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

Skip Rizzo, Ph.D.
University of Southern California Director,
VRPSYCH Lab
Institute for Creative Technologies, Dept.
of Psychiatry & School of Gerontology

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

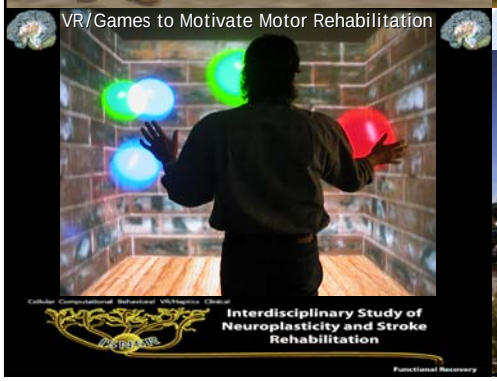
Skip Rizzo, Barbara Rothbaum, JoAnn Difede, Greg Reger, Josh Spitalnick, Ken Graap, CPT. Rob McLay, CDR. Scott Johnston, Jeff Pyne, Karen Perlman, Robert Deal, Jarrell Pair, Tom Parsons, COL. Mike Roy, COL. Greg Gahm & CDR. Russell Shilling

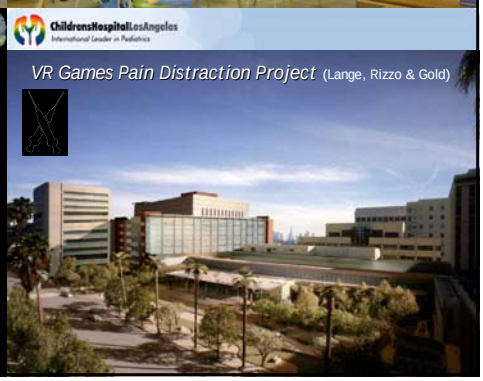
USC-Institute for Creative Technologies, Emory University, Weill Medical College at Cornell, NMCSD, Virtually Better, Inc., WRAMC, MAMC-Ft. Lewis

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

Talk Outline:

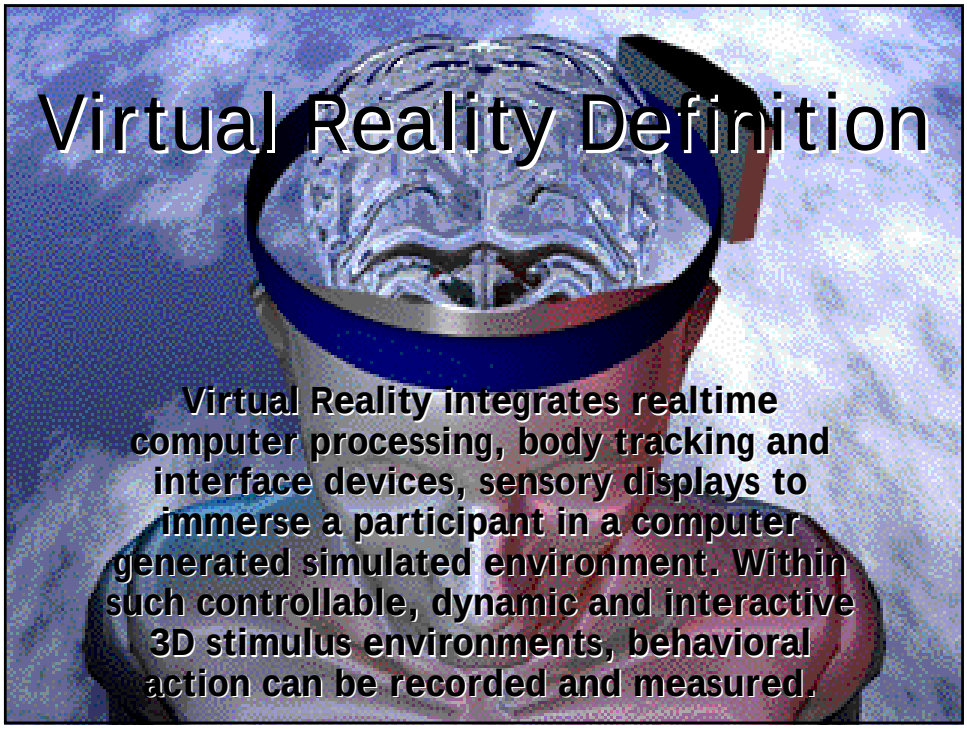
- Introduction to Clinical VR
- Exposure Therapy
- Virtual Iraq Exposure Therapy for Post Traumatic Stress Disorder
- Dr. Thomas Parsons on Cognitive Testing with Virtual Iraq

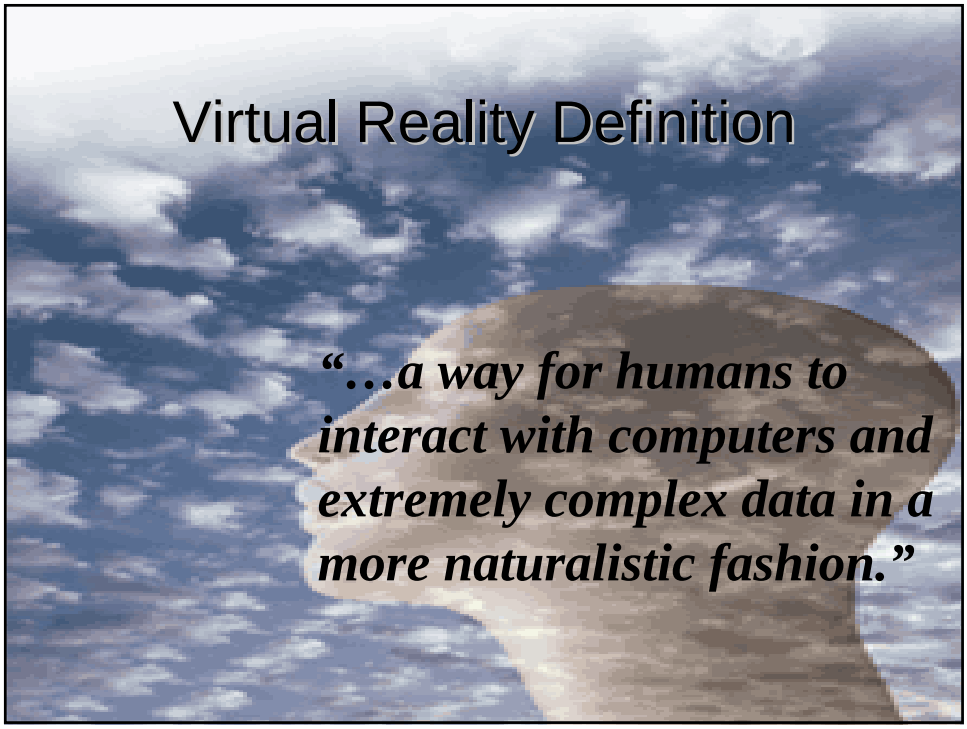




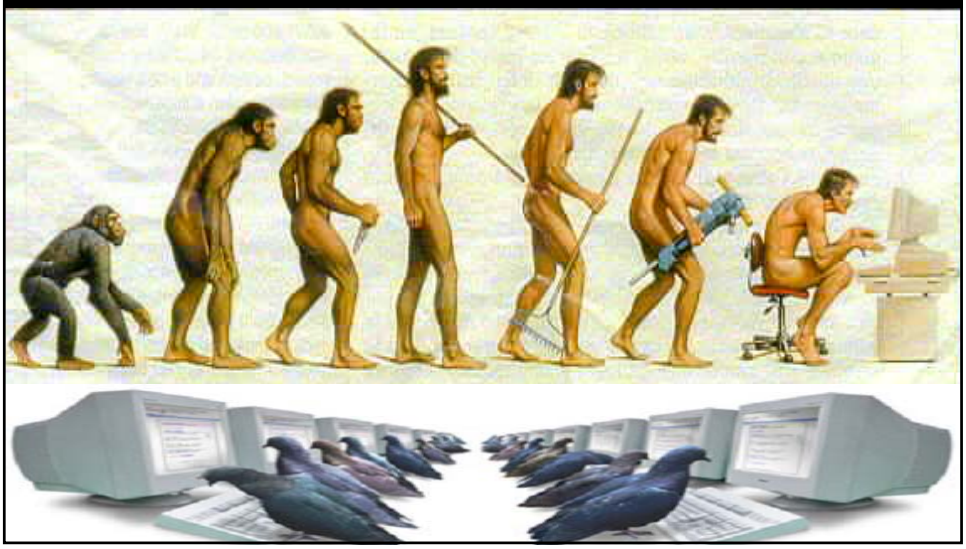
And one more…

VR Pain Distraction and Discomfort Reduction

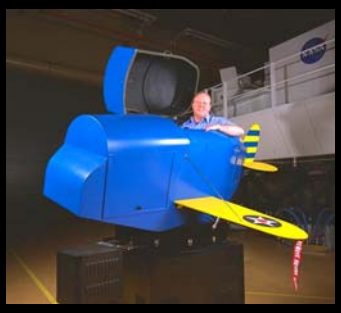

Virtual Reality Definition
Virtual Reality integrates realtime computer processing, body tracking and interface devices, sensory displays to immerse a participant in a computer generated simulated environment. Within such controllable, dynamic and interactive 3D stimulus environments, behavioral action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


Virtual Reality Definition
"…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

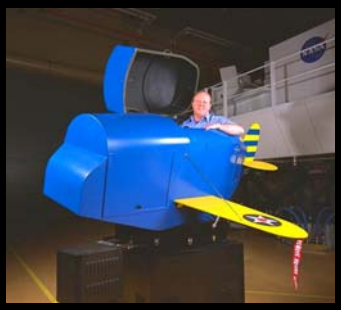


1st Link Aviation Simulator (1929)

=

Virtual Reality (2009)

To Test and Train Piloting Ability



1st Link Aviation Simulator (1929)

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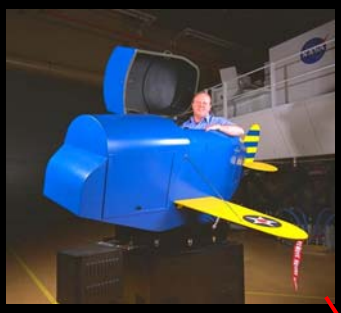
To Assess and Rehabilitate Cognitive, Psychological, & Motor Functioning

Virtual Reality (2009)

To Test and Train Piloting Ability



1st Link Aviation Simulator (1929)

=

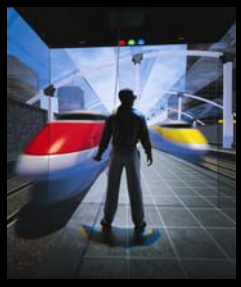
To Assess and Rehabilitate Cognitive, Psychological, & Motor Functioning

Virtual Reality (2009)

And note that a Meta Analysis of Aviation Simulation Research indicates a "Transfer Effectiveness Ratio" of .48 (Johnston, 1995).

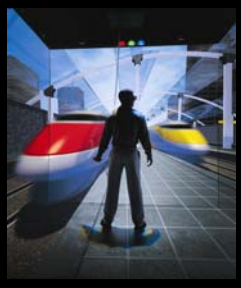
Interface for Retraining Driving Skills following Spinal Cord Injury (Collab w/Kessler Rehab.)

Auto-stereoscopic 3-D Display(courtesy of Dimension Technologies Co.)



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

Auto-stereoscopic 3-D Display(courtesy of Dimension Technologies Co.)



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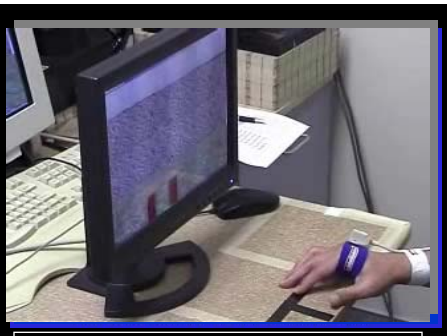


Sharp Autostereoscopic Display with Stroke Patient

Consumer Stereo Capable Screens

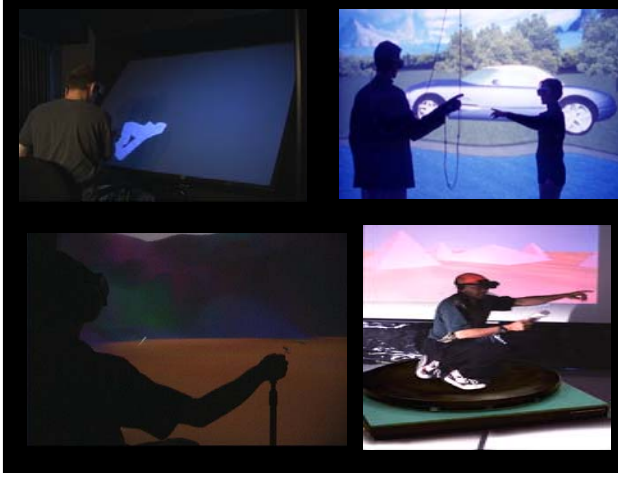
Mini-Workbench

Head Mounted Displays (HMD)

Head Mounted Displays (HMD)

KEY ELEMENTS

- Immersion
- Interactivity



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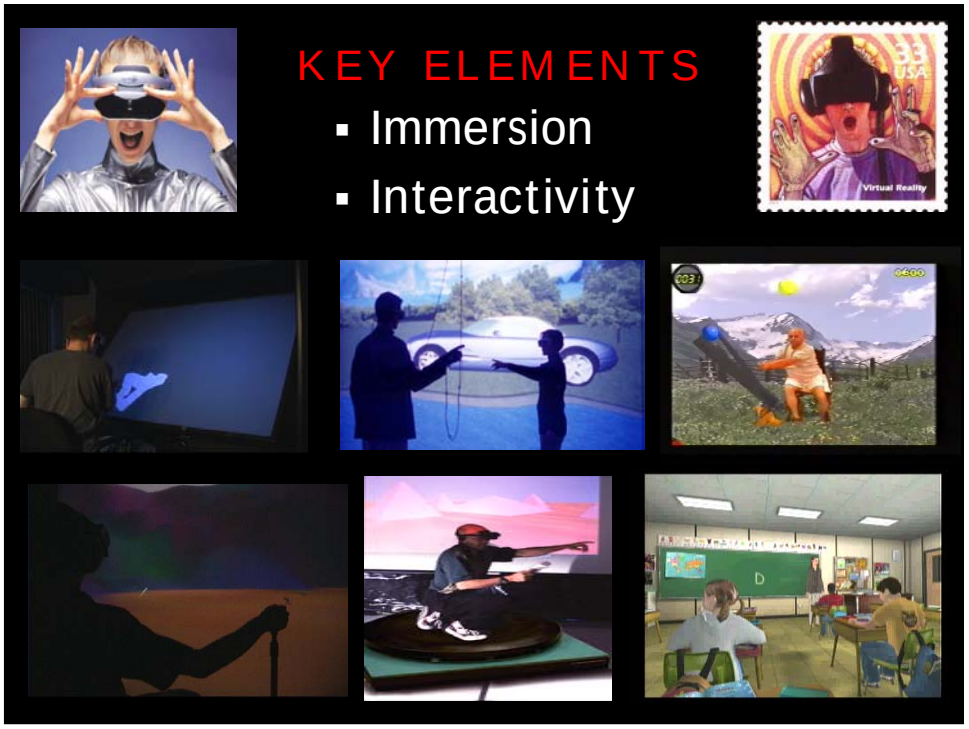
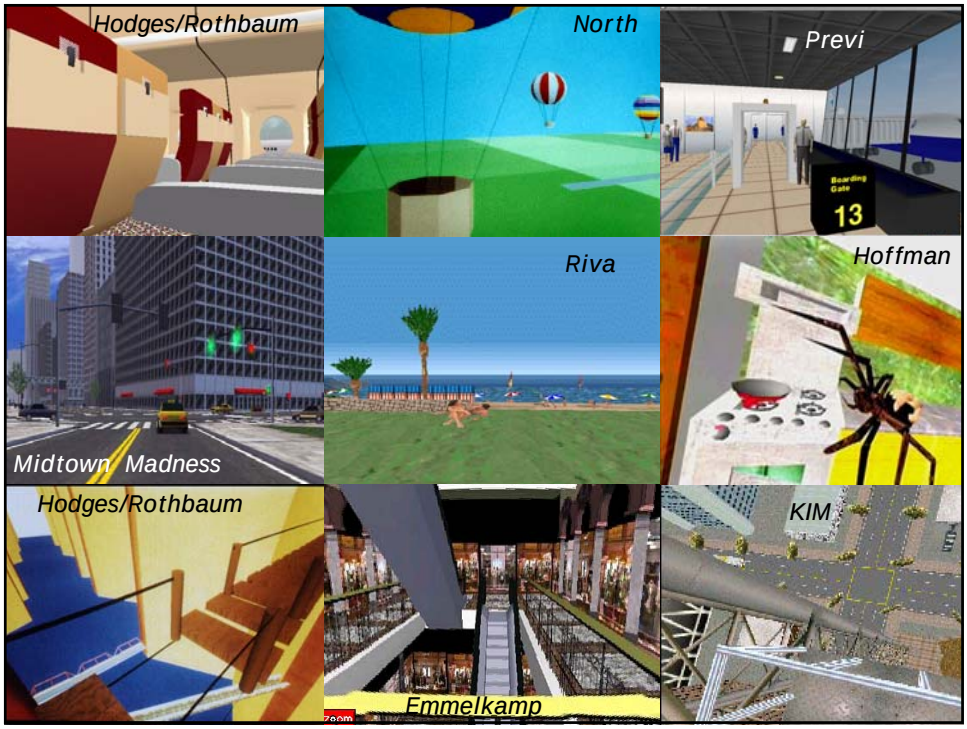

KEY ELEMENTS
▪ Immersion
▪ Interactivity
Virtual Reality

"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)

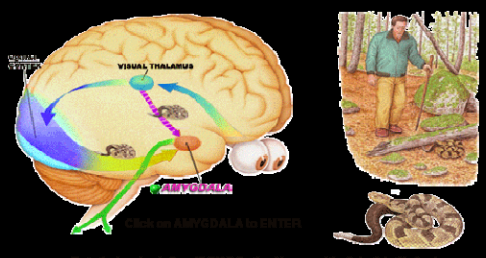
VR Exposure for Anxiety Disorders

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



VR Exposure for Anxiety Disorders

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).

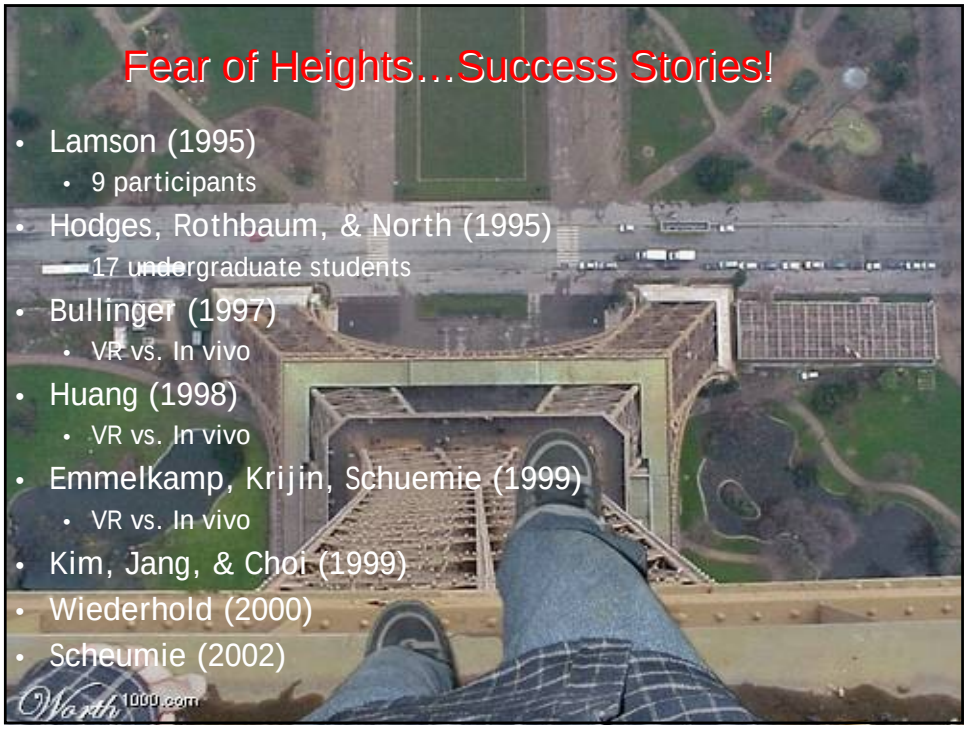


Exposure Therapy Principles

- 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
- *Prolonged Imaginal* Exposure

Fear of Heights…Research Studies

- Lamson (1995)
  - 9 participants
- Hodges, Rothbaum, & North (1995)
  - 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)
- Scheumie (2002)


Fear of Heights…Success Stories!
• Lamson (1995)
• 9 participants
• Hodges, Rothbaum, & North (1995)
• 17 undergraduate students
• Bullinger (1997)
• VR vs. In vivo
• Huang (1998)
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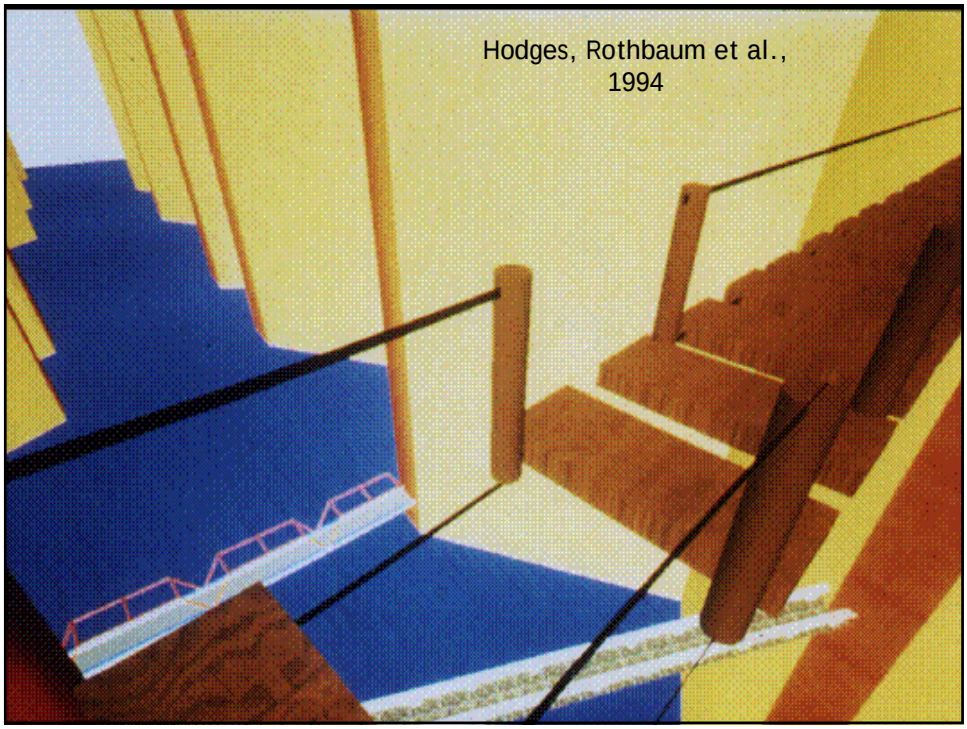
• Scheumie (2002)
Worth1000.com


Fear of Heights…Success Stories!
Worth1000.com


Hodges, Rothbaum et al.,
1994


Fear of Heights
(Rothbaum and Hodges)
Modeled from the
Glass Elevator in the
Atlanta Marriott

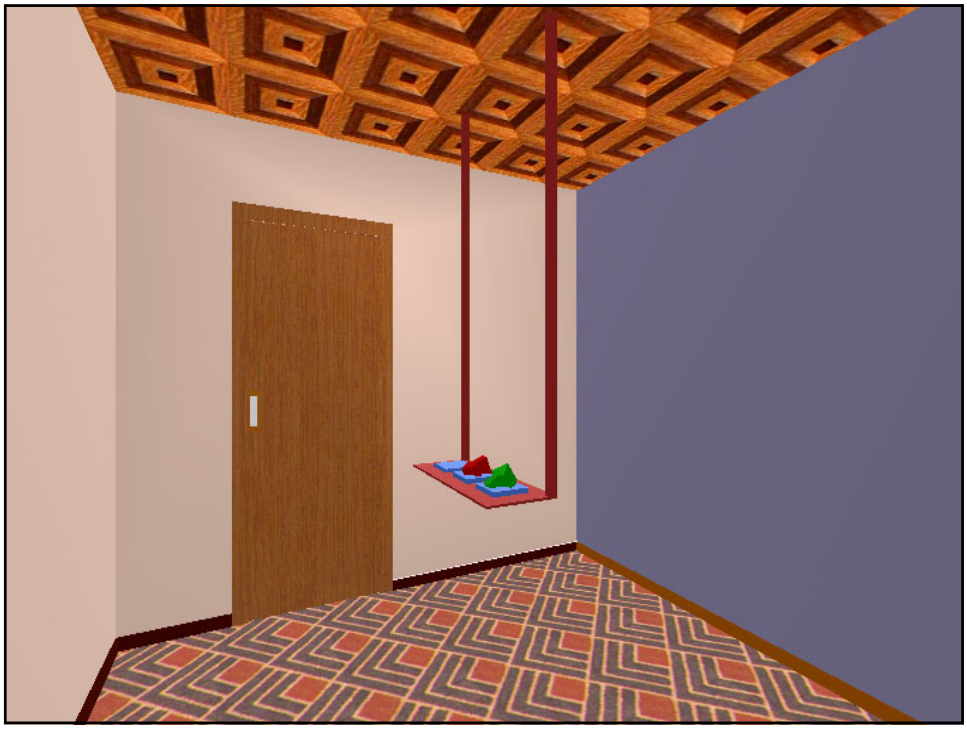
Fear of Heights Exposure Therapy

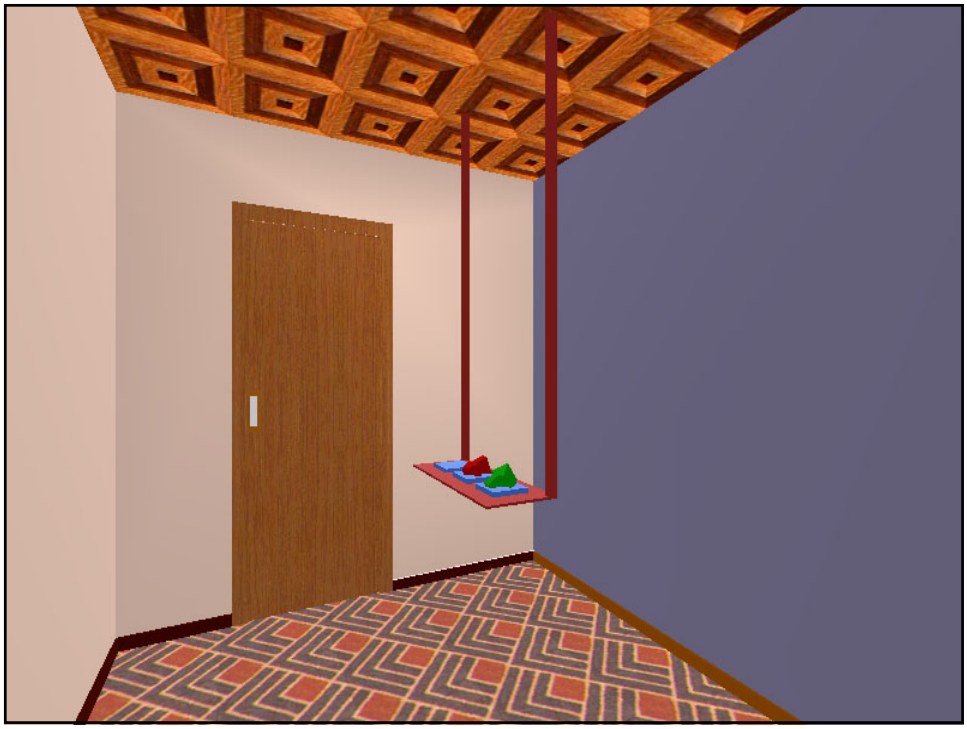
Using Unreal Tournament Game Engine

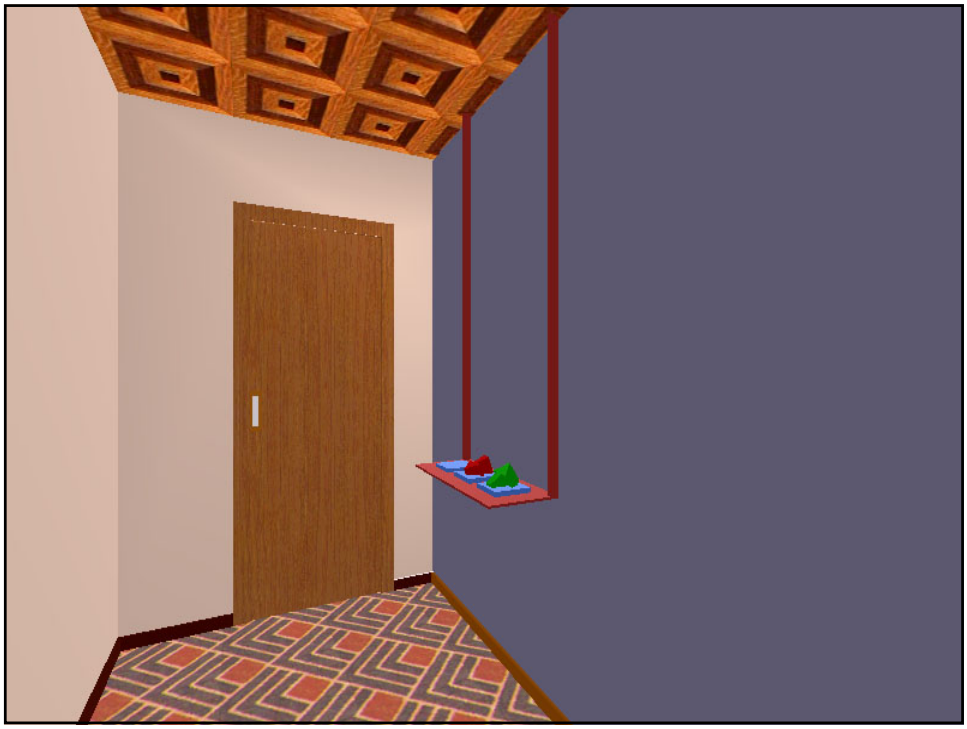
(Bouchard et al., 2003)

VR Claustrophobia Application

(Botella et al., 1997)







VR Anxiety Disorders Meta-Analysis

ELSEVIER

Journal of Anxiety Disorders 22 (2008) 561–569

Anxiety Disorders

Review

Virtual reality exposure therapy for anxiety disorders: A meta-analysis

Mark B. Powers *, Paul M.G. Emmelkamp

University of Amsterdam, The Netherlands

Received 1 March 2007; received in revised form 11 April 2007; accepted 20 April 2007

Abstract

There is now a substantial literature investigating virtual reality exposure therapy (VRET) as a viable treatment option for anxiety disorders. In this meta-analysis we provide effect size estimates for virtual reality treatment in comparison to in vivo exposure and control conditions (waitlist, attention control, etc.). A comprehensive search of the literature identified 13 studies ($n = 397$) that were included in the final analyses. Consistent with prediction the primary random effects analysis showed a large mean effect size for VRET compared to control conditions, Cohen's $d = 1.11$ (S.E. = 0.15, 95% CI: 0.82–1.39). This finding was consistent across secondary outcome categories as well (domain-specific, general subjective distress, cognition, behavior, and psychophysiology). Also as expected in vivo treatment was not significantly more effective than VRET. In fact, there was a small effect size favoring VRET over in vivo conditions, Cohen's $d = 0.35$ (S.E. = 0.15, 95% CI: 0.05–0.65). There was a trend for a dose–response relationship with more VRET sessions showing larger effects ($p = 0.06$). Outcome was not related to publication year or sample size. Implications are discussed.

Keywords: Virtual reality; Exposure t

Journal of Anxiety Disorders

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Journal of Behavior Therapy and Experimental Psychiatry ▮ (▮▮▮▮) ▮▮▮–▮▮▮

www.elsevier.com/locate/jbtep

Affective outcomes of virtual reality exposure therapy for anxiety and specific phobias: A meta-analysis

Thomas D. Parsons*, Albert A. Rizzo

Institute for Creative Technologies, University of Southern California, 13274 Fiji Way, Office 301, Marina del Rey, CA 90292-4019, USA

Received 24 October 2006; received in revised form 6 July 2007; accepted 18 July 2007

Abstract

Virtual reality exposure therapy (VRET) is an increasingly common treatment for anxiety and specific phobias. Lacking is a quantitative meta-analysis that enhances understanding of the variability and clinical significance of anxiety reduction outcomes after VRET. Searches of electronic databases yielded 52 studies, and of these, 21 studies (300 subjects) met inclusion criteria. Although meta-analysis revealed large declines in anxiety symptoms following VRET, moderator analyses were limited due to inconsistent reporting in the VRET literature. This highlights the need for future research studies that report uniform and detailed information regarding presence, immersion, anxiety and/or phobia duration, and demographics.

Keywords: Virtual reali

Journal of Behavior Therapy and

2008

VR Anxiety Disorders Meta-Analysis

Table 2: The Average Random Effect Sizes, including the Variance and Confidence Limits for the Mean Effect Sizes, for the Affective Domains and the Anxiety Total.

Domain	Average Random Effect Size	Effect Size Variance	95% CI Lower	95% CI Upper	r	%
PTSD	0.94	0.01	0.78	1.10	0.42	0.18
Social phobia	0.96	0.10	0.34	1.59	0.43	0.19
Arachnophobia	0.92	0.12	0.25	1.59	0.42	0.18
Acrophobia	0.93	0.06	0.44	1.43	0.42	0.18
Panic disorder with agoraphobia	1.79	0.02	1.52	2.06	0.67	0.44
Aerophobia	1.75	0.07	1.25	2.26	0.66	0.43
Anxiety Total	0.96	0.02	0.68	1.25	0.43	0.19

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 an 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.

In: Parsons & Rizzo (2008) *Journal of Behavior Therapy & Experimental Psychiatry*

VR Exposure for Anxiety Disorders

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

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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 NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 JULY 1, 2004 VOL. 351 NO. 1

Combat Duty in Iraq and Afghanistan, Mental Health Problems, and Barriers to Care

Charles W. Hoge, M.D., Carl A. Castro, Ph.D., Stephen C. Messer, Ph.D., Dennis McGurk, Ph.D., Dave I. Cotting, Ph.D., and Robert L. Koffman, M.D., M.P.H.

"…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…

TIME

NATION

Wednesday, Oct. 19, 2005

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

washingtonpost.com

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.

ORIGINAL CONTRIBUTION

1024 JAMA, March 1, 2006—Vol 295, No. 9 (Reprinted)

JAMA

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. Auchterlonie, MS
Charles S. Milliken, MD

Context 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.

IN MARCH 2003, THE UNITED STATES

Department of Veterans Affairs

Office of Public Affairs
Media Relations

Washington, DC 20420
(202) 273-6000
www.va.gov

Fact Sheet

March 2006

Veterans with Post-Traumatic Stress Disorder (PTSD)

Veterans Being Compensated for PTSD

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

Period	Sept. 05
Pre-WWII	-
WWII	25,278
Korea	10,944
Vietnam	179,713
Gulf War	19,356
Peacetime	9,087
Total	**244,846**

ORIGINAL INVESTIGATION

Bringing the War Back Home

Mental Health Disorders Among 103 788 US Veterans Returning From Iraq and Afghanistan Seen at Department of Veterans Affairs Facilities

Karen H. Seal, MD, MPH; Daniel Bertenthal, MPH; Christian R. Miner, PhD; Saunak Sen, PhD; Charles Marmar, MD

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 2 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, 2005, 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, 25 658 (25%) received mental health diagnosis(es); 56% of whom had 2 or more distinct mental health diagnoses. Overall, 32 010 (31%) received mental health and/or psychosocial diagnoses. 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 nonmental health 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 and 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.

Arch Intern Med. 2007;167:476-482

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Thursday
April 17, 2008

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One In Five Iraq and Afghanistan Veterans Suffer from PTSD or Major Depression

Nearly 20 percent of military service members who have returned from Iraq and Afghanistan — 300,000 in all — report symptoms of post traumatic stress disorder or major depression, yet only slightly more than half have sought treatment, according to a new RAND Corporation study.

In addition, researchers found about 19 percent of returning service members report that they experienced a possible traumatic brain injury while deployed, with 7 percent reporting both a probable brain injury and current PTSD or major depression.

Many service members said they do not seek treatment for psychological illnesses because they fear it will harm their careers. But even among those who do seek help for PTSD or major depression, only about half receive treatment that researchers consider "minimally adequate" for their illnesses.

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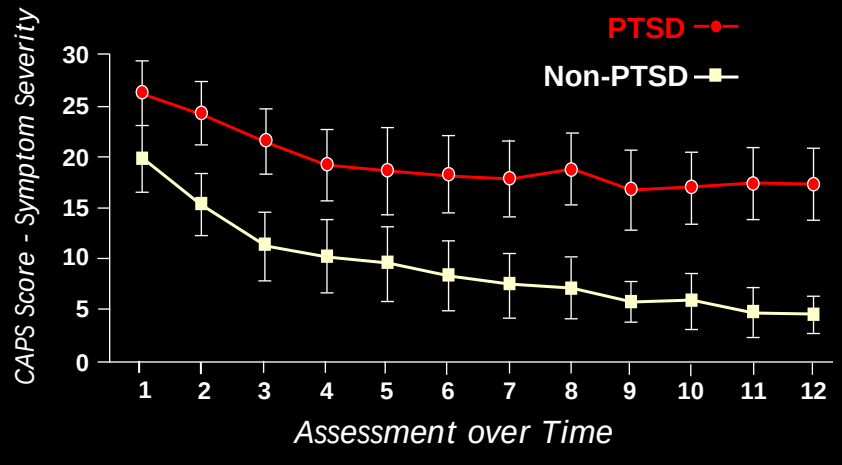
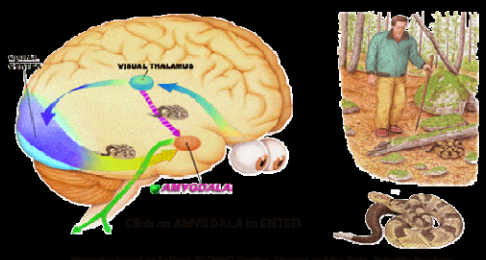
Severity of PTSD Symptoms



Rothbaum BO et al. J Traumatic Stress. 1992;5(3):464

Exposure for Anxiety Disorders

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

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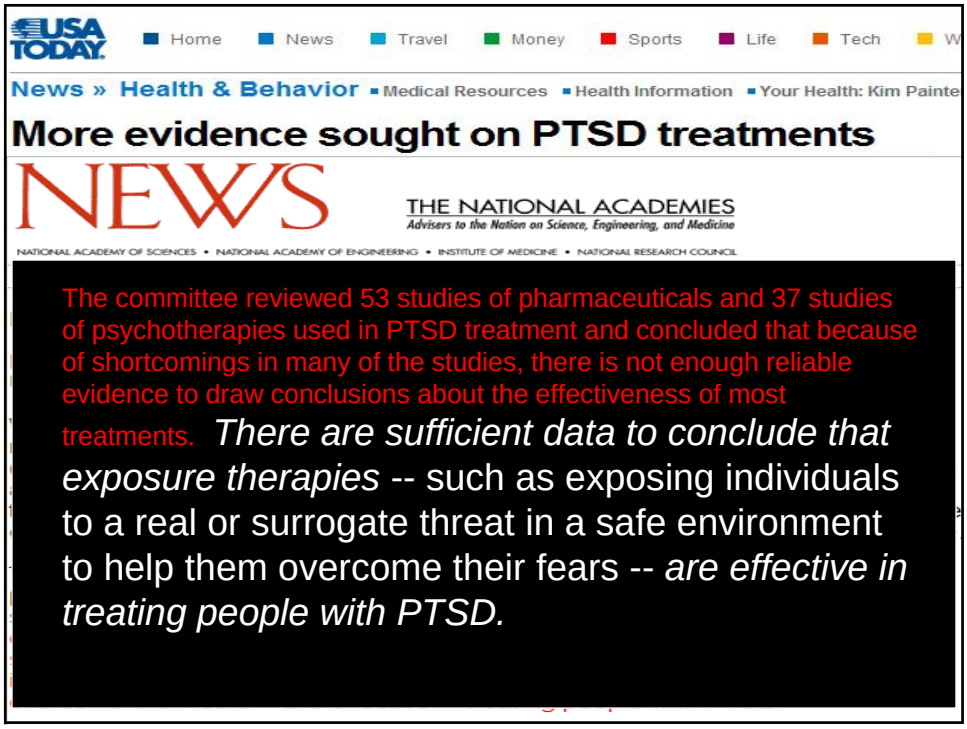
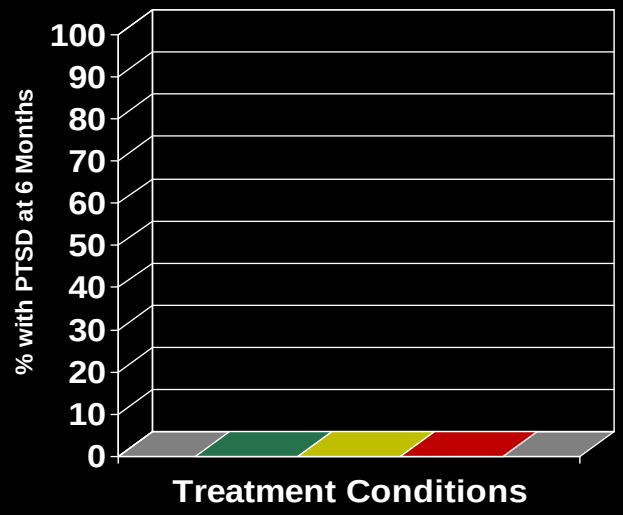


Of those diagnosed with Posttraumatic Stress Reaction at 30 Days Post



Comparison between Exposure Therapy, Supportive Counseling and No Treatment on PTSD incidence

(Bryant et al., 1999; 2005)

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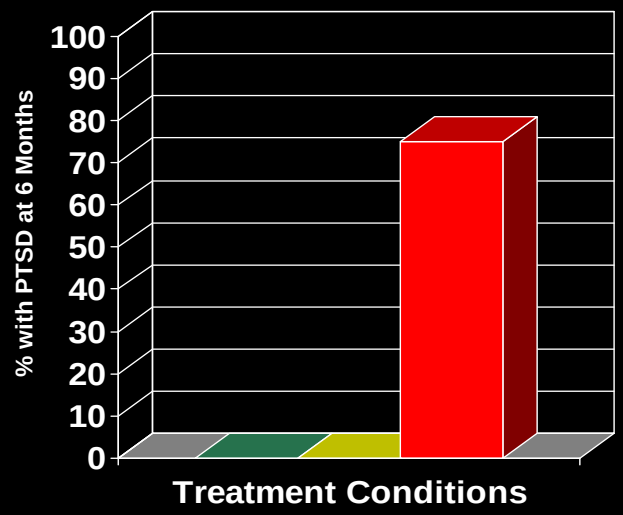

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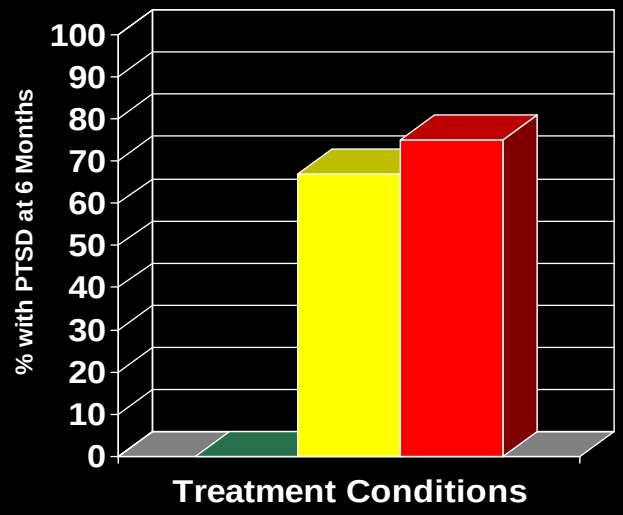
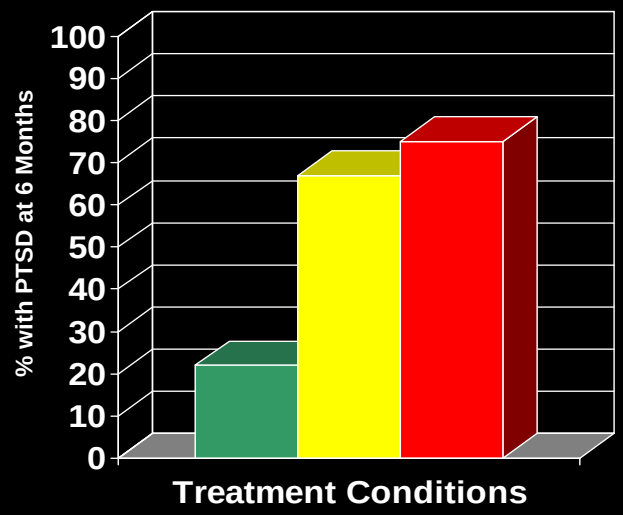


*Comparison between Exposure Therapy, **Supportive Counseling** and No Treatment on PTSD incidence*

(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).

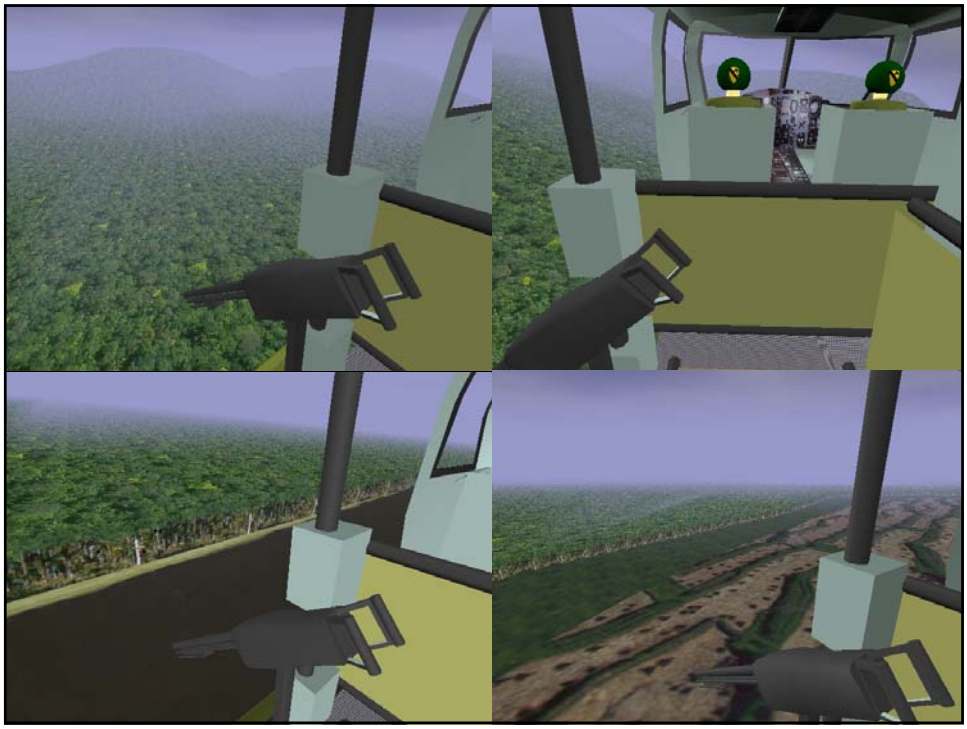
VR PTSD Examples

- 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*

Virtual Vietnam

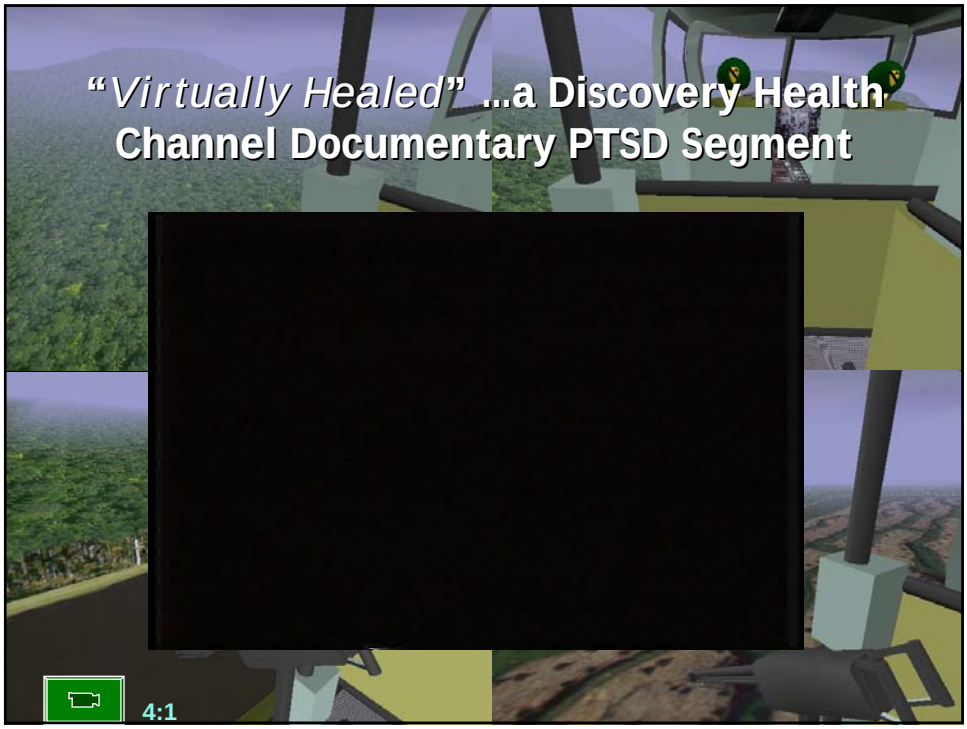
Hodges, Rothbaum, Graap, Pair et al.

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
4:1


USC
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.
Cornell-Presbyterian Hospital in Manhattan
Hunter Hoffman, Ph.D.
U. of Washington HITlab 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

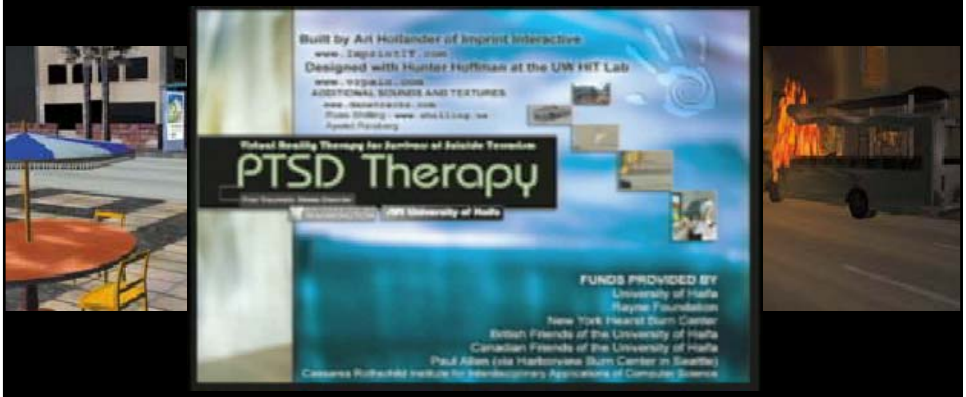
Difede, J., Cukor, J., Patt, I., Goisan, C. & Hoffman, H. (2006). The Application of Virtual Reality to the Treatment of PTSD Following the WTC Attack. *Journal of Clinical Psychiatry*, ***68,*** **1639-1647 (2007)**

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 Gamito[1], PhD
Carlos Ribeiro[2], PhD
Luiz Gamito[3], MD
José Pacheco[3], MSc
Cristina Pablo[3]
Tomaz Saraiva[1]

Portugal – From 1961-1974 war on three fronts:

- **Mozambique**
- **Angola**
- **Guiné**

25,000 with Combat Related PTSD

[1]Universidade Lusófona de Humanidades e Tecnologias, Lisbon, Portugal
[2]Militar Academy, Lisbon, Portugal
[3]Hospital Júlio de Matos, Lisbon, Portugal

VR PTSD Example

- *Virtual Angola*

EMMA Project

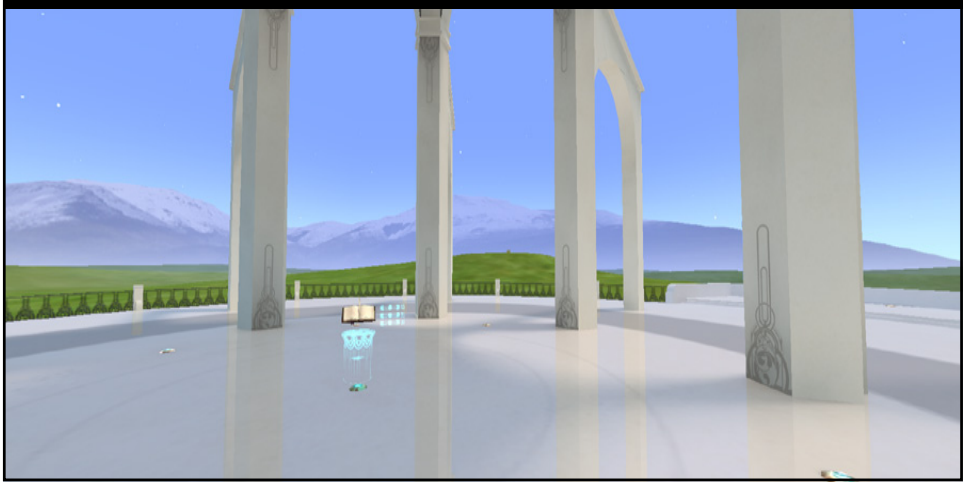
Engaging Media for Mental health Applications

Christina Botella, Universitat Jaume I, Castellon (Spain)

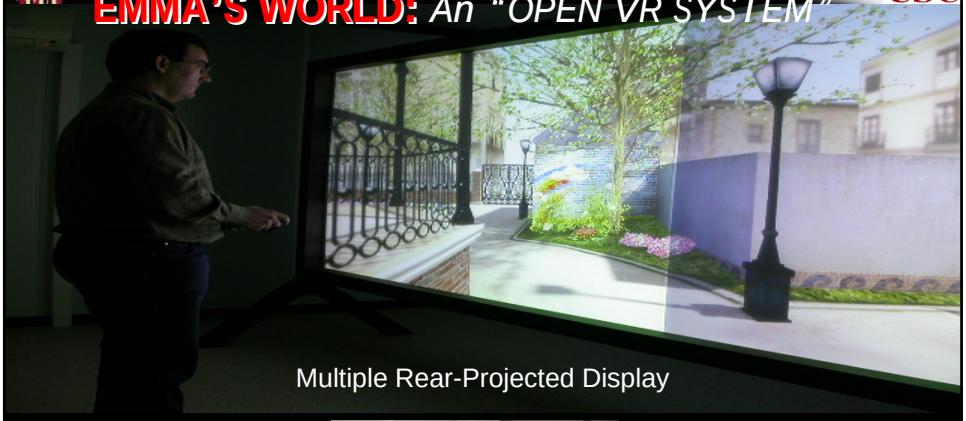
EMMA'S WORLD: *An "OPEN VR SYSTEM"*

Botella et al.,

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



EMMA'S WORLD: *An "OPEN VR SYSTEM"*

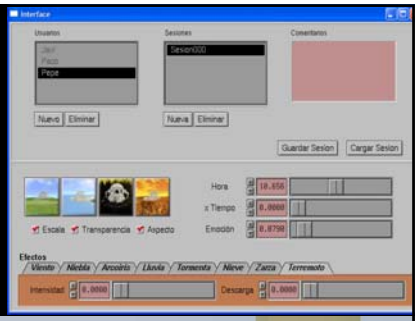


Multiple Rear-Projected Display

Wireless Joystick Navigation

EMMA'S WORLD:

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

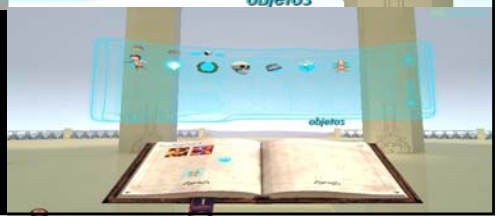


Types of Elements:

3D objects
Videos
Images
Sounds
Music
Colours

The Living Book:

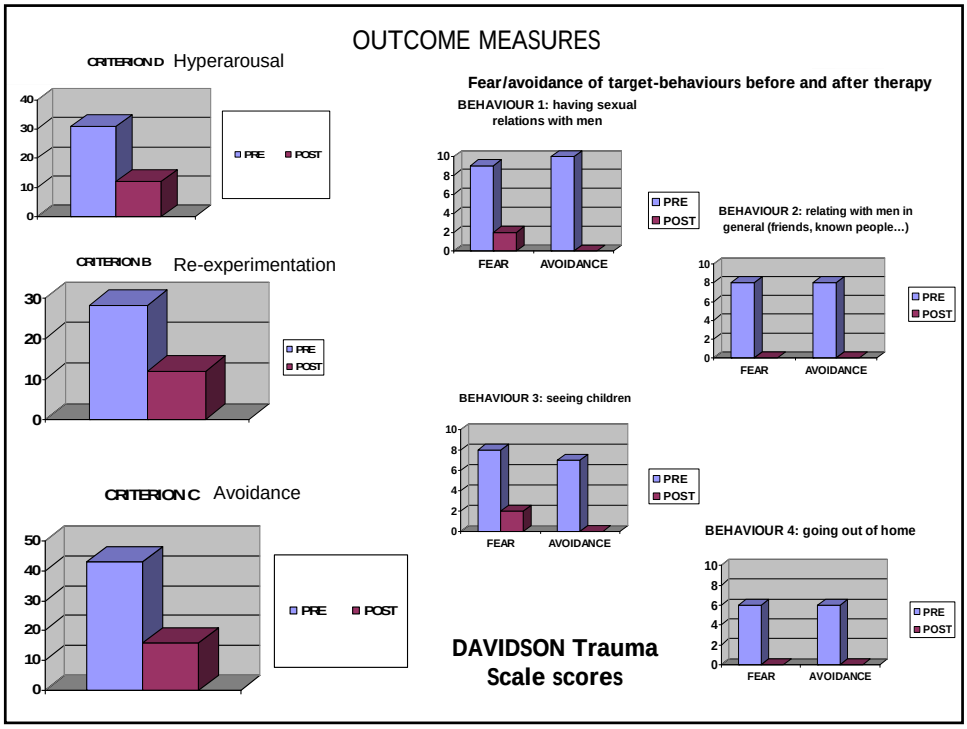
- Elements can be copied to the living book from the database screen.
- Different chapters can be added.
- Purpose: to help the user to re-live the past as it happens with family photographs and home videos.



EMMA'S WORLD: *Case Study*

USC

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


OUTCOME MEASURES
CRITERION D Hyperarousal
40
30
20
10
0
PRE
POST
CRITERION B Re-experimentation
30
20
10
0
PRE
POST
CRITERION C Avoidance
50
40
30
20
10
0
PRE
POST
Fear/avoidance of target-behaviours before and after therapy
BEHAVIOUR 1: having sexual relations with men
10
8
6
4
2
0
FEAR
AVOIDANCE
PRE
POST
BEHAVIOUR 2: relating with men in general (friends, known people…)
10
8
6
4
2
0
FEAR
AVOIDANCE
PRE
POST
BEHAVIOUR 3: seeing children
10
8
6
4
2
0
FEAR
AVOIDANCE
PRE
POST
BEHAVIOUR 4: going out of home
10
8
6
4
2
0
FEAR
AVOIDANCE
PRE
POST
DAVIDSON Trauma Scale scores


Hypothetical use of EMMA's world for Iraq War PTSD
USC

VR PTSD Examples

- Virtual Vietnam – *Emory University*
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- Virtual Iraq – *USC Institute for Creative Technologies*

Full Spectrum Warrior

X-Box Game Conversion for Iraq War PTSD clients!

Full Spectrum Warrior

X-Box Game Conversion for Iraq War PTSD clients!

Full Spectrum Warrior

Game Conversion for Iraq War PTSD clients!

Virtual Iraq

Global PTSD Requirements

- 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

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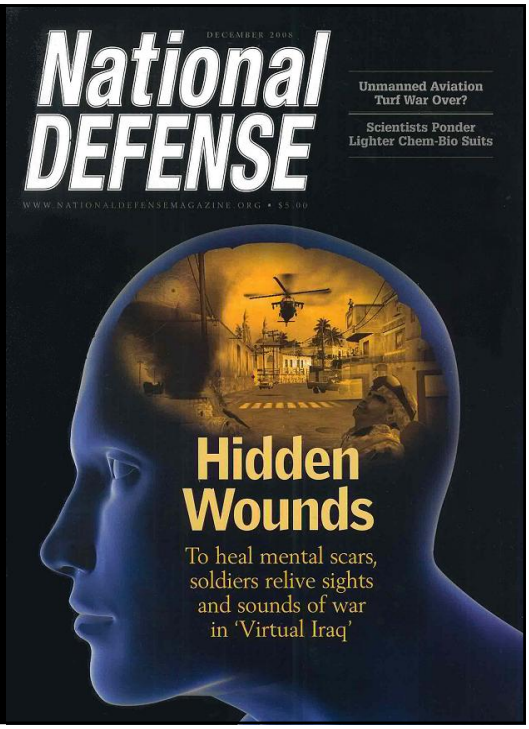


Virtual Iraq

Early Prototype of Virtual City

Virtual Iraq

Time of Day and Weather Controls

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 Turret View

Virtual Iraq

Humvee Interior *Action* View

Virtual Iraq

Humvee Interior *Action* View

Virtual Iraq

Humvee Interior *Action* View

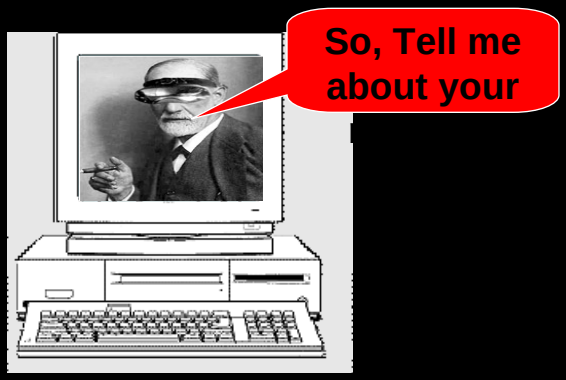
Too Creepy for Therapy??


Virtual Iraq
Afghanistan-like Content now being added


Virtual Iraq
Afghanistan-like Content now being added

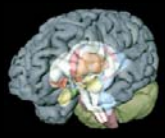
Challenges

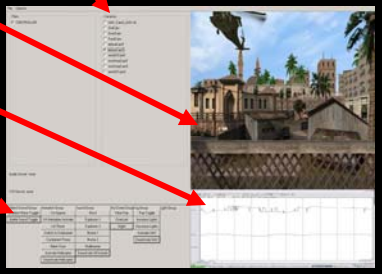
Caveat: We need to guard against the perception that VR Tools are designed to eliminate the need for the Well Trained Clinician

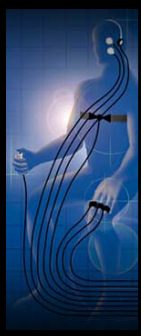


"Wizard of OZ" Clinician Interface

- 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

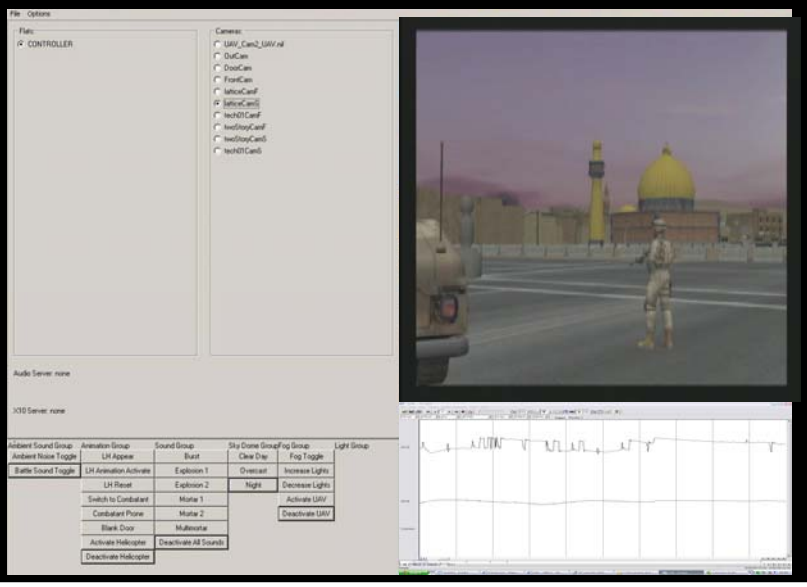
Create a Highly Usable "Wizard of OZ" Clinician Interface

- 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" Clinician Interface



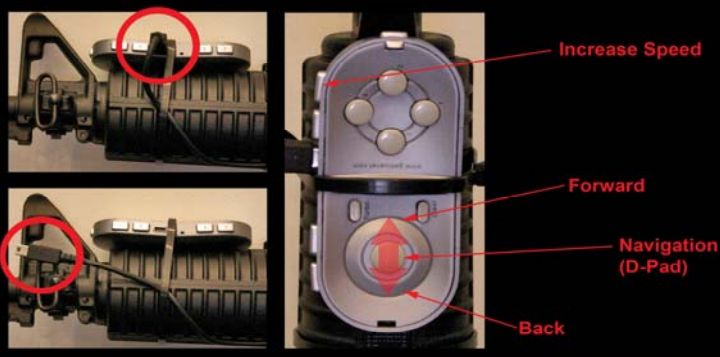
Low Cost Accessible Display Technology

Low Cost Accessible Display Technology

or

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

Natural Navigational Control



Portable Psychophysiology Tool

A non-intrusive Virtual Emotion Sensor that is worn much like a pair of glasses. The headset acquires several biometric signals such as EEG, Heartrate, 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)

TATRC-Funded User Centered Design Protocol in *IRAQ*

CPT. Greg Reger Ph.D.

98th Med Det.

Combat stress control team

Tallil ab Isa adder iraq

User-Centered Feedback from Iraq and MAMC-Ft. Lewis

- HMD comfort = 7.2/10
- Tracking update = 7.4/10
- Graphic realism = 6.7/10 **n=93**
- 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

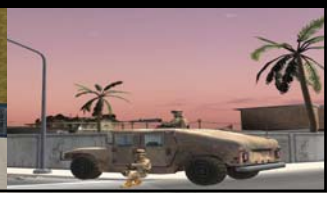
In Press: *Telemedicine and E-Health*

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

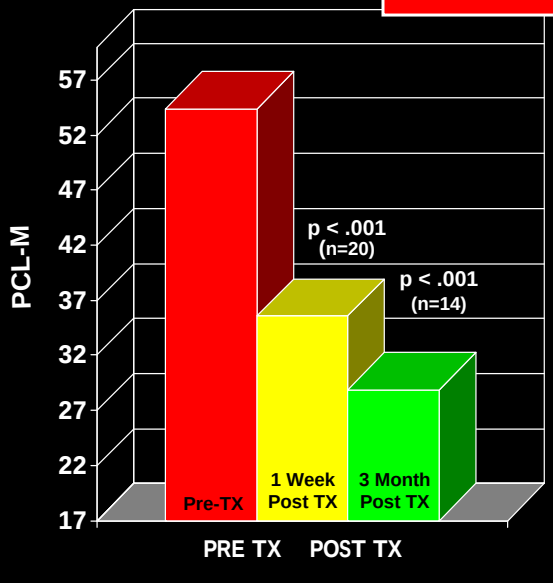
Demographics

Variable	Treatment Completers n=20
Gender	
Male	19 (95%)
Female	1 (5.0%)
Age	28.1 (sd=8.4)
Marital Status	
Married	14 (70%)
Divorced	2 (10%)
Widowed	1 (5%)
Separated	1 (5%)
Never been	2 (10%)

Variable	Treatment Completers m (sd)
Years Service	8.4 (7.8)
Months since last DEPLOYMENT	8.3 (2.5)
DEPLOYMENTS (# in career)	2.6 (2.1)
Branch	
Army	2 (10%)
Marines	18 (90%)
Rank	
E1-E2	2 (10%)
E3-E4	9 (45%)
E5-E6	6 (30%)
E7-E9	3 (15%)

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

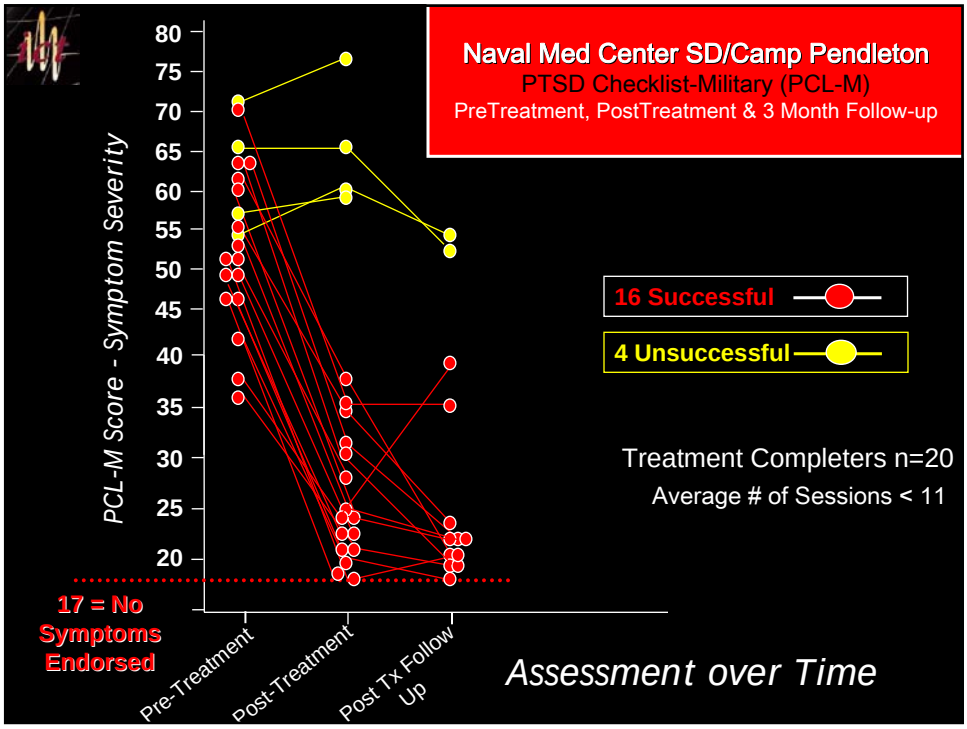
Naval Med Center SD/Camp Pendleton
PTSD Checklist-Military (PCL-M)
PreTreatment, PostTreatment & 3 Month Follow-up

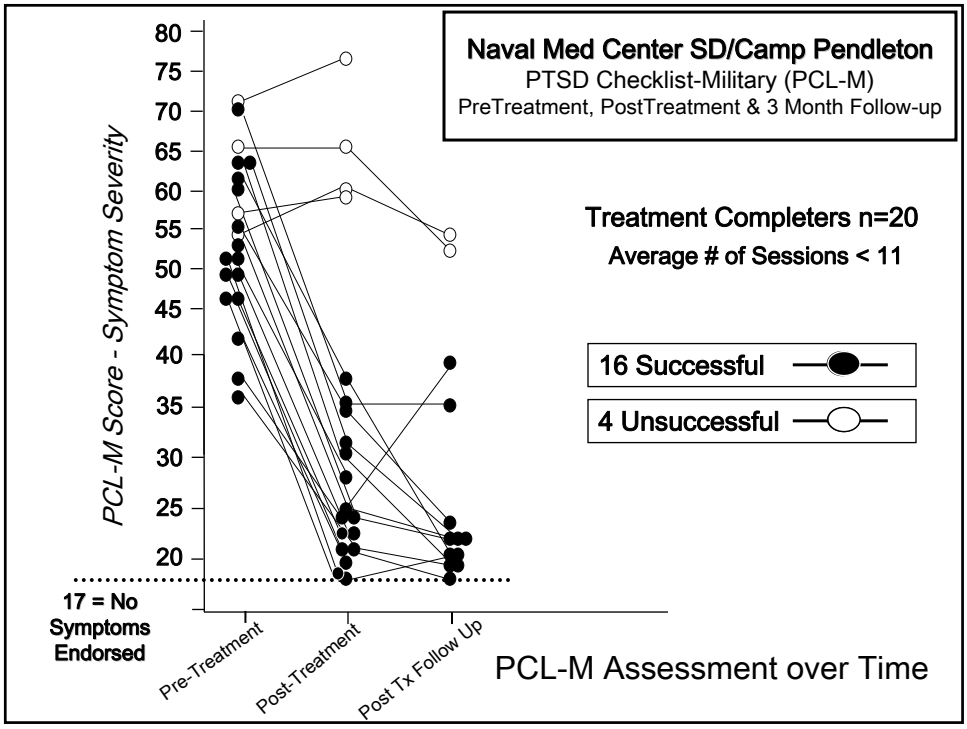


Pre-Treatment
Post-Treatment
3 Month FU

Treatment Completers n=20
Average # of Sessions < 11

In Press: Rizzo, Reger, Gahm, Difede & Rothbaum, (2008). *The Neurobiology of PTSD*, Shiromani, P., Keane, T. & LeDoux, J. (Eds.)


Naval Med Center SD/Camp Pendleton
PTSD Checklist-Military (PCL-M)
PreTreatment, PostTreatment & 3 Month Follow-up
PCL-M Score - Symptom Severity
80
75
70
65
60
55
50
45
40
35
30
25
20
16 Successful
4 Unsuccessful
Treatment Completers n=20
Average # of Sessions < 11
17 = No Symptoms Endorsed
Pre-Treatment
Post-Treatment
Post Tx Follow Up
Assessment over Time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80
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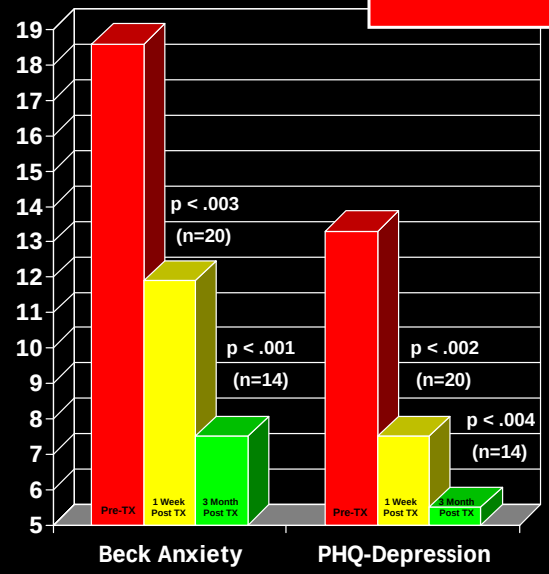
Pre-Treatment
Post-Treatment
Post Tx Follow Up
PCL-M Assessment over Time

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

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



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Post-Treatment
3 Month FU

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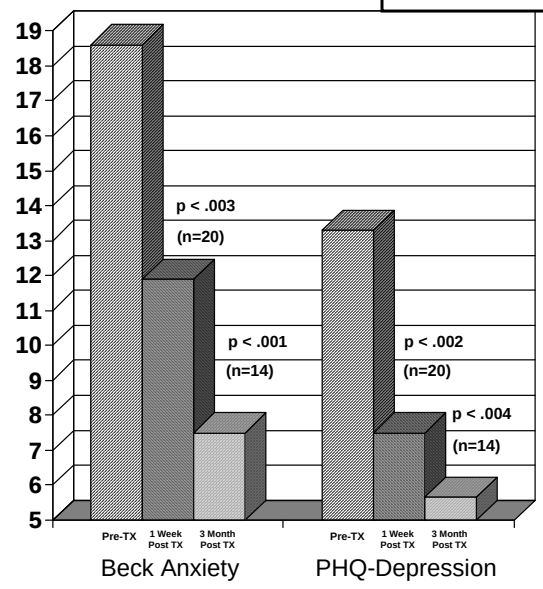
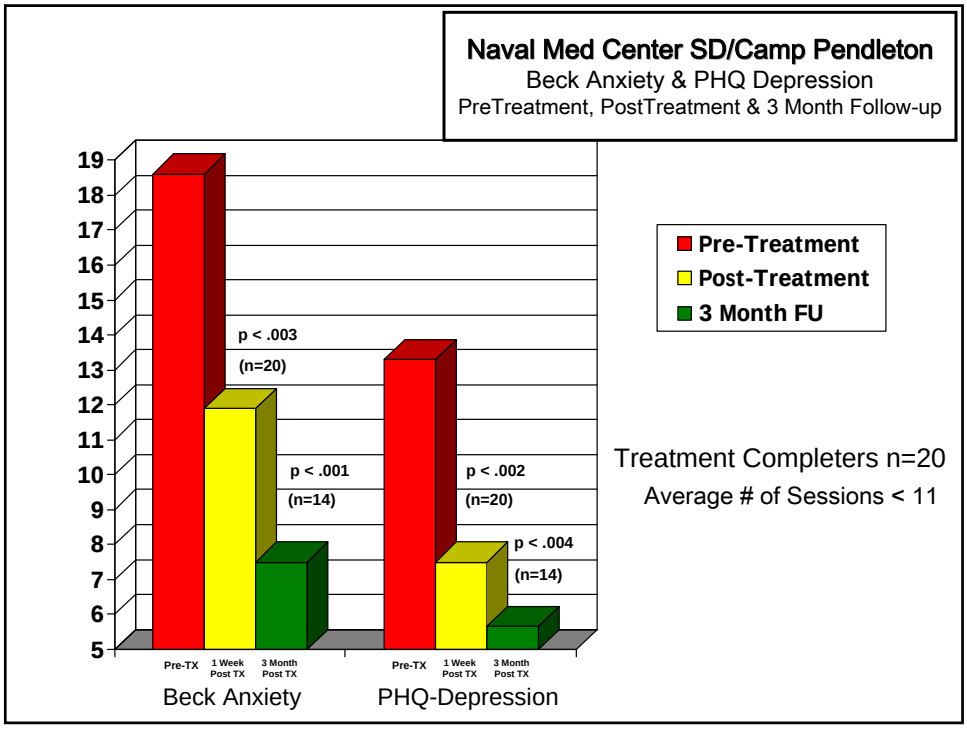
Naval Med Center SD/Camp Pendleton
Beck Anxiety & PHQ Depression
PreTreatment, PostTreatment & 3 Month Follow-up



Pre-Treatment
Post-Treatment
3 Month FU

Treatment Completers n=20
Average # of Sessions < 11



PTSD Results as of July 2008

Naval Med Center – San Diego/Camp Pendleton Open Clinical Trial

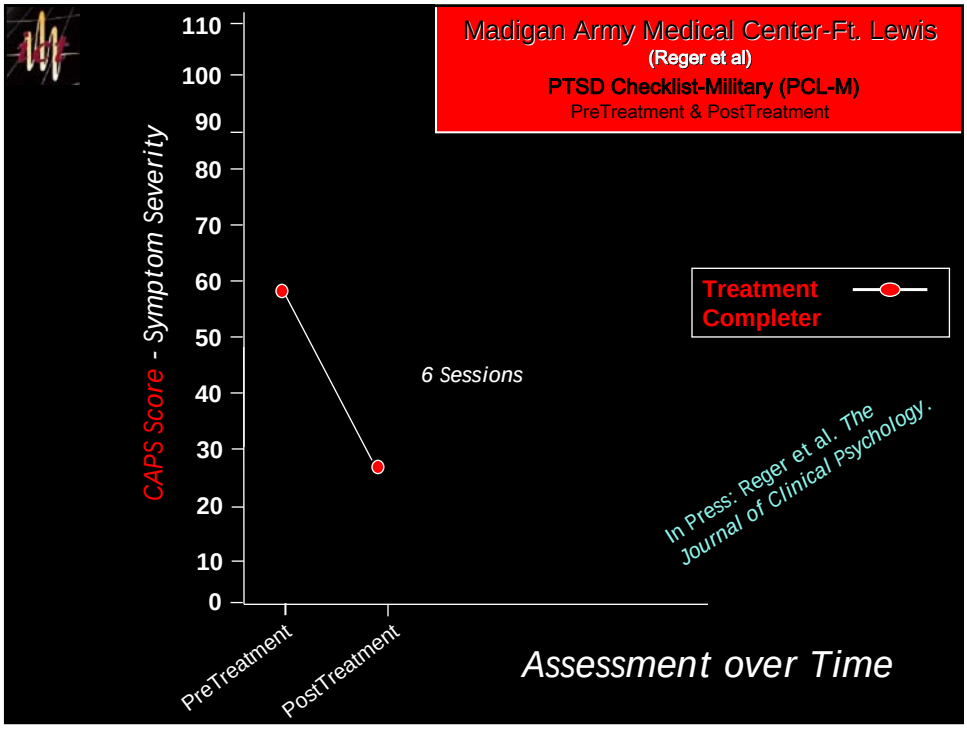
- Treatment completers successful = 16
- Treatment completers unsuccessful = 4

Challenge: Drop-outs!

- Treatment discontinued BEFORE FIRST Session: = 7
- Treatment discontinued BEFORE FIRST VR Session: 6
- Treatment discontinued *AFTER* FIRST VR Session: 7

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

How does this compare with Military Mental Healthcare attrition Rates???



Madigan Army Medical Center-Ft. Lewis

(Reger et al)

Non-Random Comparison with Standard of Care

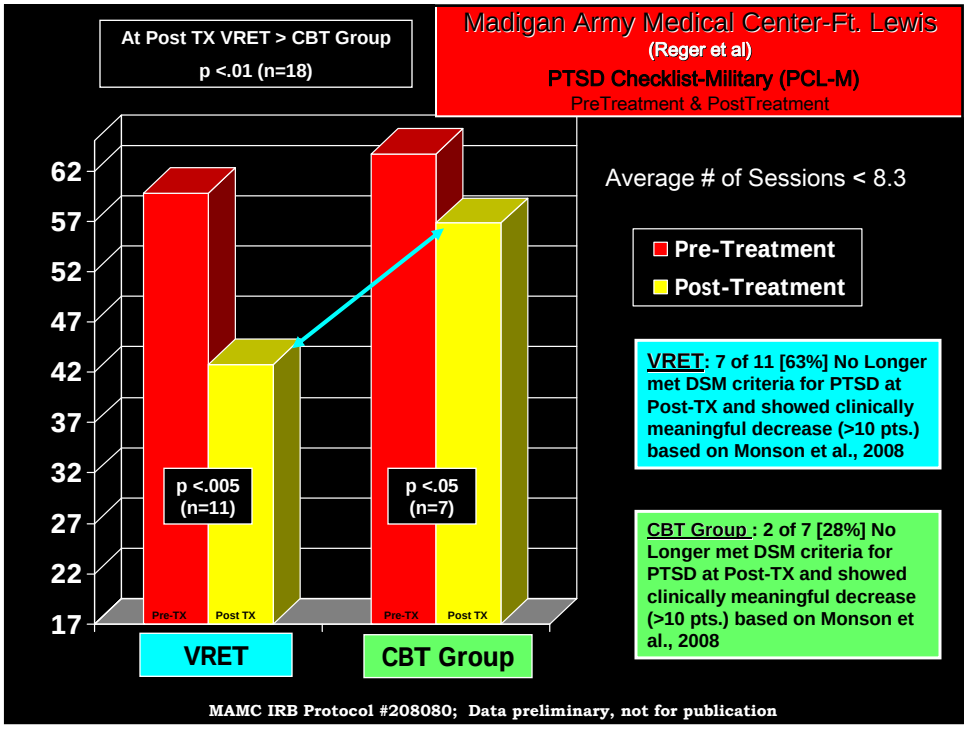
VRET

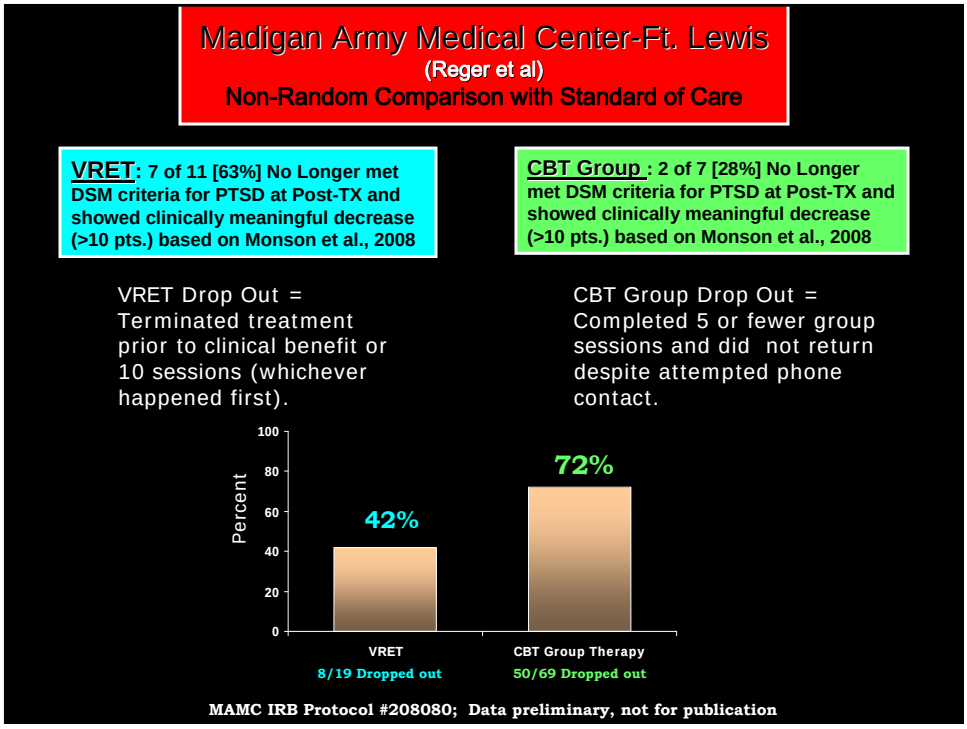
1. PE non-responders or those specifically seeking VR treatment.
2. 90-minute sessions
3. Sessions were approx weekly
4. Range number of sessions was 5-11 depending on progress.
5. 25 patients received or currently receiving VR Exposure

CBT Group

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.

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


At Post TX VRET > CBT Group
p <.01 (n=18)
Madigan Army Medical Center-Ft. Lewis
(Reger et al)
PTSD Checklist-Military (PCL-M)
PreTreatment & PostTreatment
62
57
52
47
42
37
32
27
22
17
p <.005
(n=11)
p <.05
(n=7)
Pre-TX
Post TX
Pre-TX
Post TX
VRET
CBT Group
Average # of Sessions < 8.3
Pre-Treatment
Post-Treatment
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
MAMC IRB Protocol #208080; Data preliminary, not for publication

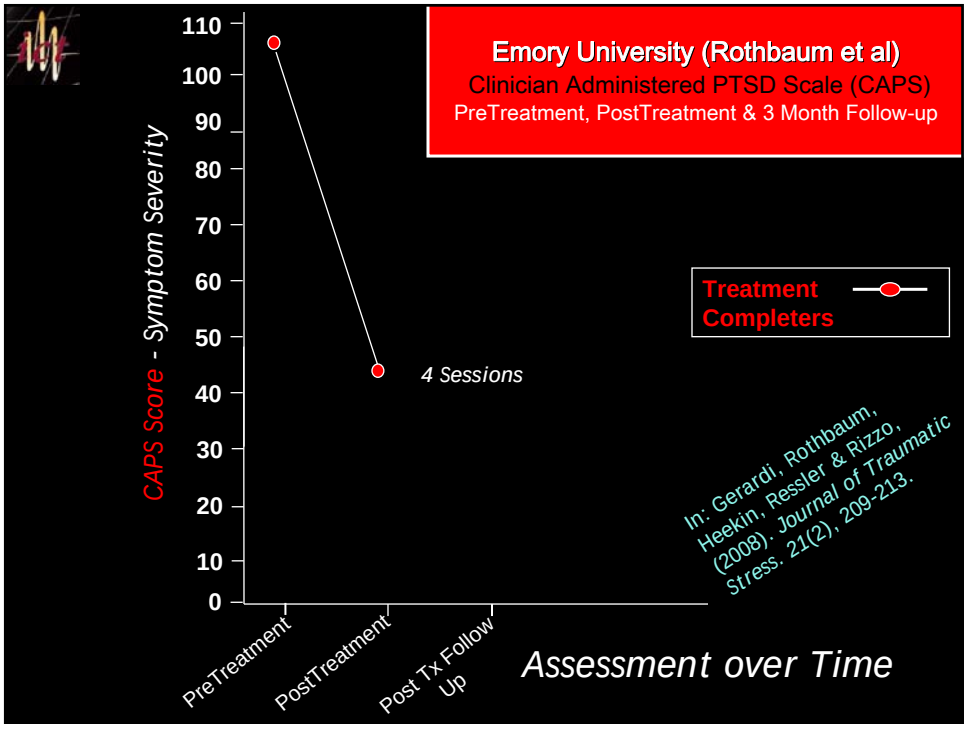

Madigan Army Medical Center-Ft. Lewis
(Reger et al)
Non-Random Comparison with Standard of Care
VRET: 7 of 11 [63%] No Longer met DSM criteria for PTSD at Post-TX and showed clinically meaningful decrease (>10 pts.) based on Monson et al., 2008
CBT Group : 2 of 7 [28%] No Longer met DSM criteria for 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.
Percent
100
80
60
40
20
0
42%
72%
VRET
8/19 Dropped out
CBT Group Therapy
50/69 Dropped out
MAMC IRB Protocol #208080; Data preliminary, not for publication

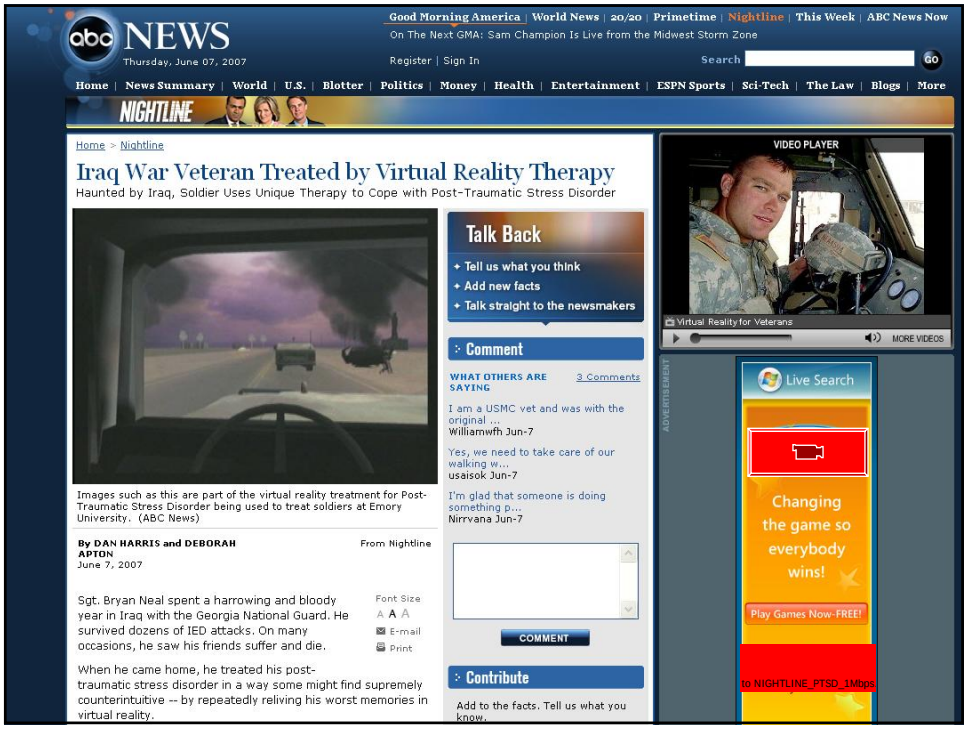
Madigan Army Medical Center-Ft. Lewis
(Reger et al)
Non-Random Comparison with Standard of Care

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

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Iraq War Veteran Treated by Virtual Reality Therapy
Haunted by Iraq, Soldier Uses Unique Therapy to Cope with Post-Traumatic Stress Disorder
Images such as this are part of the virtual reality treatment for Post-Traumatic Stress Disorder being used to treat soldiers at Emory University. (ABC News)
By DAN HARRIS and DEBORAH APTON
June 7, 2007
From Nightline
Font Size
E-mail
Print
Sgt. Bryan Neal spent a harrowing and bloody year in Iraq with the Georgia National Guard. He survived dozens of IED attacks. On many occasions, he saw his friends suffer and die.
When he came home, he treated his post-traumatic stress disorder in a way some might find supremely counterintuitive -- by repeatedly reliving his worst memories in virtual reality.
Talk Back
Tell us what you think
Add new facts
Talk straight to the newsmakers
Comment
WHAT OTHERS ARE SAYING
3 Comments
I am a USMC vet and was with the original ...
Williamwfh Jun-7
Yes, we need to take care of our walking w...
usaisok Jun-7
I'm glad that someone is doing something p...
Nirrvana Jun-7
COMMENT
Contribute
Add to the facts. Tell us what you know.
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Virtual Reality for Veterans
MORE VIDEOS
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Changing the game so everybody wins!
Play Games Now-FREE!
to NIGHTLINE_PTSD_1Mbps


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HDNet
DAN RATHER REPORTS
November 14, 2006 "Iraq War Veteran Stories"

Recent News Media Reports

November 13, 2007 "Coming Home"

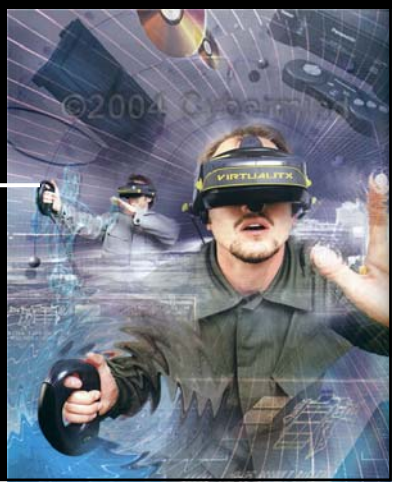
Challenge for Military Healthcare *(again from Hoge et al. 2004)*

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*

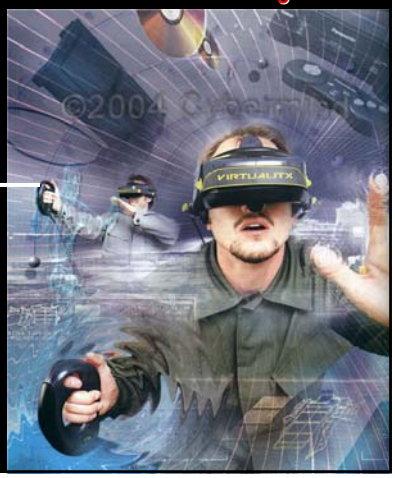
May appeal to a generation of soldiers who have grown up Digital!



Challenge for Military Healthcare

Option: Reconceptualize Therapy → *VR* Post-Deployment *Reintegration Training*

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



Challenge for Military Healthcare

Option: Reconceptualize Therapy → *VR Post-Deployment Reintegration Training*

- 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:

- Camp Pendleton
- Naval Medical Center San Diego
- Walter Reed Army Medical Center

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!

RELIVING IRAQ

A Humvee heads up a desert road in Virtual Iraq, an emerging treatment for veterans with post-traumatic stress disorder. At this month's meeting of the American Psychiatric Association in Washington, D.C., psychologist Barbara Rothbaum of Emory University in Atlanta, Georgia, reported promising results for a technique that combines Virtual Iraq with a drug that modifies the brain's fear response. The drug, D-cycloserine, enhances the function of a receptor for the neurotransmitter glutamate—the so-called NMDA receptor—that is critical for memory extinction. Earlier research showed that it helped people reduce their fear of heights (*Science*, 2 April 2004, p. 34).

In each of five sessions, soldiers take the drug and don virtual-reality goggles. Then a therapist guides them through a traumatic memory, most often an encounter with an improvised explosive device. The experience comes with sounds—people yelling, dogs barking, guns discharging, and helicopters whirring—vibrations, and even smells of burning rubber and fuel. "In general, veterans don't respond as well as civilians to drugs or therapy," Rothbaum said, but this combination makes for a "more potent exposure." The researchers have so far enrolled 27 vets, with 1-year follow-ups on three patients. Preliminary data, she said, indicate that two sessions with the drug achieve as much as eight without it.

CREDITS (TOP TO BOTTOM): THE HENRY MOORE FOUNDATION; JEFFREY WALLIN; SKIP RIZZO

www.sciencemag.org SCIENCE VOL 320 23 MAY 2008
Published by AAAS

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The Neuroscience of PTSD

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ORIGINAL ARTICLE

A Functional Magnetic Resonance Imaging Study of Amygdala and Medial Prefrontal Cortex Responses to Overtly Presented Fearful Faces in Posttraumatic Stress Disorder

Under review to DOD CoE/CAM:

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

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-

Arch Gen Psychiatry. 2005;62:273-281

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

Spherical 360-Degree Live Action Video Content

- ***Immersive 360-Degree Spherical Video***
  Shot on location or in studio using real life environments and people, live action video footage completely immerses the viewer into the scene
- ***Interactive Branching and Hot Spots***
  Customized branches and hot spots (or hit zones) within the video create interactive and individualized experiences
- ***Embedded Imagery and Computer Generated Graphics***
  Customized graphics and composite video can be added to heighten or modify the experience
- ***Special Effects***
  Innovative special effects may be incorporated to enhance the video

DSC Contact
Lance Loesberg 214.459.4020 *lance.loesberg@decisionsciencescorp.com*

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

THE NEW YORKER

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MAY 19, 2008

THE NEW YORKER
OUT LOUD
Sue Halpern talks about the use of virtual reality to treat traumatized veterans.

BLOGS
Goings On: Charlie Parker, "Design for Living," and more.
Sasha Frere-Jones watches Erykah.
Dana Goodyear looks inside the L.A. club Largo.
Victoria Roberts delves behind her cartoon characters.
Hendrik Hertzberg does new math.
George Packer monitors the disaster in Burma.
MORE BLOGS

THE NAKED
CAMPAIGN

ANNALS OF PSYCHOLOGY

VIRTUAL IRAQ

Using simulation to treat a new generation of traumatized veterans.

by Sue Halpern

MAY 19, 2008

TEXT SIZE: A | A | A
PRINT | E-MAIL | FEEDS

In November, 2004, when he was nineteen years old, a marine I'll call Travis Boyd found himself about to rush the roof of the tallest building in the northern end of Falluja in the midst of a firefight. Boyd, whose first assignment in Iraq was to the security detail at Abu Ghraib prison, had been patrolling the city with his thirteen-man infantry squad, rooting out insurgents and sleeping on the floors of abandoned houses, where they'd often have to remove dead bodies in order to lay out their bedrolls.

With Boyd in the lead, the marines ran up the building's four flights of stairs. When they reached the top, "the enemy cut loose at us with everything they had," he recalled. "Bullets were exploding like firecrackers all around us." Boyd paused and his team leader, whom he thought of as an older brother, ran past him to the far side of the building. Moments after he got there, he was shot dead. Within minutes, everyone else on the roof was wounded. "We had to crawl out of there," said Boyd, who was hit with shrapnel and suffered a concussion, earning a Purple Heart. "That was my worst day."

The program uses sights, sounds, even smells to evoke, and subdue, painful memories.

KEYWORDS
Virtual Reality; Virtual Iraq; Veterans; U.S. Soldiers; Psychotherapy; Post-Traumatic Stress Disorder (P.T.S.D.); Iraq War

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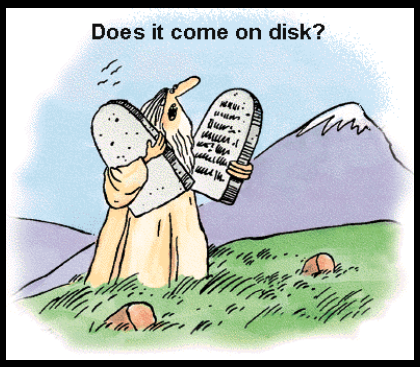
Available at: www.NewYorker.com

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.



Thanks!

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USC
Virtual Reality Cognitive
Performance Assessment Test
VRCPAT
Dr. Thomas Parsons
U.S.ARMY


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The End (for now)
"No, this is the afterlife.
Cyberspace is over there."
GOFF
"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

The End (for now)

"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