

# AUGMENTED REALITY IN STROKE REHABILITATION

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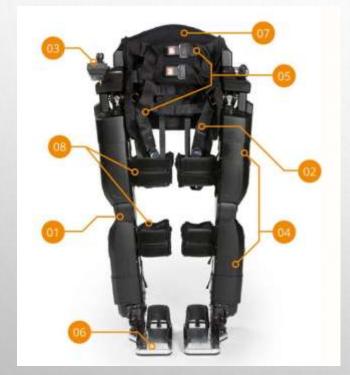
#### TERMINOLOGY

- VIRTUAL REALITY
  - COMPUTER-GENERATED SIMULATION OF A THREE-DIMENSIONAL IMAGE OR ENVIRONMENT THAT CAN BE INTERACTED WITH IN A SEEMINGLY REAL OR PHYSICAL WAY BY A PERSON USING SPECIAL ELECTRONIC EQUIPMENT, SUCH AS A HELMET WITH A SCREEN INSIDE OR GLOVES FITTED WITH SENSORS
- AUGMENTED REALITY
  - INTERACTIVE EXPERIENCE OF A REAL-WORLD ENVIRONMENT WHERE THE OBJECTS THAT RESIDE IN THE REAL WORLD ARE ENHANCED BY COMPUTER-GENERATED PERCEPTUAL INFORMATION, SOMETIMES ACROSS MULTIPLE SENSORY MODALITIES
- GAMIFICATION
  - APPLICATION OF TYPICAL ELEMENTS OF GAME PLAYING (E.G. POINT SCORING, COMPETITION WITH OTHERS, RULES OF PLAY) TO OTHER AREAS OF ACTIVITY



- EXOSKELETON ROBOTS WEARABLE DEVICES THAT WORK IN TANDEM WITH THE USER INTENDED TO MIMIC, AUGMENT OR ENHANCE THE BODY'S OWN MOVEMENTS.
- END-EFFECTOR ROBOTS WEARABLE PERIPHERAL DEVICE

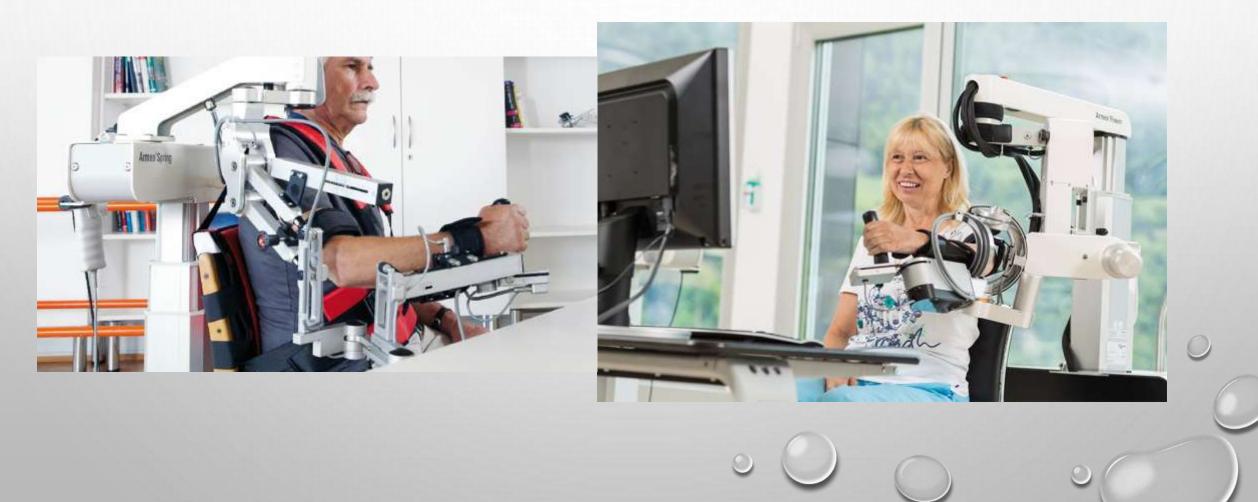
- CAN PROVIDE MODULATED ASSISTANCE TO THE PATIENTS ABILITY
  - PASSIVE HELPS THE PATIENT TRACK THE PREDETERMINED TRAJECTORY THROUGH REPEATED TRACKING CONTROL FOR PASSIVE TRAINING
  - ACTIVE WHEN THE PATIENT INITIATES MOVEMENT, THE ROBOT WILL GUIDE LIMB THROUGH CORRECT MOTION OR ASSIST WITH FORCE
  - ACTIVE ASSIST THE PATIENT DOES NOT NEED ANY HELP TO MOVE THE LIMB. WHEN THE THRESHOLD VALUE REACHES A CERTAIN STANDARD, IT WILL TRIGGER THE ROBOT.
  - ACTIVE RESIST WHEN THE PATIENT MOVES THE LIMB, THE ROBOT PROVIDES RESISTANCE TO MAKE THE EXERCISE MORE CHALLENGING

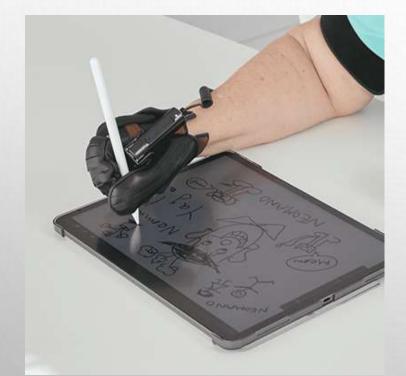


**Robotic Exoskeleton** 









Robotic Grasp Assistance



#### VIRTUAL REALITY IN REHABILITATION

AUGMENTED REALITY DEVICE FOR UE
 REHABILITATION



#### VIRTUAL REALITY IN REHABILITATION



Augmented reality device for biofeedback and gamification of rehabilitation



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### VIRTUAL REALITY IN REHABILITATION



Augmented Reality for biofeedback and gamification of rehabilitation

#### PROS

- MOTIVATION
- ENGAGEMENT
- INCREASED REPETITIONS
- INCREASED INTENSITY OF ACTIVITIES
- FACILITATES GROSS MOTOR, FINE MOTOR AND
  COGNITION
- SENSITIVITY TO CHANGES
- PATIENT AND THERAPIST SAFETY
- PROVIDES AUDITORY, VISUAL OR KINESTHETIC BIOFEEDBACK

#### CONS

- COST
- TECHNICAL ISSUES
- LEARNING CURVE
- MAY NOT CARRY OVER INTO REAL WORLD ACTIVITIES
- MIXED RESEARCH RESULTS



 ASSESSMENT OF CONVENTIONAL OCCUPATIONAL THERAPY IN POST STROKE UPPER EXTREMITY RECOVERY VS. COMBINATION OF CONVENTIONAL OCCUPATIONAL THERAPY WITH RAPAEL GLOVE USING AUGMENTED REALITY

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#### BACKGROUND

RAPAEL

5/N: C3K4

## RAPAEL Smart Glove for Hand Rehab

RAPAEL Smart Glove is a high-tech rehab device. Starting the training is as simple as wearing the glove, connecting to the "RAPAEL" app and proceeding to play the rehabilitation games.

Watch Video

http://www.neofect.com/en/product/rapael/



#### TEAM

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- DR. RAMAKRISHNAN: LEAD PHYSICIAN
- DR. CHARLENE JENSEN: LEAD RESEARCHER
- JESSICA SHEFFIELD: OT
- ASHLEY ABRAHAM: OT
- RACHEL BARBER: COTA
- RHONDA WALDROP: SYSTEMS ANALYST
- MICHELLE WOOTEN: EXECUTIVE DIRECTOR OF RESEARCH AND DISCOVERY
- CHERYL WHITE: RESEARCH COORDINATOR
- CHRISTY HELSEL: DIRECTOR OF TELEHEALTH PROGRAM

#### STUDY SITES

- TELEHEALTH, RESEARCH AND DEVELOPMENT, RIVERSIDE OCCUPATIONAL THERAPY AND RIVERSIDE COLLEGE OF HEALTH CAREERS WILL BE INVOLVED IN THE STUDY WITH INTERVENTIONAL NEUROLOGY BEING THE PRIMARY DEPARTMENT.
  - MOB OT RIVERSIDE MOB OCCUPATIONAL THERAPY
  - RCHC RIVERSIDE COLLEGE OF HEALTH CAREERS
  - SV OT SHOREVIEW OCCUPATIONAL THERAPY

- 40 PARTICIPANTS
  - 20 IN TREATMENT GROUP
  - 20 IN CONTROL GROUP
- PARTICIPANTS WILL BE RANDOMLY ASSIGNED TO THE TWO GROUPS USING A RANDOM PATTERN GENERATOR
- THE STUDY WILL LAST APPROXIMATELY 10 WEEKS FOR EACH PARTICIPANT
- CURRENT IRB APPROVAL IS UNTIL FEBRUARY 2022

- THE CONTROL GROUP WILL RECEIVE OCCUPATIONAL THERAPY TWICE PER WEEK FOR 8 WEEKS AND SHAM THERAPY ONCE PER WEEK FOR 8 WEEKS.
- THE TREATMENT GROUP WILL RECEIVE OCCUPATIONAL THERAPY TWICE PER WEEK FOR 8 WEEKS ALONG WITH ONCE A WEEK RAPAEL GLOVE SESSIONS FOR 8 WEEKS.
- WE WILL ASSESS BOTH GROUPS FOR MOTIVATION, AROM, PROM, STRENGTH AND FINE MOTOR FUNCTION FOR THE WRIST AND HAND AS A BASELINE AND AT THE END OF THE STUDY.

- PATIENTS WILL BE IDENTIFIED BY THE TREATING OCCUPATIONAL THERAPIST WITHIN THE TWO CLINICAL SITES OF SHOREVIEW OUTPATIENT THERAPY AND MOB OUTPATIENT THERAPY.
- THOSE PATIENTS WHO AGREE TO PARTICIPATE WILL BE RECRUITED BY THAT THERAPIST AND THEN THE RESEARCHER WILL MEET WITH THE PATIENT TO SIGN THE CONSENT FORM AND ASSIGN THE PATIENT TO THE CONTROL GROUP OR TREATMENT GROUP.
- CONSENT FORMS WILL BE KEPT AT THE PRIMARY RESEARCHERS OFFICE IN A LOCKED CABINET.

- MEASUREMENTS OF ACCURACY, SPEED, ROM AND FUNCTION USING THE VIRTUAL REALITY SOFTWARE AND THE NEOFECT GLOVE.
- UPPER EXTREMITY FUNCTIONAL ASSESSMENT USING JEBSON-TAYLOR STANDARDIZED ASSESSMENT AND FUGL- MEYER UPPER EXTREMITY SCALE.
- ASSESSMENT OF THE MOTIVATION TO PARTICIPATE IN TRADITIONAL THERAPY VS. WITH THE
  RAPAEL GLOVE USING INTRINSIC MOTIVATION INVENTORY.
- ASSESSMENT OF STRENGTH WITH MANUAL MUSCLE TESTING

#### INCLUSION/EXCLUSION CRITERIA

 INCLUSION/EXCLUSION CRITERIA WILL BE ASSESSED VIA CHART REVIEW BY THE INVESTIGATOR AFTER RECOMMENDATION BY TREATING OCCUPATIONAL THERAPIST



- PERSONS WITH DIAGNOSIS OF CEREBROVASCULAR ACCIDENT WITH RESIDUAL UNILATERAL UPPER EXTREMITY DYSFUNCTION CURRENTLY RECEIVING OCCUPATIONAL THERAPY.
- WITHIN 12 MONTHS OF THE STROKE INCIDENT

#### **EXCLUSION CRITERIA**

- MODIFIED ASHWORTH SCORES OF 0,1 OR 4
- INABILITY TO FOLLOW DIRECTIONS
- VISUAL IMPAIRMENTS THAT PREVENT THE SUBJECT FROM VIEWING THE VIRTUAL REALITY MONITOR
- HEARING IMPAIRMENTS THAT PREVENT PATIENT FROM FOLLOWING DIRECTIONS
- MMT SCORES OF 1 OR 0 IN THE UPPER EXTREMITY
- ENROLLMENTS IN OTHER UPPER LIMB THERAPY TRIALS

#### REFERENCES

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# QUESTIONS

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