Future Directions for Virtual Rehabilitation: Science and Clinical Care

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Disclosures

- No personal disclosures

- The view(s) expressed herein are those of the author(s) and do not reflect the official policy or position of Brooke Army Medical Center, Navy Medical Center San Diego, Naval Health Research Center, Walter Reed National Military Medical Center, the U.S. Army Medical Department, the U.S. Army Office of the Surgeon General, the Department of the Army, the Department of the Navy, the Department of Defense, the Department of Veteran’s Affairs, or the U.S. Government.

- All person’s presented within have given their expressed written consent to be filmed and/or photographed.
Future for Virtual Rehabilitation

Clinical needs:
Disorders, Impairments, Limitations, Restrictions, Environmental/Personal Factors

Virtual Rehabilitation

Clinical Techniques

ADVANCEMENTS
Clinical Needs

Return 2: Community, Duty, Sports, Home, Work, Gaming

Mike Dreyer, of Manalapan, with the Wounded Warrior Amputee softball team, delivers a pitch during a game against the New Jersey Amateur Baseball League at Billian Field in Bound Brook. (Photo: MARY IUVONE/CORRESPONDENT)
Technology: Components

Microsoft’s HoloLens. Image source: Microsoft

https://i.ytimg.com/vi/qh2UdRKNqH4/0.jpg


www.engadget.com/2013/06/03/araig/
Technology: Costs

- Google Cardboard VR...
  - 3rd party: $9.99
  - eBay

- DIY VR 3D Cardboard VR...
  - 3rd party: $4.35
  - eBay
  - GearBest

- Google Cardboard VR...
  - 3rd party: $26.33
  - Newegg.com

- HTC Vive
  - $799.00

- Head-mounted Google Cardboard VR...
  - 3rd party: $23.50
  - EachBuyer.com

- Google Cardboard VR...
  - 3rd party: $2.03
  - eBay

- EACE Center of Excellence
Technology: Accessibility

Technology: Interfaces

http://i.kinja-img.com/gawker-media/image/upload/s--xpvtlHkW--/d7ikecvtxbxcfcvzh.gif
Clinical Techniques: New?

http://www.vrpain.com/

https://www.pinterest.com/pin/408912841147406922/
Clinical Techniques: New!

Targeted Muscle Reinnervation

www.dvice.com

How to Communicate your Care/Research?

- The VR applications **did not** provide skilled care.
- The VR applications **are tools** built by a multi-disciplinary team based on clinical evidence, and implemented by skilled professionals.

“**The Effect of Wii Game Play on Fall-Risk Older Adults**”

Or

“**The Effect of Dynamic Balance Training for Fall-Risk Older Adults using Interactive Game Play**”
Clinical Techniques: Technology-agnostic

**Evolution of Home Video Game Systems**

A timeline of multimedia history “highlights”

https://www.pinterest.com/creativecripple/history-of-gaming/
Virtual Rehabilitation: Tele-Rehab
Individualized physical rehab delivered via a high quality action video game.
Virtual Rehabilitation: Outcomes

http://www.vrphysio.com/
Virtual Rehabilitation: Coaches

http://www.stalbertgazette.com/article/Virtual-Reality-gets-real-20150930
Virtual Rehabilitation: Multi-player & Social

[Image of people running on a gym floor]

[Image of virtual reality headset and a virtual environment]


Virtual Rehab Market

http://biogaming.com
http://gamesthatmoveyou.com/
http://www.hocoma.com
Translation into Clinical Practice

• Evidence-based practice (Smart Consumer)

• VR-based rehabilitation research is ongoing with the intent on translating findings into clinical practice.

• Questions being asked:
  – What is the efficacy of these VR-based rehab techniques?
  – What are the key components of these techniques?
  – Can they be ported to low-cost clinically accessible technologies?
  – How much immersion is necessary for ecological validity?
  – How to bill for reimbursement when using VR?
Translation Challenges

Courtesy of the CFI MPL; Translation by Wendy Powell, University of Portsmouth
Translation Challenges
Translation Challenges

CFI MPL  VR Translate Testing - CAREN Control

Courtesy of the CFI MPL
Translation Challenges

CFI MPL  VR Translate Testing - Cardboard Fixed View No Pert

Courtesy of the CFI MPL
Virtual Reality & Readiness

www.defense.gov/multimedia/

https://www.vrbound.com/guides/parents-virtual-reality

Courtesy of the CFI MPL
Reality

Resources

A Society for Professionals in Virtual and Tele-Rehabilitation

http://isvr.org/
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BADER CONSORTIUM
Bridging Advanced Developments for Exceptional Rehabilitation

CRSR
Center for Rehabilitation Sciences Research

NATIONAL INSTITUTES OF HEALTH

EACE
Extremity Trauma and Amputation Center of Excellence

TATRC
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