

The background of the slide is a light gray gradient with several realistic water droplets of various sizes scattered across it. The droplets have highlights and shadows, giving them a three-dimensional appearance. The title text is centered in a bold, teal color.

AUGMENTED REALITY IN STROKE REHABILITATION

CHARLENE JENSEN, MMHPE, DPT

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

TERMINOLOGY

- 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

ROBOTICS IN REHABILITATION

- 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

ROBOTICS IN REHABILITATION



Robotic Exoskeleton



ROBOTICS IN REHABILITATION



ROBOTICS IN REHABILITATION



ROBOTICS IN REHABILITATION



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



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
- 

CURRENT STUDY

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

BACKGROUND

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



TEAM

- 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

RESEARCH PROTOCOL

- 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

RESEARCH PROTOCOL

- 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 RAPHEL 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.

RESEARCH PROTOCOL

- 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.

RESEARCH PROTOCOL

- 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 RAPAEEL 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

INCLUSION CRITERIA

- 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

- ZHANG X, YUE Z, WANG J. ROBOTICS IN LOWER-LIMB REHABILITATION AFTER STROKE. *BEHAVIOURAL NEUROLOGY*. 2017;2017:3731802. DOI:10.1155/2017/3731802
- JANSSEN, JOEP MSC; VERSCHUREN, OLAF PHD; RENGER, WILLEM JAN MA; ERMERS, JOSE MPPT; KETELAAR, MARJOLIEN PHD; VAN EE, RAYMOND PHD GAMIFICATION IN PHYSICAL THERAPY: MORE THAN USING GAMES, *PEDIATRIC PHYSICAL THERAPY: JANUARY 2017 - VOLUME 29 - ISSUE 1 - P 95-99*, DOI: 10.1097/PEP.0000000000000326
- PROFFITT, RACHEL. (2015). GAMIFICATION IN REHABILITATION: FINDING THE "JUST-RIGHT-CHALLENGE". 10.4018/978-1-4666-9522-1.CH007.
- WADE E, WINSTEIN CJ. VIRTUAL REALITY AND ROBOTICS FOR STROKE REHABILITATION: WHERE DO WE GO FROM HERE? *TOPICS IN STROKE REHABILITATION*. 2011;18(6):685-700. DOI:10.1310/TSR1806-685

QUESTIONS