms: movement time, peak velocity, peak acceleration, ratio of hand path, movement units, 3-D joint kinematics (subset of subjects) using Motion Monitor magnetic tracking system



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## Training:



**Duration/Mode:** 3x's week for 6 weeks of bilateral arm training with progressive rhythmic auditory cueing (**Progressive BATRAC**)

**Treatment progressed for:**  
 Frequency  
 Excursion of the Arm  
 Height of BATRAC rails



**Duration/Mode:** 3x's week for 6 weeks unilateral arm training consisting of grasp, reach and release with **Saeboflex training orthosis**

## Results:

**Clinically meaningful gains in function are seen after combination training compared to baseline (p<.05)**

	Baseline	Post 1 (BATRAC)	Post 2 (Saebo)	% scale or NP from baseline
<b>Fugl Meyer</b>	23.5	26*	31*	+11%
<b>Mod. Wolf</b>	72.13	66.00*	50.22*	-30%
<b>Grasp (kg)</b>	9	12*	13*	+40%
<b>UMAQs</b>	20	23	26*	+12%
<b>Box &amp; Blocks</b>	0	0	8	+14%

**Functional use of the paretic arm is reported on UMAQS Scale**

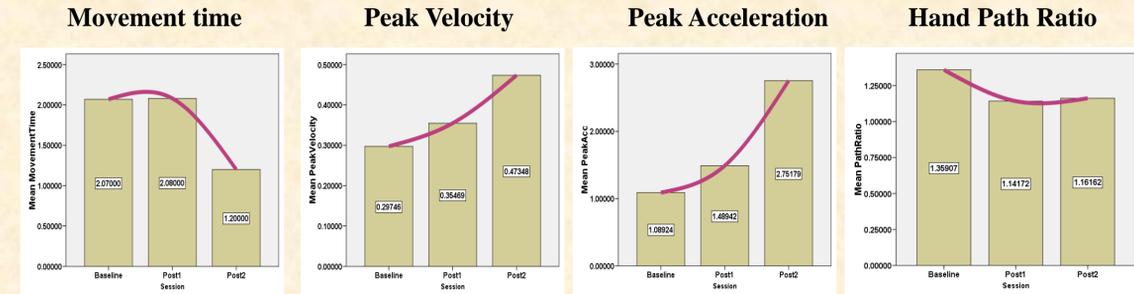
**Post Bilateral Training (Progressive BATRAC)**

- I am able to keep my arm on the table
- My weak hand can hold placed objects
- I notice my paretic arm swings
- I can stabilize with my weak arm
- I can put weight through my arm to stand

**Post Unilateral Training (Saeboflex Training Orthosis)**

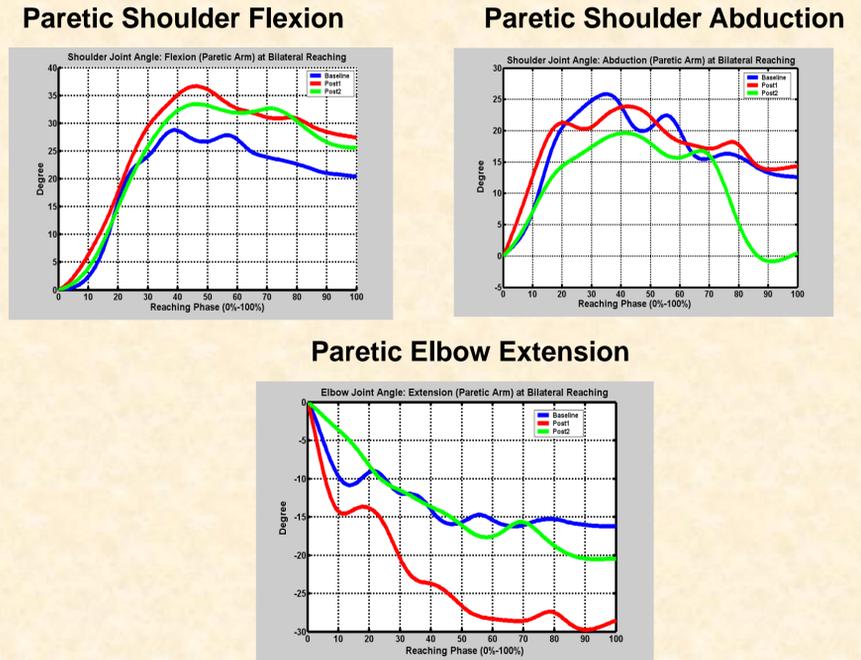
- I am able to reach and grasp objects
- I can independently hold things in my hand
- I can let go of an object after holding it
- I can hold a cup and bring it to my mouth
- I can reach and still hold on to an object

**Motor control performance during bilateral reaching improves after combination training**



**Increases in shoulder flexion and elbow extension are seen after training with decreases in shoulder abduction**

3-D joint kinematics (exemplar subject)



## Summary and Conclusions:

- Combining bilateral proximal and unilateral training shows promise in promoting recovery of meaningful function of the arm and hand in patients with moderate severity paresis
- Proximal training with progressive BATRAC may have a priming effect that aids the response to subsequent unilateral arm training
- Gains in supportive role functions are seen after progressive BATRAC training
- Gains in hand use were seen in some patients after unilateral training with the Saeboflex device