

**BRINGING NEW TECHNOLOGIES
TO POWER WHEELCHAIR
ASSESSMENT AND TRAINING**

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LEARNING OBJECTIVES

1. The participant will be able to describe limitations of traditional power mobility assessment and training.
2. The participant will be able to describe how Virtual Reality can be used as a power wheelchair assessment and training tool.
3. The participant will be able to describe how Power Wheelchair Apps can be used as a power wheelchair assessment and training tool.



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WHAT WE WILL BE COVERING TODAY:

- Definitions
- VR in Rehab
 - Research
- The Problem
 - Limitations in Power Wheelchair Evaluation and Training
- Some Cutting-Edge solutions
 - Virtual Reality
 - Apps




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DEFINITIONS

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WHAT IS VIRTUAL REALITY?

- A realistic three-dimensional image or artificial environment that is:
 - created with a mixture of interactive hardware and software, and
 - presented to the user in such a way that the any doubts are suspended and it is accepted as a real environment
 - in which it is interacted with in a seemingly real or physical way.




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DEFINITIONS

- Real World
 - What we experience throughout our day
 - Our lives are becoming more 'virtual' – online banking, webinars, etc.




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DEFINITIONS

- Virtual World
 - Synthetic environments
 - Computer generated
 - Not limited by laws of physics
 - Viewed on monitor or head mounted display (HMD)



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DEFINITIONS

- Virtual Environments
 - Non-Immersive
 - Mixed
 - Immersive



Non-Immersive



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DEFINITIONS

- Virtual Environments
 - Non-Immersive
 - Video games
 - Wii games
 - Robotics



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DEFINITIONS

Pokemon Go



- Virtual Environments
 - Mixed
 - Augmented Reality - *Pokemon Go, HoloLens, CAVE
 - Adds digital images on top of real images
 - Augmented Virtuality - *Playstation Eyetoy, IREX VR system
 - Images of real world placed in virtual environment

Playstation Eyetoy



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DEFINITIONS

- Virtual Environments
 - Immersive
 - What we are addressing today!




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Lack of standardized terminology

Make sure you are clear what type of technology is actually being used

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WHAT IS INCLUDED?

- Current systems typically use a VR Headset
- Display includes gyroscopes and motion sensors which track head, hand and body positions
- Stereoscopic display
- Processor



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VIRTUAL REALITY HISTORY

- VR started in the 1970s
- Started in:
 - Medicine
 - Flight simulation
 - Automobile design
 - Military training



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VIRTUAL REALITY THROUGH THE YEARS

- 1990s
 - Consumer headsets, primarily for gaming
- By 2016, over 200 companies developing VR products, applications expanding



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QUESTIONS?



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VR IN REHAB & RESEARCH

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VR IN THE HEALTHCARE SETTING

- VR is being used in hospital settings to help with pain and alleviate anxiety.

- "Virtual reality has the power to ease the pain of chemotherapy treatment, create a seamless environment for physical therapy exercises, and train children with ADHD to focus their attention"

VRHealth CEO Eran Orr



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VIRTUAL REALITY FOR STROKE REHABILITATION

- The use of virtual reality and interactive video gaming may be beneficial in improving upper limb function and ADLs when used as an adjunct to usual care
 - to increase overall therapy time or
 - when compared with the same dose of conventional therapy



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- Most clinical evidence for VR in improving:
 - Pain
 - PTSD
 - Anxiety

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VIRTUAL REALITY, REHAB & RESEARCH

- Much of the VR Research has been based on non-immersive environments
 - Xbox Kinect or Wii
- Small groups
- Heterogeneous groups
- Lack of consistent interventions



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What's the bottom line?

1. Not clear which characteristics of VR are most helpful yet
2. Goal is more important than the Tool
3. VR is an adjunct to assessment and therapy

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TOOLS FOR THE CLINIC

- Expanding applications
- Including use for power wheelchair assessment and training



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VR AND PWC ASSESSMENT & TRAINING



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PAST ATTEMPTS

- In the past, computer programs and joysticks were used to assess and train PWC readiness
- This 2D activity did not translate over well to actual wheelchair driving



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VR AND POWER MOBILITY

- Research on the use of VR specifically for PWC assessment and training has strong results
 - Cooper, et. al. (2002) concluded that PWC performance in the virtual environment was representative of driving ability in the real environment.
 - Other studies have concluded that VR could potentially be used to complement PWC mobility training
 - Archambault, et. al (2012)
 - Cooper, et. al (2005)
 - Harrison, et. al (2002)



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Someone who has never had mobility experiences

Someone who has lost mobility

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QUESTIONS?



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THE PROBLEM

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VR IN THE POWER ASSESSMENT PROCESS

- Time Management
- Documented Results
- Controlled Environment
- Unlimited practice time



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TYPICAL PWC ASSESSMENT

Challenges:

- Access to PWCs that support positioning and access needs
- Large area to house equipment and trial the PWC
- Weather!



VR Possibilities:

- Client can remain in current mobility base and seating system
- Less physical space required
- Driving method can be attached to the MWC



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TYPICAL PWC TRAINING

Challenges:

- Space limitations
- Environmental access
- Adequate supervision



VR Possibilities:

- Begin in a virtual introductory setting
- Move through various environments of increasing complexity
- Frequent practice opportunities, even with less supervision



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THE SOLUTIONS

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- These cutting edge solutions can, and should, be combined with more traditional strategies
- VR specific considerations
- The future

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COMBINING VR AND TRADITIONAL APPROACHES

- Assessment
 - The client should be given the opportunity to drive an actual PWC in the real environment with appropriate postural support and an optimal driving method before final equipment recommendations are made.




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COMBINING VR AND TRADITIONAL APPROACHES

- Training
 - VR and traditional mobility training strategies can be used in combination to enhance results.
 - Progression
 - Multi-modality




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VR CONSIDERATIONS

- Cognitive Immersion
 - Loss of connection with the outside world
 - Acceptance of virtual world
- The brain is tricked into thinking this is now reality



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VR CONSIDERATIONS

- Physiologic Immersion
 - Physiologic response
 - i.e. heart rate
- As the body thinks this is the new reality, the body reacts accordingly



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VR CONSIDERATIONS

- Reduction in Pain
 - Research has shown that this 'distraction' actually reduces pain in many people



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VR CONSIDERATIONS

- Older patients often have a difficult time adjusting to new technologies.
- Since they can be reticent about using VR, providers must be sure to introduce it in the right manner



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THE FUTURE OF VR IN COMPLEX REHAB

- As technology continues to advance, clients, caregivers, and other team members may be more open to using VR and even embrace this technology



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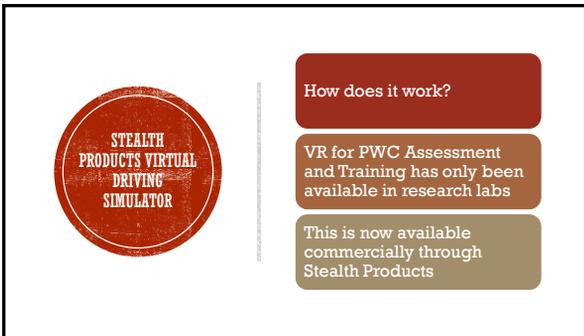
QUESTIONS?



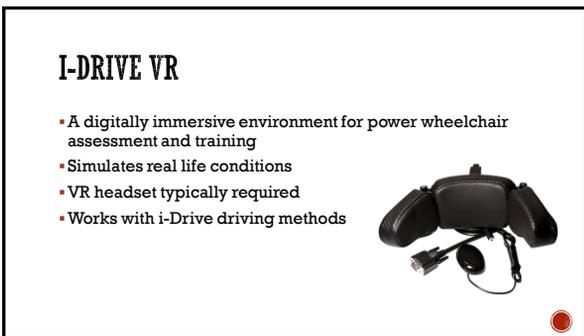
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VIDEO INTRODUCTION



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SOME TIPS...

- Allow time for the user to accommodate to reduce motion sickness



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SOME TIPS...

- If the user cannot tolerate the goggles for any reason, just use the display
 - Still provides a sense of movement
 - May not be as intense
- If the user cannot tolerate the physical goggles



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SOME FEATURES

'Distractions' are added to the environments at higher levels

VR can be used to maintain or increase skills while waiting for PWC funding approval and delivery

Updates provided through remote software downloads

Data tracking
• Based on Wheelchair Skills test

Record a session and play back to analyze



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LEVEL 1

- Basic Driving
 - Large gym
 - Few distractions and obstacles
 - Allows driver to accommodate to the VR experience and begin simple PWC movement
 - Progress to tasks with cones, driving between lines, and turning



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LEVEL 2

- Outdoor Driving
 - Outdoor wooded trail
 - The driver can safely explore the environment
 - Provides sense of movement over varied terrain



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LEVEL 3



- Living Quarters
 - Closed area experience
 - Simulates challenges in a home
 - Navigate through rooms, hallways, between furniture, and through doorways
 - Practice positioning a PWC close to objects to be transferred to
 - More challenging tasks and distractions
 - Changes in speed, lighting, special perception, distance, and sound



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Demonstration

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DEMONSTRATION



LET'S TAKE A LOOK AT
LEVEL 1



VOLUNTEER PLEASE!



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DEMONSTRATION



LET'S TAKE A LOOK AT
LEVEL 2

VOLUNTEER PLEASE!



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DEMONSTRATION



LET'S TAKE A LOOK AT
LEVEL 3

VOLUNTEER PLEASE!



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QUESTIONS?



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VR PACKAGE OPTIONS

- VR Basic
 - PC and VR Headset
- VR Joystick
 - Adds I-Drive Assessment Interface and joystick
- VR Proximity
 - Adds I-Drive Assessment Interface and Proximity Sensors
- VR Complete
 - Adds I-Drive Assessment Interface, Head Array, Sip 'n Puff, Fiber Optic sensors, Proximity sensors, Joystick, Mechanical Switches and Mounts



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POWER MOBILITY RELATED APPS

- Stealth Products Loonz



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LOONZ

- App that allows the client to play games through the driving method
- Can connect iDrive 4.0 driving method to a manual wheelchair and connect to an iPad through Bluetooth
- Portable rechargeable battery pack



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LOONZ

Clinical Advantages

- Allows a current PWC driver to play games through an i-Drive driving method for recreation
- Provides training in the motor skills required for that driving method
- Can be used 'off chair' with a battery pack to allow training and play without a power wheelchair



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LOONZ

The Specs:

- Works with any I-Drive controls
- 16 stage game that increases in difficulty
- Collects data to track progress
- Rewards for progress
- Programming for some features
- App available on Windows or Apple
- Wireless (BT)



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LOONZ!



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LOONZ DEMO

- Volunteer Time!



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QUESTIONS?



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THANKS!



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VR WEBLINK

- www.iDrive-vr.stealthproducts.com
- Sign-up for a demo



GET A FREE i-DRIVE VR SHIRT WHEN YOU SIGN UP FOR DEMO*

SIGN UP FOR AN IN-SERVICE DEMONSTRATION

SIGN ME UP FOR A DEMO



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