# Resonating Arm Exerciser (RAE)

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## OTHER INFORMATION

## KEYWORDS

Hand movement rehabilitation, Stroke rehabilitation, Traumatic brain injury

## CATEGORIZED AS

- **Medical**
  - Devices
  - Disease: Musculoskeletal Disorders
  - Rehabilitation

## BRIEF DESCRIPTION

This is a low cost rehabilitation device. The device is used for retraining arm function after neurological injuries or diseases. For usage, the patient rocks a wheelchair back and forth with impaired arm. As part of the process, the device uses mechanical resonance to allow for larger range of motion.  The device attaches to standard wheelchair.

## RELATED CASES

2012-077-0

## FULL DESCRIPTION

This invention is low-cost arm exercise rehabilitation device. It attaches to a standard wheelchair and has three main components: a lever, an arm support, and elastic bands that are stretched across the frame of the wheelchair. The effect is that when a user moves the lever with the impaired arm, the wheelchair rocks back and forth. The arm movement involves shoulder rotation, elbow extension and flexion, and wrist extension and flexion. A larger range of arm motion is allowed when the chair is moved at the resonant frequency of the device. The rocking movement of the chair is meant to be a pleasing and engaging motion that encourages a larger range of motion from the impaired arm. Overall, the device is designed to motivate and stimulate the user. It encourages active effort and precisely timed movement and motivates the user by amplifying the user's movement into a pleasing, rocking motion.

Researchers have tested prototypes and have obtained results of a six week experiment with 8 participants with moderate to severe arm movement impairment as defined as an upper extremity Fugl-Meyer (FM) score of < 35 (out of 60). Participants refrained from all other rehabilitation exercises and activities during the experiment. Results indicated a substantial improvement after the six week program for all participants with group having a mean starting FM score of 17 +/- 8 and ending with a mean improvement of 8.5 +/- 4.1. Additionally, range of motion (ROM) improved for all participants starting with diminished ROM.

Assistance during therapeutic exercise has previously been provided by physical and occupational therapists, robots, arm supports, overhead slings, and tabletops. The primary disadvantage of therapists, robots, arm supports, and overhead slings are that they are costly. The primary disadvantage of simply using a table top is that it is not engaging and provides limited assistance for movement.

## SUGGESTED USES

Retraining arm function after neurological injuries or diseases such as stroke, spinal cord injury, cerebral palsy, multiple sclerosis, and muscular diseases

## ADVANTAGES

- Low cost
- No power requirements
- Attaches to standard wheelchair
- Improved safety
- Engaging, motivational and effective

## PATENT STATUS

| Country | Type | Number | Dated | Case |
|---|---|---|---|---|
| United States Of America | Issued Patent | 9,162,101 | 10/20/2015 | 2012-077 |

## STATE OF DEVELOPMENT

Prototypes have been assembled and tested.

## TESTING

Researchers have tested prototypes and have obtained results of a six week experiment with 8 participants with moderate to severe arm movement impairment as defined as an upper extremity Fugl-Meyer (FM) score of < 35 (out of 60). Participants refrained from all other rehabilitation exercises and activities during the

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## PUBLICATIONS

http://biorobotics.eng.uci.edu/armrehab/rae\

http://www.ncbi.nlm.nih.gov/pubmed/25273359

## LEAD INVENTOR

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**ADDITIONAL TECHNOLOGIES BY THESE INVENTORS**

- Manumeter for Monitoring and Assessing Upper Extremity Rehabilitation