Virtual Reality is a Reality – and It’s Helping (Chronic Pain) Patients Right Now

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Non-disclosure

- President of Virtual Reality Medical Center
- CEO of Interactive Media Institute, a 501c3 non-profit

Flying Video
HRV and Respiration

Still To Add In

- Atlantic Article - patient stories
- Acute, chronic, pre-post surgery stories
- Intersperse data
- Indigenous
- Chronic pain - PT rehab - VR-enhanced integrative care model

In 2018, VR turns 50...
1996: 1st Randomized Controlled Clinical Trial: VR for Fear of Flying

- VR plus Biofeedback was Superior in the Short-Term

### Behavioral Outcome

#### 3 Month Follow-Up

- VR plus Biofeedback was Superior in the Short-Term

#### 3-Year Follow-Up

- VR plus Biofeedback was Superior in the Long-Term
VR continues to evolve...

2014 - Facebook acquires Oculus for $2 billion

Why is VR a superior medium for exposure therapy?

• Not dependent upon patients' imagery abilities.
• Provides a structured environment.
• Visual and auditory stimuli.
• Can "over learn" skills.
• Done in the therapist's office.
• Confidential.
• Less time consuming.
• Less expensive.
• Safer.

Safety & Reliability Issues

Possible Side Effects
• Cybersickness (Simulator Sickness)
• Headache
• Eye strain
• Blurred vision
• Dizziness
• Nausea

Possible Contraindications
• Epilepsy
• Severe Depression or other psychiatric disorders
• Alcohol or drug abuse
• Pregnancy

Safe in TBI
2006: ONR-Funded PTSD Study
1st Randomized Controlled Clinical Trial

PILOT STUDY

CONTROLLED TRIAL

>30% improvement on the CAPS

VR Group

TAU

VR Recreates Sights & Sounds

In Theatre PTSD Systems: More Effective

- 86% success rate
Results

• Lower anxiety and pain after undergoing VR treatment.
• Decrease in physiological measurements of pain and anxiety.
• VR distraction may be beneficial for patients with mild to moderate fear and anxiety associated with dental treatments.

MRI/Claustrophobia

(7) ISO 13485 VR Worlds
(below is Enchanted Forest)

Dream Castle
Magic Cliff

Icy Cool World

Reduction of Pre-surgical Anxiety with Mobile VR

Same clinically validated technology developed for HMD

- Less Immersion
- Less interaction
- Positive Results

- n = 27
- Feasibility of VR scenarios to reduce discomfort in patients during ambulatory and obstetric surgeries.

Results (2006)

- Reduction of discomfort
- Patients using VR reported higher well-being on the pain scale (HMD VR = 7.25 vs. No VR = 3.12).
- 75% reduction of medication used


Laparoscopic Surgery with Regional Anesthesia
Epidural/Spinal Block

Upper Gastrointestinal Endoscopy

Gastrointestinal Surgery

- n = 115
- 56 patients local anesthesia and VR
- 59 patients local anesthesia only.
115 Patients during Upper GI Endoscopy

Subjective & Objective Results

Labor and Delivery Suite
Recovery Room Post Caesarean Section

VR Pain Distraction During Colposcopy (n=45)

- VR group = 21
- Control = 24
- Heart Rate
- VAS
- VR administered before, during, and after procedure.

Results

![Graph showing change in pain and HR decrease]
VR for Pain Management in Cardiac Surgery

- n = 67
- Patients navigated through pain distraction worlds for 30 minutes.
- Pre and post-op vital signs and Likert scale pain ratings.

VR Therapy Post Cardiac Surgery

MEASURES AND RESULTS

- Mean Arterial Pressure
- Respiration Rate
- Heart Rate
- Oxygen Saturation

- 88% of all participants reported reduced pain levels.
- Correlations of physiological responses and Likert ratings are presented below.
Using Cybertherapy to Reduce Postoperative Anxiety in Cardiac Recovery Intensive Care Units

- n = 22
- Using VR to reduce postoperative distress in patients who recently received cardiac surgery.
- Patients navigated through relaxation world.

Results

- 21 of 22 subjects reported less discomfort after navigating through the virtual environment.

![Graph showing heart rate and pain level comparison before and after VR therapy.]


Pre/Post Cardiac (n=22)

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10/11/17
Study of gender differences in VR response following cardiac surgery.

- n = 22 (7 females, 15 males)
- All patients underwent cardiac surgical interventions.
- Each patient received virtual reality relaxation before and immediately after their surgical procedure.
- Researchers investigated VR as a method to reduce stress, anxiety, and pain.


Results

- Heart rate, breathing rate, and Likert scale ratings all showed decreases in both males and females.
- Overall, the results demonstrate the efficacy of VR treatment and the safety of the method and detection of differences in the responses based on gender.

Ancient Acropolis
OBJECTIVE

The main objective of this study is to determine if VR enhances the effectiveness of traditional somatic body imagery techniques to alter the perception of chronic pain (Figure 1).

Figure 1. Photograph of Dr. Stetz and SPC Nelson testing the system in the Tripler's Psychology Laboratory.
METHODS

- Participants (n = 37) were persons who had chronic pain and who had signed an informed consent form.
- There were 3 modes of treatment: (1) live therapist guided imagery or “Standard”; (2) audio recorded guided imagery or “Audio”; and (3) audio recorded guided imagery in “VR.”
- The script was the same for all three conditions.
- The relaxing zone used for the VR condition was “Shell Island.”

RESULTS - cont.

Finally, figure 8 shows that the highest hand temperatures (suggesting more relaxation) was in the VR condition, followed by the Audio and Standard conditions.

VR in Pain Self Management

- Acute Pain
  - Distraction - Absorbing into the moment/away from pain
  - Involvement & Immersion

- Chronic Pain
  - Education
    - If you have less pain being absorbed in the VR, then what happens when you increase your ADL?
  - Skills training
    - Relaxation/Visualization
    - Paced Breathing
    - Attentional Retraining
Virtual Reality Pain Distraction in Chronic Pain Patients

- This study explored virtual reality as an adjunctive therapy to treat chronic pain.
- n = 40 patients aged 22-68 years
- All patients experienced moderate to severe average daily pain.
  - Average pain intensity score = 4 (0 = no pain, 10 = worst possible pain).

Chronic Pain (n=40)

Mean pain ratings exhibited over a fourfold decrease when participants were exploring the Icy Cool World.

Mean skin temperature was significantly higher during the Icy Cool World session.

Taking the Show on the Road
Mobile devices as adjunctive pain management tools.

- n = 31
- This study explored the use of mobile phones as platforms to administer virtual reality pain distraction.

VR Mobile Phone Study

31 Patients with Chronic Pain

VR Mobile Phone Study

20 Patients with Chronic Pain

Reduction in Pain Intensity
Cell Phone (p < 0.001)
HMD (p < 0.001)

Higher Skin Temperature (p<0.0001)
for both conditions.
Postsurgical and Stroke/Injury Rehabilitation Game System (RGS)

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Further Resources

www.cybertherapyandrehabilitation.com  www.interactivemediainstitute.com

Other Considerations

• Cybersickness
• Weight
• Overheating
• Immersiveness
Samsung Recall

Wired or Wireless