Functional Utility of a Myoelectric Upper Extremity Orthosis for Chronic Stroke Survivors with Moderate Hemiparesis

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Introduction to the MyoPro 2.0 Motion-G Myoelectric Orthosis

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ORIGINAL RESEARCH

Giving Them a Hand: Wearing a Myoelectric Elbow-Wrist-Hand Orthosis Reduces Upper Extremity Impairment in Chronic Stroke

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Objective

- Determine the immediate effect of wearing a portable, myoelectric elbow-wrist-hand orthosis on **motor impairment and functional ability in chronic stroke survivors** with moderate UE hemiparesis

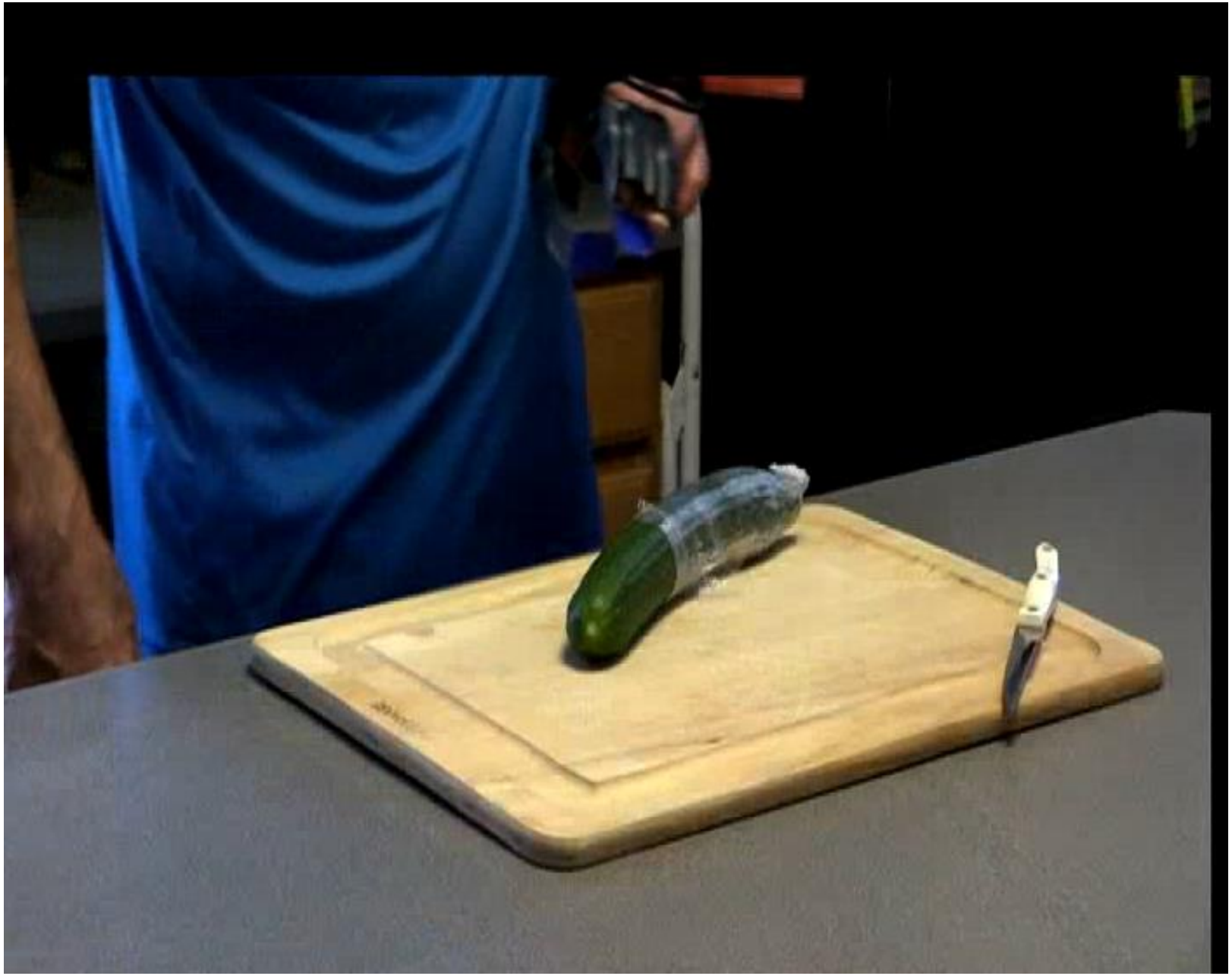
Study Design and Participants

- Observational cohort study (n=18)
- 2 sessions
  - Session 1: Device Setup & Orientation
  - Session 2: Outcome Measures Administered with and without orthosis
- Key Inclusion Criteria:
  - Chronic stroke (≥ 12 months)
  - EMG signal in biceps of hemiparetic side
  - MMT ≥ 1/5 in biceps and/or triceps
  - Active shoulder flexion ≥ 30° and active shoulder abduction ≥ 20°
- Key Exclusion Criteria:
  - Excessive pain in hemiparetic UE
  - Excessive spasticity at the elbow, wrist, or hand (≥ 2 on Modified Ashworth Scale)

MyoPro Motion-G Device[2]

Outcome Measures

- **Fugl-Meyer Assessment (UE Section)**
  - To assess motor impairment
- **Battery of Functional Tasks**
  - To assess ability to complete 4 functional tasks
    - Lifting a laundry basket
    - Bringing a spoon to the mouth
    - Drinking from a cup
    - Turning on a light switch
- **Box and Block Test**
  - To assess gross manual dexterity



Note: This video is <u>not</u> part of the study described here, but is intended to demonstrate how the myoelectric orthosis used in the study works. Used with permission of Myomo, Inc.

Results

- **Fugl-Meyer Assessment (UE Section)**
  - *Significant improvement in UE impairment* (t=8.56, P < .001) with myoelectric orthosis
    - With Myoelectric Orthosis: $(\mu = 27.28, \sigma = 7.85)$
    - Without Myoelectric Orthosis: $(\mu = 18.56, \sigma = 6.30)$
- **Battery of Functional Tasks**
  - *Significant improvement in quality of feeding and drinking tasks* with the myoelectric orthosis versus without (Feeding Quality[Elbow]: z=2.251, P = .02; Feeding Quality [Grasp]: z=2.966, P=.003; Drinking Quality [Grasp]: z=3.187, $P < .001$)
    - *Median scores for quality were also higher for the laundry basket task* with the myoelectric orthosis versus without, however, this was not statistically significant
  - *Significant improvement in time to grasp cup* during bringing cup to mouth task
- **Box and Block Test**
  - *Significant increase in gross manual dexterity,* as evidenced by difference in median Box and Block test scores (z=3.42, P < .001), with the myoelectric orthosis versus without

Study Conclusions

- Promising evidence that providing myoelectric elbow-wrist-hand orthoses to stroke survivors with moderate UE hemiparesis will immediately decrease motor impairment, thus increasing functional independence with meaningful activities

Inclusion/Exclusion and Additional Considerations

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Personal ☐ Intact cognition ☐ Highly motivated, appropriate goals, willing to attend therapy ☐ Good caregiver/family support as needed for care and use of device Shoulder ☐ Min active shoulder flexion >30° and abduction >20°. (If not, can the candidate accept function with elbow held down at the side?) ☐ Stable shoulder (if subluxation present, should be minor & pain free) Biceps/Triceps ☐ Min muscle strength of 1/5 in biceps and/or triceps ☐ Adequate EMG signal in biceps and triceps ☐ Not receiving Botox in these muscles (or willing to discontinue it*). Elbow ☐ Full passive range of motion in elbow (0°-130°) with no pain ☐ None to moderate elbow flexor/extensor tone, ≤ 3 M.A.S.	Criteria for all MyoPros
Wrist ☐ Does not have fused/permanently fixed wrist ☐ Passive flexion/extension without pain, & can tolerate neutral position ☐ None to mild flexor/extensor tone: ≤ 2 M.A.S.	Additional criteria for Motion W and Motion G
Forearm ☐ Full passive range of motion in pronation / supination ☐ Min muscle strength of 1/5 in wrist flexors/extensors ☐ Adequate EMG signal in wrist/hand flexor & extensor groups ☐ Not receiving Botox in these muscles (or willing to discontinue it*). Fingers ☐ Does not have active grasp or release ☐ Full passive extension with no pain, while wrist in flex, ext, & neutral ☐ None to mild flexor/extensor tone: ≤ 2 M.A.S.	Additional criteria for Motion G only

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Click **Partner Resource Center** (top left corner) for screening forms, evaluation forms, informational brochures, and more information

References

1. Page SJ, Hill V, White S. Portable upper extremity robotics is as efficacious as upper extremity rehabilitative therapy: a randomized controlled pilot trial. Clin Rehabil 2013; 27:494-503.

2. MyoPro Motion-G; Myomo, Inc.