Therapeutic Use of Sailing for People with Physical Disabilities: Virtual Reality to Reality

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Outline:

1. Sailing as an Intervention

2. Virtual Reality Sailing Simulation

3. Virtual Reality to Reality
   - Phase I Research: Virtual Reality Sailing Simulation and Quality of Life of Persons with Physical Disabilities
   - Phase II Research: Adapted Sailing and Quality of Life of Persons with Physical Disabilities
Background

• Sailing as leisure and sport

• Sailing as a recreational therapy (RT) intervention for people with disabilities


• Virtual reality sailing simulation for people with disabilities
The Therapeutic Use of Sailing

Sailing is pursued for both recreation and competitive sport purposes. Participation in sailing by people with disabilities is regarded as having positive outcomes on their quality of life. However, evidence-based research is lacking (Autry and Anderson, 2016).

Common constraints to sailing are: knowledge and skill of sailing, access to sailboats, swimming skills, financial resources, and the perception that sailing is elitist and dangerous (Recio, et al.). As such, persons with disabilities typically do not choose sailing as recreation or sport.
The Therapeutic Use of Sailing

Sailing Principles
- Boat Design (hull shape and sails)
- Wind Direction
- Water Current
- Navigation

The Sailboat
- Learning a new “language”
- Examples of parts:
  - Mast
  - Keel
  - Rudder
  - Tiller
  - Mainsail
  - Jib
The Therapeutic Use of Sailing

Adaptations:
- The Dock
- The Boat
- The Course
The Therapeutic Use of Sailing

Community based sailing programs for people with disabilities:

- Shake-A-Leg of Miami
- Warrior Sailing
- Sail to Prevail
- Sailing Heals
- Para World Sailing
The Therapeutic Use of Sailing

Sailing takes many forms; you can cruise, race or simply potter around in all kinds of boats, on the sea or inland water. It is one of the very few sports in which able-bodied sailors and Para sailors can participate on equal terms.

– Para World Sailing
The Therapeutic Use of Sailing

Benefits/Outcomes for People with Disabilities

Physical: balance, posture, gross motor, fine motor, strength, endurance, hand-eye coordination, tracking

Mental: knowledge of nautical terms, instruments, boat-wind-sails interaction, environmental conditions, weather

Emotional: connection to nature, mindfulness, confidence, self-esteem, flow

Social: team building, cooperation, decision-making, family-oriented, community engagement, environmental awareness
Virtual Reality Simulation

Definition and Types of Virtual Reality:

Virtual reality (VR): a computer-based technology that allows users to gain immersion and presence within a virtual environment (Chi, Chau, Yeo, & Tu, 2019).

Immersive: physical presence in a non-physical world (e.g. Oculus).

Non-Immersive: a computer-generated environment without a feeling of being immersed in the virtual world (most common today with technology).

Simulation: use of 3D objects and environments to create immersive and engaging learning experiences.

Trends in TR/RT:

Gaming
Exergaming
Wiihabilitation
Virtual reality sailing simulators (www.virtualsailing.com.au) have the potential to bridge the gap between dry-land and on-the-water sailing for persons with disabilities.

- Recio, et al., 2013
Purpose of the East Carolina University Sailing Simulation Lab:
- To use virtual reality sailing simulation as an intervention for people with disabilities and in youth development to increase quality of life physically, emotionally, cognitively, and socially and to produce evidence through research in the field of therapeutic recreation/recreational therapy.
- The lab is a member of the Sim Sailing International Research Consortium comprising of 8 countries and includes 25 members and 7 universities/research institutes.
Sim Sailing International Consortium

Spain: Universidad Católica San Antonio de Murcia (UCAM)

Australia: University of Melbourne

USA: The International Center for Spinal Cord Injury, Kennedy Krieger Institute

USA: University of Michigan and Ann Arbor VA Hospitals

Japan
Netherlands
New Zealand
Poland
United Kingdom
Norman Saunders
Professorial Fellow in Neuroscience, University of Melbourne, Australia
Founder and CEO, Virtual Sailing: Manufacturer of the VRSS


Video: Wind in the Sails
https://www.youtube.com/watch?v=7YhVLhaC2E
VRSS: Video for Evidence Based Programming

Albert Recio, MD, RPT, PTRP
Kennedy Krieger Institute, Baltimore, MD; Aquatics Medicine Program
The Johns Hopkins University School of Medicine; Physical Medicine and Rehabilitation

CNN Video: https://www.cnn.com/videos/health/2012/10/16/health-minute-virtual-sailing.cnn
ECU Sailing Simulation Lab: Target Populations & Future

Student Opportunities:

Recreational Therapy Courses
Recreational Therapy Student Society
Research (undergraduate and graduate)

Participants with Disabilities:

Current Focus- Physical Disabilities:
   Spinal Cord Injury
   Cerebral Palsy
   Spina bifida

Future:
   Youth development/youth at-risk
   Veterans with disabilities (physical, PTSD, etc.)
   Adapt VRSS with chin/mouth controller for higher SCI
Set-up & Adaptions

Program includes various one person designs: Optimist, Laser, Byte, 29er
Transferring

Dycem
Cushions

3 in 1 Folding

Separable Design

Can expand to any size you want
Seat, Manual Joy-Stick, and Adapted Sailboat on Screen
Electronic Joy-Stick
VRSS Program Participant with Paraplegia
VRSS Program Participant with Quadriplegia
Statement of the Problem

Sailing is pursued for both recreation and competitive sport purposes. Participation in sailing by people with disabilities is regarded as having positive outcomes on their quality of life. However, evidence-based research is lacking (Autry and Anderson, 2016).

Common constraints to sailing are: knowledge and skill of sailing, access to sailboats, swimming skills, financial resources, and the perception that sailing is elitist and dangerous (Recio, et al.). As such, persons with disabilities typically do not choose sailing as a sport.
Hypothesis

Participation in the virtual reality sailing simulator (VRSS) program will result in an increase in participants’ simulator sailing standard scores: knowledge (cognitive) and skills (physical), which is the competence level required for on-the-water sailing, and their quality of life (QOL) score.
Method

Quantitative

- World Health Organization Quality of Life- BREF (WHOQOL-BREF) (1997)
  - Pre and post
  - 26-item questionnaire
  - Includes four domains: physical health, psychological, social relationships and environment.

- Sailing Standards
  - Pre study requirement (never have sailed before)
  - Post Standard Scores
    - Knowledge
    - Practical Skills

- Reach and Strength
  - Pre and post
  - Functional Reach Test: Modified Functional Reach
    (Katz-Leurer, M., Fisher, I., Neeb, M., Schwartz, I., & Carmeli, E., 2009)
  - Degree in movement of manual joy stick

- Observation
  - Formative Evaluation
  - Check list per session
Method

Qualitative

- Interviews
- Post
- Interview Guide Areas:
  - Leisure
  - Quality of Life
  - VRSS Program
  - Sailing on the Water

Observation

- Formative Evaluation
- Notes per session
Participants

Eight participants with physical disabilities (to date).

Disability
- 4 spinal cord injuries (SCI)
  - 1 with quadriplegia
  - 3 with paraplegia
  - Range: 3-13 year post injury
- 2 Cerebral palsy
- 2 spina bifida

Mobility
- 6 use wheelchair full time
- 1 uses crutches and wheelchair

Demographics
- 4 females
- 4 males
- Age range: 27-50
Treatment Protocol

VRSS program:

- 1.5 – 2 hours per session
- 11 sessions
- Sequence of skills
  - Steering
  - Trimming sail
  - Heeling
  - Reading the wind
  - Points of sail
  - Sailing on a course
    - Tacking and jibing
    - With buoys
  - Race-course
- Learning a new “language”
- Instructors:
  - 1 Certified Instructor with US Sailing Association
  - 1 Certified and Licensed in Recreational Therapy
Data Analyses

For the quantitative data, the participants’ scores (WHOQOL-BREF, Sailing Standards, Reach, Strength) and session assessment data will be analyzed using SPSS software.

Qualitative data will be analyzed using NVivo software. Various coding methods will be applied including Attribute Coding, Provisional Coding, In Vivo Coding, and Eclectic Coding (Saldaña, 2013).
Preliminary Findings

- Seven participants (to date) completed and passed the sailing standards (cognitive and physical/practical skills).

- All reported that the VRSS Program: Learning to Sail on Land contributed to their quality of life.

- Six (to date) qualify to move on to Phase II: Adapted Sailing Program on the water with a Martin 16.
Virtual Reality to Reality: Adapted Sailing Program

**Treatment Protocol**

- 2 hours per session
- 6 sessions
  - Session(s) for pre data collection and refresher in Bonny (VRSS)
  - 4 on the water
  - Session for post data collection
- Sequence of skills: knowledge and physical
  - Preparation on land
  - Reading the wind and weather
  - Navigation
  - Transferring with lift
  - Leaving and returning to dock
  - Steering and trimming sail
  - Heeling
  - Points of sail
  - Sailing on a course
    - Tacking and jibing with buoys
    - Olympic race-course
  - Practicing/immersion in “language”
- Instructors:
  - 1 Certified Instructor with US Sailing Association
  - 1 Certified and Licensed in Recreational Therapy
- Volunteers - LWSS
The Martin 16, *Roberta*: Pre-COVID-19
Sailing her to Little Washing Sailing School (LWSS)
Pamlico River, NC


Sponsor and Donor Recognition:

Virtual Reality Sailing Simulation Program
East Carolina University

The authors would like to recognize Norman Saunders and Shake-A-Leg of Miami as sponsors of the virtual reality sailing simulator.

Adapted Sailing Program
East Carolina University
Little Washington Sailing School in Washington, NC

The authors would also like to recognize the owners, Jon and Robin Kenney of the Martin 16 for donating its use with the Adapted Sailing Program.

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Thank you!

If you have any questions or comments about this presentation please contact us!

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