Virtual Iraq: Virtual Reality Exposure Therapy for OIF/OEF PTSD

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VRPSYCH Lab
Institute for Creative Technologies, Dept. of Psychiatry & School of Gerontology

Full Spectrum VR Exposure Therapy for Iraq War PTSD

Skip Rizzo, Barbara Rothbaum, JoAnn Difede, Greg Reger, Josh Spitalnick, Ken Graap, CPT. Rob McLay, CDR. Scott Johnston, Jeff Pyne, Karen Perlman, Robert Deal, Jarrell Pair, Tom Parsons, COL. Mike Roy, COL. Greg Gahm & CDR. Russell Shilling

USC-Institute for Creative Technologies, Emory University, Weill Medical College at Cornell, NMCSD, Virtually Better, Inc., WRAMC, MAMC-Ft. Lewis

Full Spectrum VR Exposure Therapy for Iraq War PTSD
Talk Outline:

- Introduction to Clinical VR
- Exposure Therapy
- Virtual Iraq Exposure Therapy for Post Traumatic Stress Disorder
- Dr. Thomas Parsons on Cognitive Testing with Virtual Iraq
Skip Rizzo, Thomas Parsons, Belinda Lange, Sheryl Flynn, Patrick Kenny, Luke Yeh, John Brennan & Brad Newman

Anxiety Disorders/PTSD

Motor Function Assessment & Rehabilitation

Virtual Patient Clinical Training

VRPSYCH Lab Project Areas

Cognitive Assessment and Rehabilitation

VR Games to Motivate Motor Rehabilitation

VR Games Pain Distraction Project

Virtual Patients to Teach Clinical Skills

And one more...

VR Pain Distraction and Discomfort Reduction
Virtual Reality integrates realtime computer processing, body tracking and interface devices, sensory displays to immerse a participant in a computer generated simulated environment. Within such controllable, dynamic and interactive 3D stimulus environments, behavioral action can be recorded and measured.

“...a way for humans to interact with computers and extremely complex data in a more naturalistic fashion.”
The Evolution of the Tool-Using Animal

Virtual Reality as a Simulation Technology

To Test and Train Piloting Ability

1st Link Aviation Simulator (1929)

To Assess and Rehabilitate Cognitive, Psychological, & Motor Functioning

Virtual Reality (2009)

And note that a Meta Analysis of Aviation Simulation Research indicates a “Transfer Effectiveness Ratio” of .48 (Johnston, 1995).
Types of Virtual Realities

- Gaming Applications
  - Flatscreen VR
  - Panoram Tech 3-Screen Desktop
- Veridian System Interface for Retraining Driving Skills following Spinal Cord Injury (Collab w/Kessler Rehab.)

Design by: Rizzo, Klimchuk & Mitura
Auto-stereoscopic 3-D Display (courtesy of Dimension Technologies Co.)

18.1" LCD display, Resolution: 1280 x 1024

Sharp Autostereoscopic Display with Stroke Patient

Consumer Stereo Capable Screens

CAVE 3-D large volume display (Fakespace Co.)

$2,000

Head Mounted Displays (HMD)
Head Mounted Displays (HMD)

KEY ELEMENTS
- Immersion
- Interactivity
KEY ELEMENTS
- Immersion
- Interactivity
KEY ELEMENTS

- Immersion
- Interactivity
“Virtual reality arrives at a moment when computer technology in general is moving from automating the paradigms of the past to creating new ones for the future” (Myron Krueger, 1993)
VR Exposure for Anxiety Disorders

- Heights
- Flying
- Driving
- Spiders/snakes
- Public Speaking
- Claustrophobia
- Generalized Social Phobia
- Panic Disorder with Agoraphobia
- Post Traumatic Stress Disorder

Hodges/Rothbaum
North
Previ
Riva
Hoffman
Midtown Madness
Hodges/Rothbaum
Emmelkamp
KIM
The aim of exposure is to help the patient to confront the feared stimulus in order to correct the dysfunctional associations that have been established between the stimulus and perceived threat (e.g., it is dangerous, I can’t cope).

**VR Exposure for Anxiety Disorders**

- Exposure to feared stimulus repeatedly and for prolonged period leads to habituation and extinction
- Based on learning/conditioning principles
- Reliable findings with animals and simple phobic disorders
- Prolonged Imaginal Exposure
Fear of Heights

Research Studies

  - 9 participants
  - 17 undergraduate students
- Büllinger (1997)
  - VR vs. In vivo
- Huang (1998)
  - VR vs. In vivo
- Emmelkamp, Krijin, Schuemie (1999)
  - VR vs. In vivo
- Kim, Jang, & Choi (1999)
- Wiederhold (2000)
- Schuemie (2002)
Fear of Heights... Success Stories!

  - 9 participants
  - 17 undergraduate students
- Bullinger (1997)
  - VR vs. In vivo
- Huang (1998)
  - VR vs. In vivo
- Emmelkamp, Krijin, Schuemie (1999)
  - VR vs. In vivo
- Kim, Jang, & Choi (1999)
- Wiederhold (2000)
- Schuemie (2002)
Fear of Heights
(Rothbaum and Hodges)

Modeled from the
Glass Elevator in the
Atlanta Marriott
Fear of Heights Exposure Therapy
*Using Unreal Tournament Game Engine*

(Bouchard et al., 2003)

VR Claustrophobia Application

(Botella et al., 1997)
VR Anxiety Disorders Meta-Analysis

Review
Virtual reality exposure therapy for anxiety disorders: A meta-analysis
Mark B. Powers*, Paul M.G. Emmelkamp
University of Nijmegen, Nijmegen
Received 3 March 2007; revised 9 April 2007; accepted 30 April 2007

Abstract
This is a review of the literature investigating virtual reality exposure therapy (VRET) as a valid treatment option for anxiety disorders. In the meta-analysis, we provide effect size estimates for virtual reality treatment compared to waitlist control and other treatments. A comprehensive search of the literature identified 25 studies in which VRET was used as the treatment condition. Overall, VRET was found to be more effective than waitlist control and other treatments. This finding was consistent across a variety of anxiety disorders, including specific phobias, panic disorder, and social phobia. These results suggest that VRET is a useful treatment option for anxiety disorders. However, further research is needed to determine the long-term effectiveness of VRET and to identify predictors of treatment outcome.

Affective outcomes of virtual reality exposure therapy for anxiety and specific phobias: A meta-analysis
Thomas D. Powers*, Albert A. Rizzo
University of Southern California, Los Angeles, CA 90089-0746, USA
Received 20 December 2006; revised 6 July 2007; accepted 20 July 2007

Abstract
Virtual reality exposure therapy (VRET) is an increasingly common treatment for anxiety and specific phobias. To date, there is a need for quantitative meta-analyses that provide a systematic and comprehensive assessment of the effectiveness and clinical utility of VRET. The purpose of this meta-analysis was to evaluate the efficacy of VRET for anxiety and specific phobias. A comprehensive literature search was conducted, and studies were included if they met predefined criteria. The results of this meta-analysis suggest that VRET is an effective treatment for anxiety and specific phobias. However, further research is needed to determine the long-term effectiveness of VRET and to identify predictors of treatment outcome.

Keywords: Virtual reality, exposure therapy, anxiety, specific phobias

* Corresponding author.
VR Anxiety Disorders Meta-Analysis

<table>
<thead>
<tr>
<th>Domain</th>
<th>Average Random Effect Size</th>
<th>Effect Size Variance</th>
<th>95% CI Lower</th>
<th>95% CI Upper</th>
<th>t</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTSD</td>
<td>0.94</td>
<td>0.01</td>
<td>0.78</td>
<td>1.10</td>
<td>0.42</td>
<td>0.18</td>
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<tr>
<td>Social phobia</td>
<td>0.96</td>
<td>0.10</td>
<td>0.34</td>
<td>1.59</td>
<td>0.43</td>
<td>0.19</td>
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<tr>
<td>Acrophobia</td>
<td>0.92</td>
<td>0.12</td>
<td>0.25</td>
<td>1.59</td>
<td>0.42</td>
<td>0.18</td>
</tr>
<tr>
<td>Aerophobia</td>
<td>0.93</td>
<td>0.06</td>
<td>0.44</td>
<td>1.43</td>
<td>0.42</td>
<td>0.18</td>
</tr>
<tr>
<td>Panic disorder with agoraphobia</td>
<td>1.79</td>
<td>0.02</td>
<td>0.52</td>
<td>2.06</td>
<td>0.67</td>
<td>0.44</td>
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<tr>
<td>Claustrophobia</td>
<td>1.75</td>
<td>0.07</td>
<td>1.23</td>
<td>2.26</td>
<td>0.66</td>
<td>0.43</td>
</tr>
<tr>
<td>Anxiety Total</td>
<td>0.96</td>
<td>0.02</td>
<td>0.68</td>
<td>1.25</td>
<td>0.43</td>
<td>0.19</td>
</tr>
</tbody>
</table>

Note: All reported random effect sizes reflect large effects for VRET on decrease of negative affective symptoms. PTSD = Post-Traumatic Stress Disorder. % = percent of variance accounted for by VRET. The average weighted effect sizes were calculated for each of the six affective domains and on overall affective effect size (Anxiety Total). This involved combining the standardized effect sizes within each affective domain (within and across domains for Anxiety total) into a composite mean weighted effect size, and examining each domain’s significance. Total N= 266.


VR Exposure for Anxiety Disorders

- Heights
- Flying
- Driving
- Spiders/snakes
- Public Speaking
- Claustrophobia
- Generalized Social Phobia
- Panic Disorder with Agoraphobia
- Post Traumatic Stress Disorder
Post Traumatic Stress Disorder (DSM-4-TR) is caused by exposure to traumatic events that are outside the range of usual human experiences such as military combat, violent personal assault, being kidnapped or taken hostage, terrorist attack, torture, incarceration as a prisoner of war, natural or man-made disasters, automobile accidents, or being diagnosed with a life-threatening illness.

The disorder also appears to be more severe and longer lasting when the event is caused by human means and design (bombings, shootings, combat, etc.).
Post Traumatic Stress Disorder

**General symptoms**

- Re-experiencing (nightmares/flashbacks/intrusions)
- Avoidance
- Emotional Numbing
- Hyper-arousal

"...The percentage of study subjects whose responses met the screening criteria for major depression, generalized anxiety, or PTSD was significantly higher after duty in Iraq (15.6 to 17.1 percent) than after duty in Afghanistan (11.2 percent) or before deployment to Iraq (9.3 percent)" (Hoge et al., 2004)
And more recently...

The Iraq War Comes Home
A Pentagon survey of returning U.S. soldiers finds many traumatized by the occupation
By MARK THOMPSON

The Iraq war is coming home, with more than one of every four returning vets complaining of mental or physical wounds caused by the conflict. The first time the U.S. went to war with Iraq, in 1991, ground combat lasted precisely 100 hours, but its impact on the U.S. troops who waged it, including physical and mental scars, was ignored and belittled by the Pentagon hierarchy for years. This time, with the war going much worse for U.S. forces, the Pentagon is paying much closer attention to the invisible wounds combat is leaving on soldiers.

Veterans Report Mental Distress
About a Third Returning From Iraq Seek Help
By Shankar Vedantam
Washington Post Staff Writer
Wednesday, March 1, 2006; Page A01

More than one in three soldiers and Marines who have served in Iraq later sought help for mental health problems, according to a comprehensive snapshot by Army experts of the psyches of men and women returning from the wars in Iraq, Afghanistan and other places.

Mental Health Problems, Use of Mental Health Services, and Attrition From Military Service After Returning From Deployment to Iraq or Afghanistan

Charles W. Hoge, MD
Jennifer L. Audet-Burk, MS
Charles S. Milliken, MD

Contact: The US military has conducted population-level screening for mental health problems among all service members returning from deployment to Afghanistan, Iraq, and other locations. To date, no systematic analysis of this program has been conducted, and studies have not assessed the impact of these deployments on mental health care utilization after deployment.
Veterans with Post-Traumatic Stress Disorder (PTSD)

More than 200,000 veterans were listed by the VA in 2005 as having PTSD as a service-connected disability.

<table>
<thead>
<tr>
<th>Period</th>
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<tbody>
<tr>
<td>Pre-WWII</td>
<td>-</td>
</tr>
<tr>
<td>WWII</td>
<td>25,278</td>
</tr>
<tr>
<td>Korea</td>
<td>10,944</td>
</tr>
<tr>
<td>Vietnam</td>
<td>179,713</td>
</tr>
<tr>
<td>Gulf War</td>
<td>19,356</td>
</tr>
<tr>
<td>Peacetime</td>
<td>9,087</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>244,846</strong></td>
</tr>
</tbody>
</table>

Overall Mental Health diagnoses = 31%

**Background:** Veterans of Operations Enduring Freedom and Iraqi Freedom (OEF/OIF) have endured high combat stress and are eligible for 3 years of free military service-related health care through the Department of Veterans Affairs (VA) health care system. Yet little is known about the burden and clinical circumstances of mental health diagnoses among OEF/OIF veterans seen at VA facilities.

**Methods:** US veterans separated from OEF/OIF military service and first seen at VA health care facilities between September 30, 2001 (US invasion of Afghanistan) and September 30, 2009, were included. Mental health diagnoses and psychosocial problems were assessed using International Classification of Diseases, Ninth Revision, Clinical Modification codes. The prevalence and clinical circumstances of and subgroups at greatest risk for mental health disorders are described herein.

**Results:** Of 103,788 OEF/OIF veterans seen at VA health care facilities, 34,950 (33%) received mental health diagnoses; 50% of whom had 2 or more distinct mental health diagnoses. Overall, 33,010 (31%) received mental health and/or psychosocial disorders. Mental health diagnoses were detected soon after the first VA clinic visit (median of 13 days), and most initial mental health diagnoses (60%) were made in somatic psychology clinics, mostly primary care settings. The youngest group of OEF/OIF veterans (age, 18-24 years) were at greatest risk for receiving mental health or posttraumatic stress disorder diagnoses compared with veterans 40 years or older.

**Conclusions:** Co-occurring mental health diagnoses and psychosocial problems were detected early in primary care medical settings in a substantial proportion of OEF/OIF veterans seen at VA facilities. Targeted early detection and intervention beginning in primary care settings are needed to prevent chronic mental illness and disability.

Ark Intern Med. 2007;167:476-482
 severity of PTSD symptoms

PTSD
Non-PTSD

CAPS Score - Symptom Severity

Assessment over Time

The aim of exposure is to help the patient to confront the feared stimulus in order to correct the dysfunctional associations that have been established between the stimulus and perceived threat (e.g., it is dangerous, I can’t cope).

Exposure Therapy Principles

- Exposure to feared stimulus repeatedly and for prolonged period leads to habituation and extinction
- Based on learning/conditioning principles
- Reliable findings with animals and simple phobic disorders
- One of the “Evidence-Based” PTSD approaches endorsed by DOD/VA/NAS and ISTSS treatment guidelines
- Prolonged Therapeutic Exposure
Exposure Therapy Principles

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The committee reviewed 53 studies of pharmaceuticals and 37 studies of psychotherapies used in PTSD treatment and concluded that because of shortcomings in many of the studies, there is not enough reliable evidence to draw conclusions about the effectiveness of most treatments. **There are sufficient data to conclude that exposure therapies** -- such as exposing individuals to a real or surrogate threat in a safe environment to help them overcome their fears -- **are effective in treating people with PTSD.**
Comparison between Exposure Therapy, Supportive Counseling and No Treatment on PTSD incidence (Bryant et al., 1999; 2005)
Of those diagnosed with Posttraumatic Stress Reaction at 30 Days Post

Comparison between Exposure Therapy, Supportive Counseling and No Treatment on PTSD incidence (Bryant et al., 1999; 2005)

Of those diagnosed with Posttraumatic Stress Reaction at 30 Days Post

Comparison between Exposure Therapy, Supportive Counseling and No Treatment on PTSD incidence (Bryant et al., 1999; 2005)
Post Traumatic Stress Disorder  Problems with Imaginal Exposure

Many patients are unwilling or unable to effectively visualize the traumatic event. In fact, avoidance of reminders of the trauma is inherent in PTSD, and is one of the defining symptoms of the disorder. Research on this aspect of PTSD treatment suggests that the inability to emotionally engage (in imagination) is a predictor for negative treatment outcomes (Jaycox, Foa, & Morral, 1998).

“...some patients refuse to engage in the treatment, and others, though they express willingness, are unable to engage their emotions or senses.” (Difede & Hoffman, 2002).

VR PTSD Examples

- Virtual Vietnam - Emory University
- World Trade Center - Weill Cornell Medical Center/U of Wash
- Terrorist Bus Bombing - U. of Haifa/U of Wash
- Motor Vehicle Accidents - Univ. of Buffalo
- Emma’s World - Universitat de València (Spain)
- Virtual Angola - U. of Lusófona de Humanidades e Tecnologias, Lisbon
- Virtual Iraq - USC Institute for Creative Technologies
In 1997, researchers at Georgia Tech released the first version of the Virtual Vietnam VR scenario for use as a graduated exposure therapy treatment for PTSD with Vietnam veterans. This occurred over 20 years following the end of the Vietnam War.
Virtual Vietnam PTSD Studies

- Ready et al. (1998) - Atlanta VA early pilot study
  - 34% decrease in clinician-rated PTSD symptoms
  - 45% decrease in self-rated PTSD symptoms
- Rothbaum et al. (1999) - case study + at 6-month FU
- Rothbaum et al. (2001) - open clinical trial (n=16)
“Virtually Healed” ... a Discovery Health Channel Documentary PTSD Segment

VR PTSD Example

• World Trade Center - Weill Cornell Medical Center/HIT-Lab, Univ. of Washington

Virtual Reality Exposure Therapy for Treatment of Acute World Trade Center PTSD: A case study

JoAnn Difede, Ph.D. and Hunter Hoffman, Ph.D.

Cornell-Presbyterian Hospital in New York and School of Medicine, University of Washington in Seattle

Thanks to Pfizer Pharmaceuticals
The Paul Allen Foundation for Medical Research
National Institutes of Health
Dell Computers
And www.3dcafe.com for a model of Manhattan.
Virtual WTC PTSD Studies

Waiting List Control Study Results:

- n = 17
- Active Treatment = Statistically and Clinically meaningful reduction in CAPS scores
- Five of nine successful patients showed no gain from previous “imaginal” exposure therapy


VR PTSD Example

- Terrorist Bus Bombing - U. of Haifa/U of Wash. HIT Lab
VR PTSD Example

- Terrorist Bus Bombing - U. of Haifa/U of Wash. HIT Lab

VR PTSD Example

- Motor Vehicle Accidents - Univ. of Buffalo
VR PTSD Example

- **Motor Vehicle Accidents** - Univ. of Buffalo
  - J. Gayle Beck - Randomized Clinical Trial in progress. Four observations at this point:
    - VR producing better outcomes than control
    - Motion platform enhances “engagement”
    - VR + adherence to CBT homework = better outcomes
    - **Therapist Skill in delivering trigger stimuli appears related to outcomes**

VR PTSD Example

- **Virtual Angola**
  - Pedro Gamito¹, PhD
  - Carlos Ribeiro², PhD
  - Luiz Gamito³, MD
  - José Pacheco³, MSc
  - Cristina Pablo³
  - Tomaz Saraiva¹

  Portugal - From 1961-1974 war on three fronts:
  - Mozambique
  - Angola
  - Guinea

  25,000 with Combat Related PTSD

¹Universidade Lusófona de Humanidades e Tecnologias, Lisbon, Portugal
²Militar Academy, Lisbon, Portugal
³Hospital Júlio de Matos, Lisbon, Portugal
VR PTSD Example

- Virtual Angola

Problems with “Flooding” approach in initial User Test with PTSD patient

EMMA Project

Engaging Media for Mental health Applications

Christina Botella, Universitat Jaume I, Castellon (Spain)
**EMMA’S WORLD:** An “OPEN VR SYSTEM”

**PURPOSE:** In this space the user can remember and relive past experiences, rest, recover, and commit to moving forward.

Botella et al., 2006

- Multiple Rear-Projected Display
- Wireless Joystick Navigation
EMMA’S WORLD:

A Clinician’s Interface to control Elements that are integrated into EMMA:

Types of Elements:
- 3D objects
- Videos
- Images
- Sounds
- Music
- Colours

The Living Book:
- Elements can be copied to the living book from the database screen.
- Different chapters can be added.
- Purpose: to help the user to re-live the past as it happens with family photographs and home videos.

EMMA’S WORLD: Case Study

- 33-year-old woman
- PTSD developed from an episode of physical aggression by her partner
- She was pregnant.
- After the aggression she decided to abort
OUTCOME MEASURES

Fear/avoidance of target-behaviours before and after therapy

BEHAVIOUR 1: having sexual relations with men

BEHAVIOUR 2: relating with men in general (friends, known people...)

BEHAVIOUR 3: seeing children

BEHAVIOUR 4: going out of home

DAVIDSON Trauma Scale scores

Hypothetical use of EMMA’s world for Iraq War PTSD
VR PTSD Examples

- Virtual Vietnam - Emory University
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- Emma’s World - Universitat de València (Spain)
- Virtual Angola - U. of Lusófona de Humanidades e Tecnologias, Lisbon
- Virtual Iraq - USC Institute for Creative Technologies

Virtual Iraq and now Virtual Afghanist
Full Spectrum Warrior
Game Conversion for Iraq War PTSD clients!

- Multiple Scenario Settings
- Selectable User Perspective Options
- Create Library of “Trigger” Stimuli
- Integrate Scent, Vibration and Phys. Props
- Create a Highly Usable “Wizard of OZ” Clinician Interface
- Integrate Physiological Recording into Clinician Interface

Major Goal: Customize Graduated Exposure based on Client Needs

Virtual Iraq
Global PTSD Requirements

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**Virtual Iraq**

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Major Goal: Customize Graduated Exposure based on Client Needs

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**Virtual Iraq**

Early Prototype of Virtual City
Virtual Iraq

Time of Day and Weather Controls

Night Vision
Virtual Iraq
City Building Interiors

Virtual Iraq
Desert Highway and Village
Virtual Iraq
Desert Highway Checkpoint

Virtual Iraq
Humvee Interior - Safe View
Virtual Iraq
Humvee Interior \textit{Action} View

Too Creepy for Therapy??
Virtual Iraq
Afghanistan-like Content now being added
Caveat: We need to guard against the perception that VR Tools are designed to eliminate the need for the Well Trained Clinician.

Challenges

So, Tell me about your mother?

- Scenario Settings
  - Location, Time of Day, Weather, etc.
- User Perspective
  - Alone, Patrol, HUMVEE, Helicopter, etc.
- Real-Time Psychophysiological Display
- TRIGGER Stimuli
Global FSW PTSD Requirements

Create a Highly Usable “Wizard of Oz” Clinician Interface

- The “Wizard of Oz” type clinical interface is a key element in the application, as it needs to provide a clinician with a usable tool for placing the user in VE locations that resemble the setting and context in which the traumatic events initially occurred.

- As important, the clinical interface must also allow the clinician to further customize the therapy experience to the patient’s individual needs of via the systematic real-time delivery and control of “trigger” stimuli in the environment.

- Visual Display of client’s FOV and psychophysiological status

- This is essential for fostering the anxiety modulation needed for therapeutic habituation.

“Wizard of OZ” Clinician Interface

- Wireless Tablet Option
"Wizard of OZ" Interface
Low Cost Accessible Display Technology

or

High Fidelity Wide FOV (approx. 150 degrees)??

(Bolas & Rizzo, 2008)
A non-intrusive Virtual Emotion Sensor that is worn much like a pair of glasses. The headset acquires several biometric signals such as EEG, Heart rate, blood oxygen, and motion and processes them in real time. The module is connected to a computer through a wireless link.
Current Research Activities

- User Centered Trials in **IRAQ** and Ft Lewis
  (Equipment funded by TATRC)
User-Centered Feedback from Iraq and MAMC-Ft. Lewis

- HMD comfort = 7.2/10
- Tracking update = 7.4/10
- Graphic realism = 6.7/10
- Audio realism = 7.2/10
- Navigation = 6.2/10
- Side effects = 3/27; 1DC
- Much useful qualitative feedback on architecture, olfactory cues, human content, landscape, etc.

Reger, Gahm, Rizzo, Swanson & Duma
Soldier Evaluation of the Virtual Reality Iraq
In Press: Telemedicine and E-Health

Current Research Activities

- User Centered Trials in IRAQ and Ft Lewis (Equipment funded by TATRC)
- Clinical Trials ongoing at the Ft. Lewis, San Diego Naval Med. Center, Camp Pendleton, Cornell Weill, Walter Reed AMC & Emory Univ. and 12 other military and VA Centers
Current Research Activities

- Clinical Version 1.6 to be Released Oct 2008

Open Clinical Trial Protocol
Naval Medical Center San Diego

- Session 1
  - Clinical interview to identify the index trauma, provide psychoeducation on trauma and PTSD, and instruction on a deep breathing technique for general stress management purposes.

- Session 2
  - Provide instruction on the use of Subjective Units of Distress (SUDS), the rationale for prolonged exposure (PE), including imaginal exposure and in-vivo exposure. First experience with imaginal exposure of the index trauma and in-vivo hierarchy exposure list was constructed with the first item assigned as homework.

- Session 3
  - Present rationale for VRET and have the participant experience the VR environment without recounting the index trauma narrative for approximately 25 minutes with no provocative trigger stimuli introduced. The purpose of not recounting the index trauma was to allow the participant to navigate Virtual Iraq in an exploratory manner and to function as a “bridge session” from imaginal alone to imaginal exposure combined with virtual reality.

- Sessions 4-10
  - Focus on engagement in Virtual Iraq while recounting the trauma narrative
Demographics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Treatment Completers</th>
<th>Treatment Completers</th>
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</thead>
<tbody>
<tr>
<td>Gender</td>
<td>n=20</td>
<td>n=20</td>
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<tr>
<td>Male</td>
<td>19 (95%)</td>
<td>19 (95%)</td>
</tr>
<tr>
<td>Female</td>
<td>1 (5.0%)</td>
<td>1 (5.0%)</td>
</tr>
<tr>
<td>Age</td>
<td>28.1 (sd=8.4)</td>
<td>28.1 (sd=8.4)</td>
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<tr>
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<td>14 (70%)</td>
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<td>Divorced</td>
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<td>2 (10%)</td>
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<td>Widowed</td>
<td>1 (5%)</td>
<td>1 (5%)</td>
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<tr>
<td>Separated</td>
<td>1 (5%)</td>
<td>1 (5%)</td>
</tr>
<tr>
<td>Never been</td>
<td>2 (10%)</td>
<td>2 (10%)</td>
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<td>Years Service</td>
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<td>Months since last DEPLOYMENT</td>
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<td>DEPLOYMENTS (# in career)</td>
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<td>Branch</td>
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<tr>
<td>Army</td>
<td>2 (10%)</td>
<td>2 (10%)</td>
</tr>
<tr>
<td>Marines</td>
<td>18 (90%)</td>
<td>18 (90%)</td>
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<tr>
<td>Rank</td>
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<tr>
<td>E1-E2</td>
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<tr>
<td>E3-E4</td>
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<tr>
<td>E5-E6</td>
<td>6 (30%)</td>
<td></td>
</tr>
<tr>
<td>E7-E9</td>
<td>3 (15%)</td>
<td></td>
</tr>
</tbody>
</table>

Naval Med Center SD/Camp Pendleton
PTSD Checklist-Military (PCL-M)
PreTreatment, PostTreatment & 3 Month Follow-up

16 of 20 No Longer meet DSM criteria for PTSD at Post-TX

PCL-M

Pre-Treatment
Post-Treatment
3 Month FU

Average # of Sessions < 11

Naval Med Center SD/Camp Pendleton
PTSD Checklist-Military (PCL-M)
PreTreatment, PostTreatment & 3 Month Follow-up

Treatment Completers n=20
Average # of Sessions < 11

16 Successful
4 Unsuccessful

17 = No Symptoms Endorsed

PCL-M Assessment over Time
Naval Med Center SD/Camp Pendleton
Beck Anxiety & PHQ Depression
PreTreatment, PostTreatment & 3 Month Follow-up


16 of 20 No Longer meet DSM criteria for PTSD at Post-TX

Treatment Completers n=20
Average # of Sessions < 11
Beck Anxiety & PHQ Depression

Pre-Treatment
Post-Treatment
3 Month FU

p < .003
p < .002
p < .004

(n=14)
(n=20)
(n=20)

Average # of Sessions < 11

Beck Anxiety & PHQ Depression

Pre-Treatment, Post-Treatment & 3 Month Follow-up

Naval Med Center SD/Camp Pendleton
Challenge: Drop-outs!

PTSD Results as of July 2008
Naval Med Center - San Diego/Camp Pendleton Open Clinical Trial

- Treatment completers successful = 16
- Treatment completers unsuccessful = 4

13/20 = 65% of dropouts before full VRET therapy begins in session 4

How does this compare with Military Mental Healthcare attrition Rates???
1. PE non-responders or those specifically seeking VR treatment.
2. 90-minute sessions
3. Sessions were approx weekly
4. Range number of sessions was 5-11 depending on progress.
5. 25 patients received or currently receiving VR Exposure

1. Group for those unwilling to access individual trauma focused therapy (PE, CPT, EMDR)
2. Psychoeducational and skills based CBT class.
3. 11 weekly 90-minute sessions
4. Range number of sessions was 7-14 depending on progress.
At Post TX VRET > CBT Group
p < .01 (n=18)

At Post TX VRET > CBT Group
p < .05 (n=11)

Average # of Sessions < 8.3

VRET: 7 of 11 [63%] No Longer met DSM criteria for PTSD at Post-TX and showed clinically meaningful decrease (>10 pts.) based on Monson et al., 2008

CBT Group: 2 of 7 [28%] No Longer met DSM criteria for PTSD at Post-TX and showed clinically meaningful decrease (>10 pts.) based on Monson et al., 2008

VRET Drop Out = Terminated treatment prior to clinical benefit or 10 sessions (whichever happened first).

CBT Group Drop Out = Completed 5 or fewer group sessions and did not return despite attempted phone contact.

MAMC IRB Protocol #208080; Data preliminary, not for publication
Limitations of Effectiveness Study

- Comparison of individual and group treatments
- Groups not likely drawn from the same population:
  - CBT group represents a treatment resistant group by definition.
  - VRET group includes PE treatment failures.
- Lack of random assignment to groups.
- A number of uncontrolled covariates (e.g., duration of treatment, medications being used concurrently, etc).
- Preliminary results: Comparison should only be as a point of reference

MAMC IRB Protocol #208080; Data preliminary, not for publication

Emory University (Rothbaum et al)
Clinician Administered PTSD Scale (CAPS)
PreTreatment, PostTreatment & 3 Month Follow-up

CAPS Score - Symptom Severity

Assessment over Time

Iraq War Veteran Treated by Virtual Reality Therapy

November 13, 2007 “Coming Home”

November 14, 2006 “Iraq War Veteran Stories”
Recent News Media Reports

November 13, 2007 “Coming Home”

Challenge for Military Healthcare (again from Hoge et al. 2004)

Among Iraq War veterans: “…those whose responses were positive for a mental disorder, only 23 to 40 percent sought mental health care. Those whose responses were positive for a mental disorder were twice as likely as those whose responses were negative to report concern about possible stigmatization and other barriers to seeking mental health care.” (p. 13).
Challenge for Military Healthcare

Option: Reconceptualize Therapy

VR Post Deployment
Reset Training

May appeal to a generation of soldiers who have grown up Digital!

Challenge for Military Healthcare

Option: Reconceptualize Therapy

VR Post-Deployment Reintegration Training

May appeal to a generation of soldiers who have grown up Digital!
Integrate VR combat exposure as part of a comprehensive program administered upon return from a tour of duty.

Since past research is suggestive of differential patterns of physiological reactivity in soldiers with PTSD when exposed to combat-related stimuli (Laor et al., 1998, Keane et al., 1998).

Use initial reintegration procedure that applies our VR PTSD application with physiological recording could be of value.

If indicators of such physiological reactivity are present during an initial VR exposure, a referral for continued “Reintegration training” could be negotiated and/or prescribed.

This could provide a format whereby the perceived stigma of seeking help/treatment could be lessened as the soldier would be simply participating in post-combat reintegration “training” in similar fashion to other designated duties to which they are assigned.

Clinical/Research Test Sites

Funded by: NIH, TATRC, VA, DOD, EU, US Air Force:

- Fort Lewis, Washington
- US Air Force (8 Bases)
- Ft. Sill
- Weill Medical College of Cornell
- Emory University
- Atlanta VA Hospital
- Providence VA/Brown U.
- Little Rock VA Hospital
- Manhattan VA
- Montrose VA
- White River Jct. VA
- University of Reading, UK
- University of Esbjerg, Denmark
- Babes-Bolyai University, Romania
- And 12 more coming online this month!
Current Research Activities

- Two Special Projects
  - WTC 911 Project with Difede et al.
  - D-Cycloserine Study with Rothbaum & Davis

Virtual Reality Exposure and D-cycloserine for Treating PTSD in Combat Veterans

- Rothbaum/Davis, Ph.D. Emory University
- JoAnn Difede, Ph.D. New York Presbyterian Hospital

The Neuroscience of PTSD

- Developing Novel Diagnostic and Treatment Tools for PTSD using Virtual Reality Technology, Cognitive Neuroimaging, and other Neurobiological Measures

Under review to DOD CoE/CAM:

- Rizzo (PI), Damasio, Damasio, Parsons, Lu, Rothbaum, Difede, Reger, Pato, Rubin, Houston & Bechara

Main Outcome Measures: We used functional magnetic resonance imaging (fMRI) to study blood oxygen...
Current Research Activities

- Randomized Clinical Trial (Reger et al)
- Enhancing Therapy w/DCS (Rothbaum/Difede et al)
- Assessment of PTSD Post-deployment (Unger/Keller et al)
- PTSD/TBI Trial (Roy et al)
- Neuroscience Factors (Damasio et al)
- Stress Inoculation (Lethin et al)
- Virtual Afghanistan Project
- Spherical Video Exploration

Virtual Reality Exposure Therapy Workshop

Learn how virtual reality, with its ability to create immersive, multisensory 3D environments, can be used as a form of exposure therapy for PTSD and trauma survivors.

Presented by leading experts in the field of Virtual Reality Exposure Therapy:
- Dr. Barbara Rothbaum, Emory University
- Dr. Joan Difede, Cornell University
- Dr. Albert “Skip” Rizzo, Institute for Creative Technologies, USC

January 26-27, 2009
The Four Chaplains Memorial Chapel, Fort Lewis, WA

REGISTER NOW. Seating is limited.
CONTACT: lauren.bartlett@us.army.mil

Next Training: January 2009
Why do this work???

- **Ethical** Responsibility to reduce human suffering
- **Assessment, Diagnosis, Selection** and **Stress Inoculation** applications could prevent or lower PTSD incidence and produce soldiers better equipped for combat
- **Healthcare savings** via a reduction in long term service connected disability

*As of January, 2005 - 13,752 Gulf War Vets receiving VA Benefits for PTSD*

*As of September, 2005 - 19,356 Gulf War Vets receiving VA Benefits for PTSD*
A Psychologist’s DREAM!?

The capacity to design a functional environment, precisely administer stimuli, and measure, treat and train performance within the environment.
A Copy of this talk will be available for the attendees. Please cite the source if you use any of the materials from this talk.

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Thanks!
"It would be strange, and embarrassing, if clinical psychologists, supposedly sophisticated methodologically and quantitatively trained, were to lag behind internal medicine, investment analysis, and factory operations control in accepting the computer revolution."

Paul Meehl, 1987
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- Paul Meehl, 1987