Using Virtual Reality during Medical Procedures

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The VRMC Team

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- ✓ Kira Schabram
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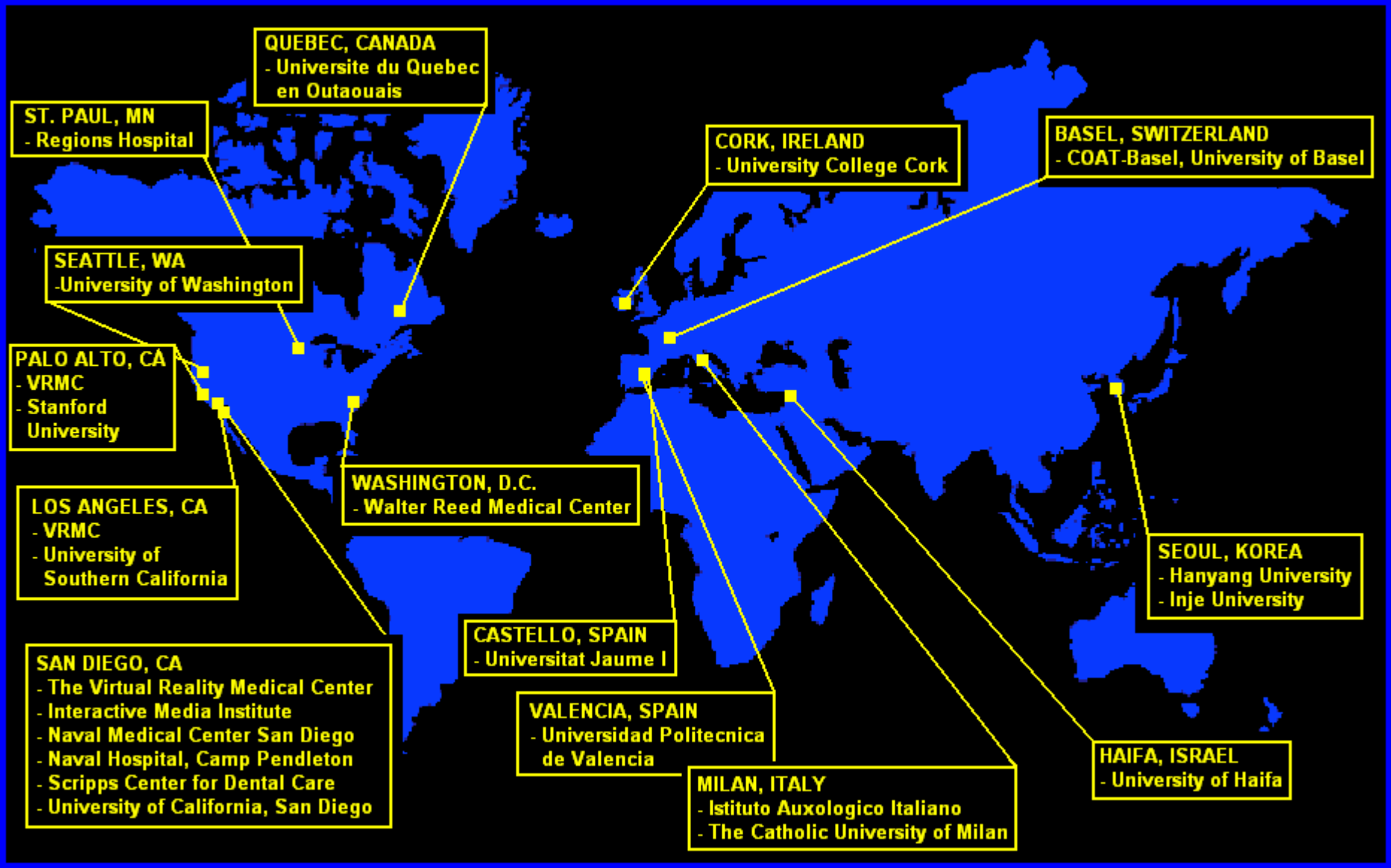
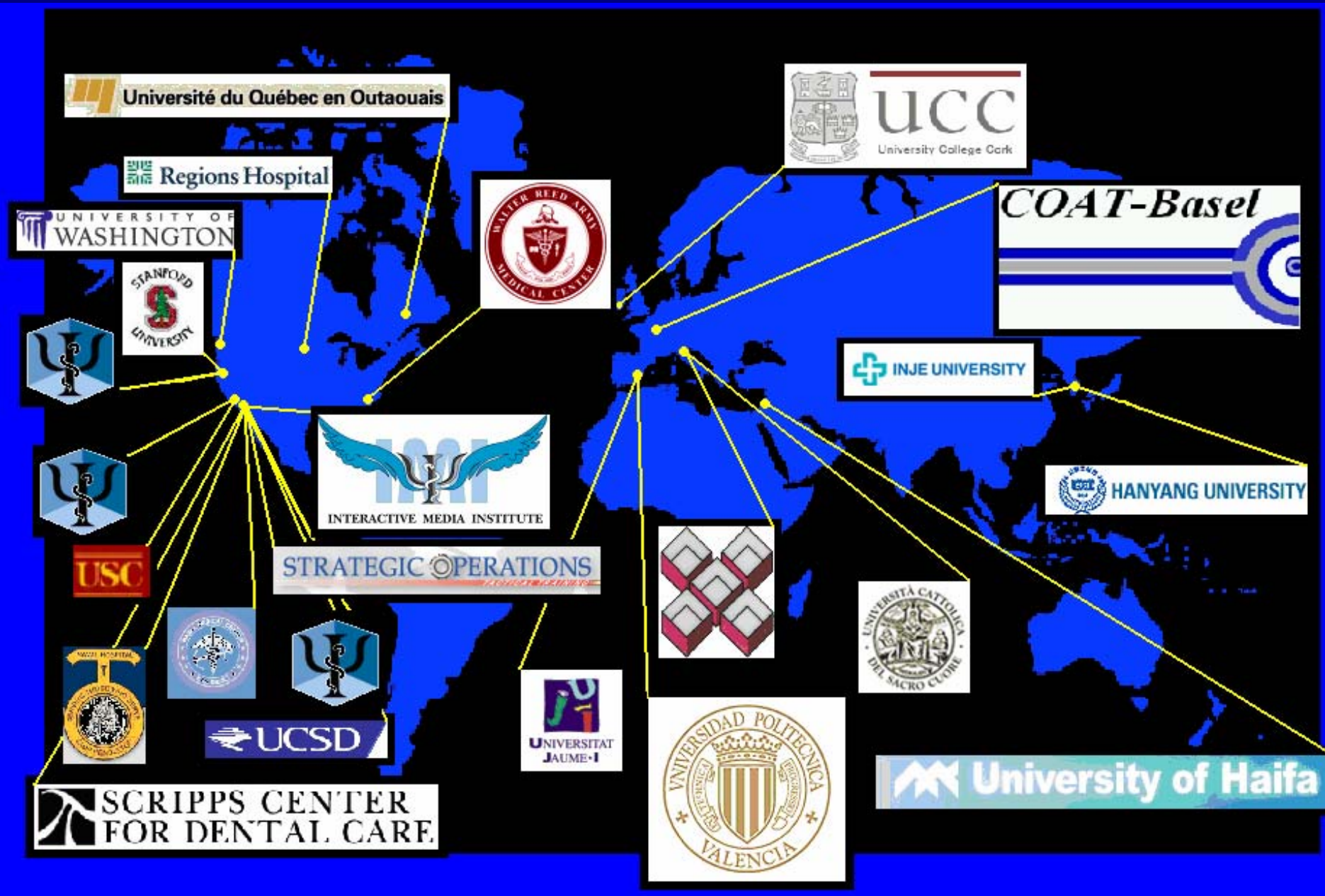
VRMC Research Collaborations

- Balboa Naval Hospital
  - Pain Distraction, PTSD
- Camp Pendleton
  - PTSD
- Region's Hospital, Minnesota
  - Pain Distraction
- Scripps Clinic
  - Pain Distraction
- Stanford University
  - Anxiety, Physiology
- UCSD
  - Pain Distraction
- University of Washington
  - Pain Distraction
- USC
  - ADHD, PTSD, Pain Distraction, Rehabilitation
- Walter Reed Army Hospital, D.C.
  - Rehabilitation
- Hanyang University, Korea
  - Smoking Cessation/Prevention, Schizophrenia, ADHD, Rehabilitation, Pain Distraction
- Inje University Paik Hospital, Korea
  - Anxiety
- Istituto Auxologico, Italy
  - Eating Disorders, Obesity, Anxiety, Pain Distraction
- University of Basel
  - Anxiety, Physiology, Addictions, Pain Distraction
- University of Quebec
  - Anxiety Disorders, Pain Distraction


QUEBEC, CANADA
- Universite du Quebec en Outaouais
ST. PAUL, MN
- Regions Hospital
CORK, IRELAND
- University College Cork
BASEL, SWITZERLAND
- COAT-Basel, University of Basel
SEATTLE, WA
-University of Washington
PALO ALTO, CA
- VRMC
- Stanford University
WASHINGTON, D.C.
- Walter Reed Medical Center
LOS ANGELES, CA
- VRMC
- University of Southern California
SEOUL, KOREA
- Hanyang University
- Inje University
CASTELLO, SPAIN
- Universitat Jaume I
SAN DIEGO, CA
- The Virtual Reality Medical Center
- Interactive Media Institute
- Naval Medical Center San Diego
- Naval Hospital, Camp Pendleton
- Scripps Center for Dental Care
- University of California, San Diego
VALENCIA, SPAIN
- Universidad Politecnica de Valencia
HAIFA, ISRAEL
- University of Haifa
MILAN, ITALY
- Istituto Auxologico Italiano
- The Catholic University of Milan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WALTER REED ARMY MEDICAL CENTER
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INJE UNIVERSITY
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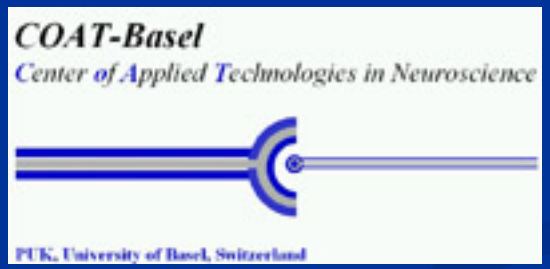
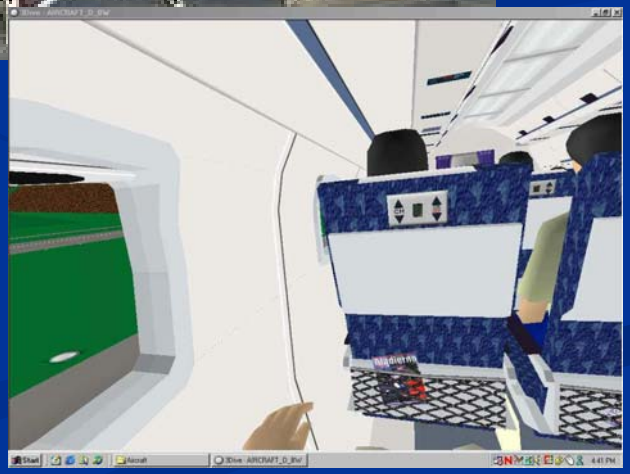
STRATEGIC OPERATIONS
USC
UCSD
UNIVERSITÀ CATTOLICA DEL SACRO CUORE
UNIVERSITAT JAUME·I
UNIVERSIDAD POLITÉCNICA VALENCIA
University of Haifa
SCRIPPS CENTER FOR DENTAL CARE

VRMC/IMI Funding



Virtual Reality Clinical Services
(San Diego, West LA, Palo Alto)

- Specific Phobias
  - Flying
  - Driving
  - Public Speaking
  - Claustrophobia
  - Heights
  - Spiders
  - Medical Procedures
  - School
- Panic Disorder
- Agoraphobia
- Generalized Social Phobia
- PTSD due to motor vehicle accidents



Research Studies

- Eating Disorders & Obesity
- Distraction during Painful Medical & Dental Procedures
- Cue Exposure
- Health Promotion
- Anger Management
- Autism
- Attention Deficit Hyperactivity Disorder (ADHD)
- Driving Deficits after Brain Injury
- Functional Disorders
- PTSD in Gulf War Veterans
- Quality of Life in Chronic Disease

VRMC Research & Development

- Research Studies
- VR for Training
- Student Internship/Fellowship Programs
- Clinical Trials
- Evaluation of New Software
- Software Development
- Collaborations

Interactive Media Institute (IMI)
a 501 c3 non-profit organization

- Non-profit affiliate of VRMC
- International Advisory Board
- Scientific and public education
  - Publications
  - Conferences
  - Continuing Education Courses
- Our mission:
  - To further the application of advanced technologies for behavioral healthcare
  - To serve as a unifying organization for basic and clinical research
  - To create a set of standards and guidelines for simulations

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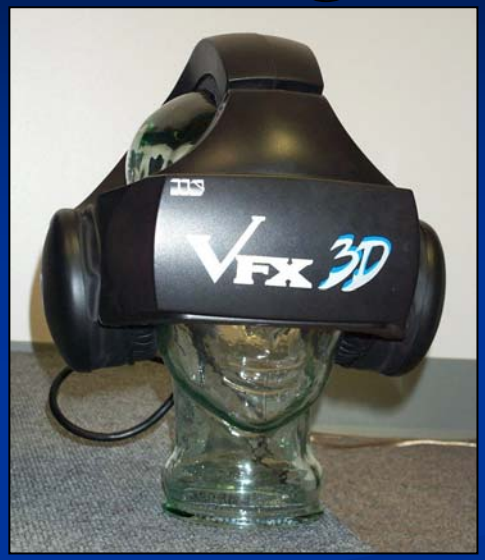
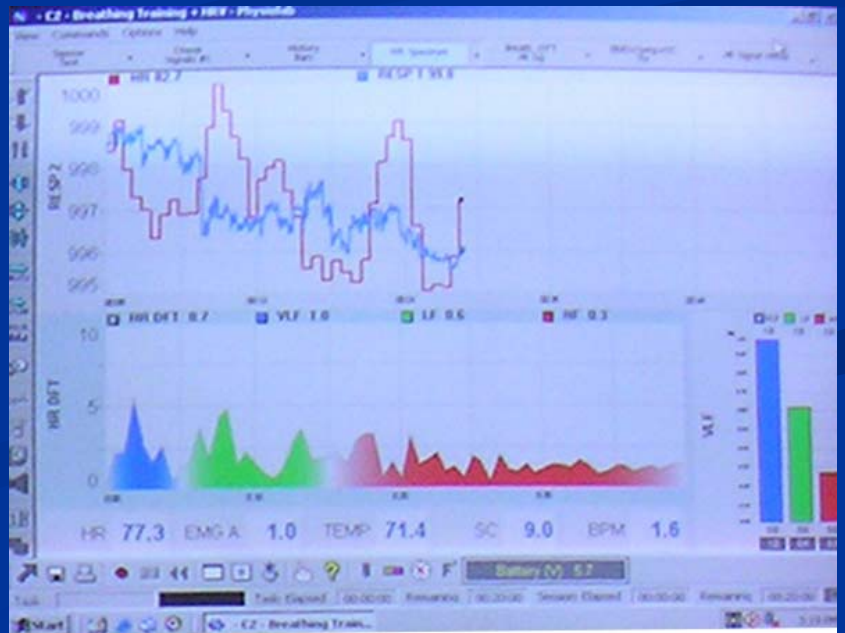
VRMC Technologies

- Virtual Reality/Simulation
- Videogames
- Non-Invasive
- Physiological Monitoring
- Shared Internet Worlds
- Biometrics
- Human-Robot Interactions





Additional useful devices

Evaluative Measures

Subjective

Subjective Units of Distress

Self-Report Scales (P & P)

Overt Behavioral Observation

Personality Inventory

Physiology

Objective

3 Systems Theory:
Experience, behavior, and physiology are loosely coupled,
rather independent data sources that should be assessed concurrently
in anxiety disorders to provide a comprehensive picture of change in anxiety.
- ***P. Lang***

Prevalence Rates

Specific Phobia	Prevalence (U.S.)
Needle Phobia	5% -10%
Blood Phobia	5% - 10%
Dental Phobia	≥ 10%

Specific Phobias

- Blood, Injection, and Injury phobias are the only phobias that are associated with fainting in the feared situation.
- 2/3 of people with a blood phobia faint in the feared situation
- About half of people with a needle phobia report a history of fainting in the situation
- The fainting response is related to an extreme drop in blood pressure that occurs upon exposure to situations involving blood, surgery, and needles.

Blood Phobia

- Symptoms:
  - Breathlessness
  - Dizziness
  - Excessive sweating
  - Nausea
  - Dry mouth
  - Heart palpitations
  - Inability to think clearly
  - Fear of dying
  - A sensation of detachment from reality or a full blown anxiety attack

Dental Phobia and Dental Anxiety

- 50% of the American population does not seek regular dental care
- An estimated 9-15% of all Americans avoid dental care due to anxiety and fear experience.
- This translates to some 30 - 40 million people so afraid of dental treatment that they avoid it altogether

Needle Phobia

- Affects at least 10% of the population
- The problem often significantly impacts the quality of life
- Symptoms typically include:
  - Shortness of breath
  - Rapid breathing
  - Irregular heartbeat
  - Panic Attacks
  - Sweating
  - Nausea
  - Overall feelings of dread

Controlled Studies: n > 8

Needle Phobia

Author	Country	Year	# of Pts	Test Groups
Wiederhold	U.S.	2005	20	Normal non-phobic
Hamza	South Africa	2000	16	Needle phobic

VR for Blood-Injection-Injury Phobia

(Wiederhold, Mendoza, Nakatani, Bullinger, & Wiederhold, 2005)

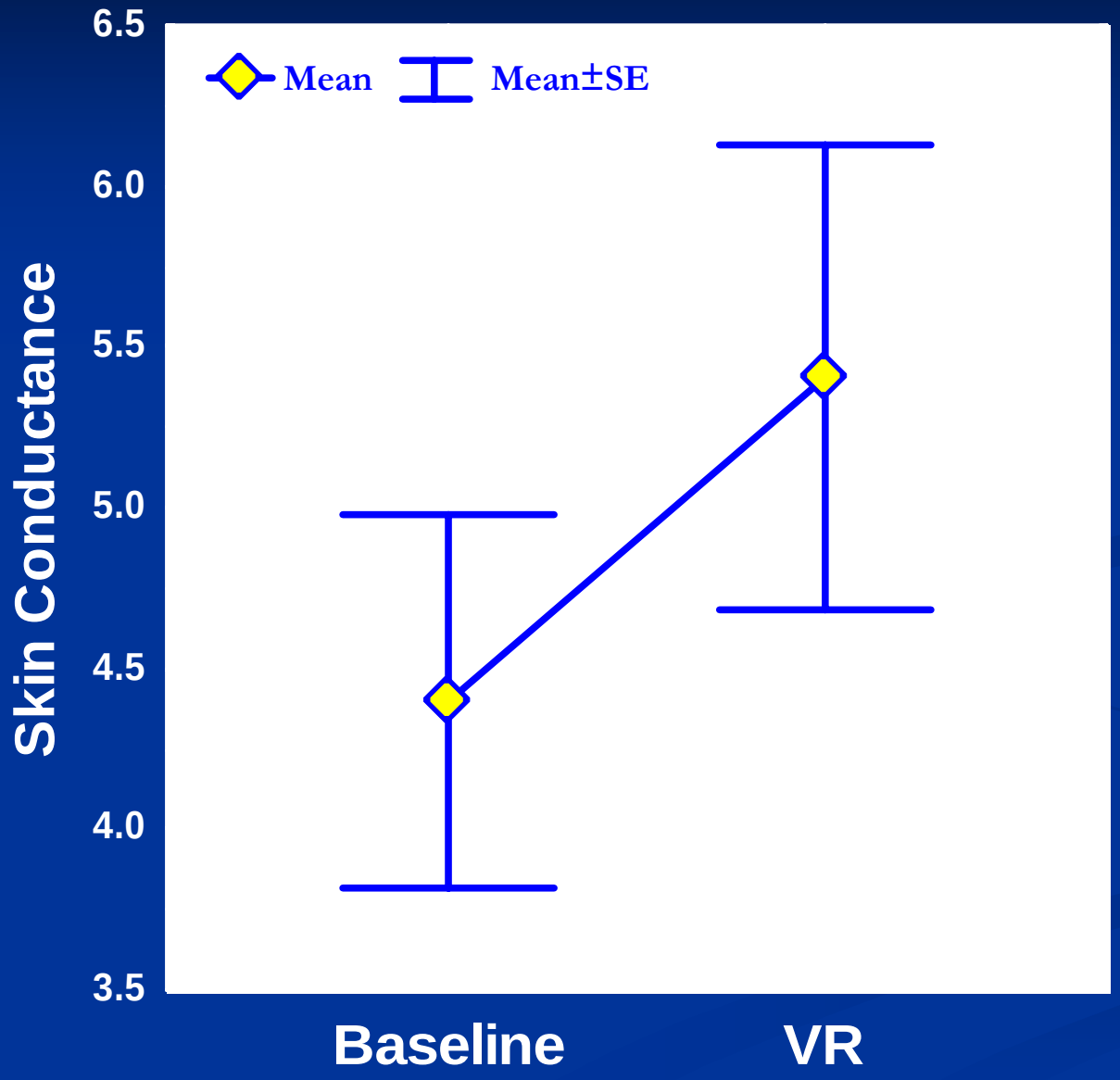
- **Subject Population:**
  - 20 healthy non-phobic participants (males and females)
- **Virtual Environment:**
  - Virtual world was modeled after an outpatient clinic in La Jolla
  - Includes:
    - Exam rooms
      - Filled with typical phlebotomy lab paraphernalia
    - Clinic entrance
    - Waiting room
    - Lobby
    - Nurse Avatar who administers the injection

Scripps Clinic Movie Clip

Methods

- Participants were randomly assigned to two groups (Group A and B)
- Group A:
  - Instructed to navigate through the virtual clinic to a specified exam room
  - Not informed that they would be "receiving an injection"
- Group B:
  - Same instructions as Group A but were informed that they would be "receiving an injection"
- All participants navigated the world for 3 minutes
- Physiological measures were obtained for each participant
- After VR exposure, each participant completed post-test questionnaires and gave subjective feedback

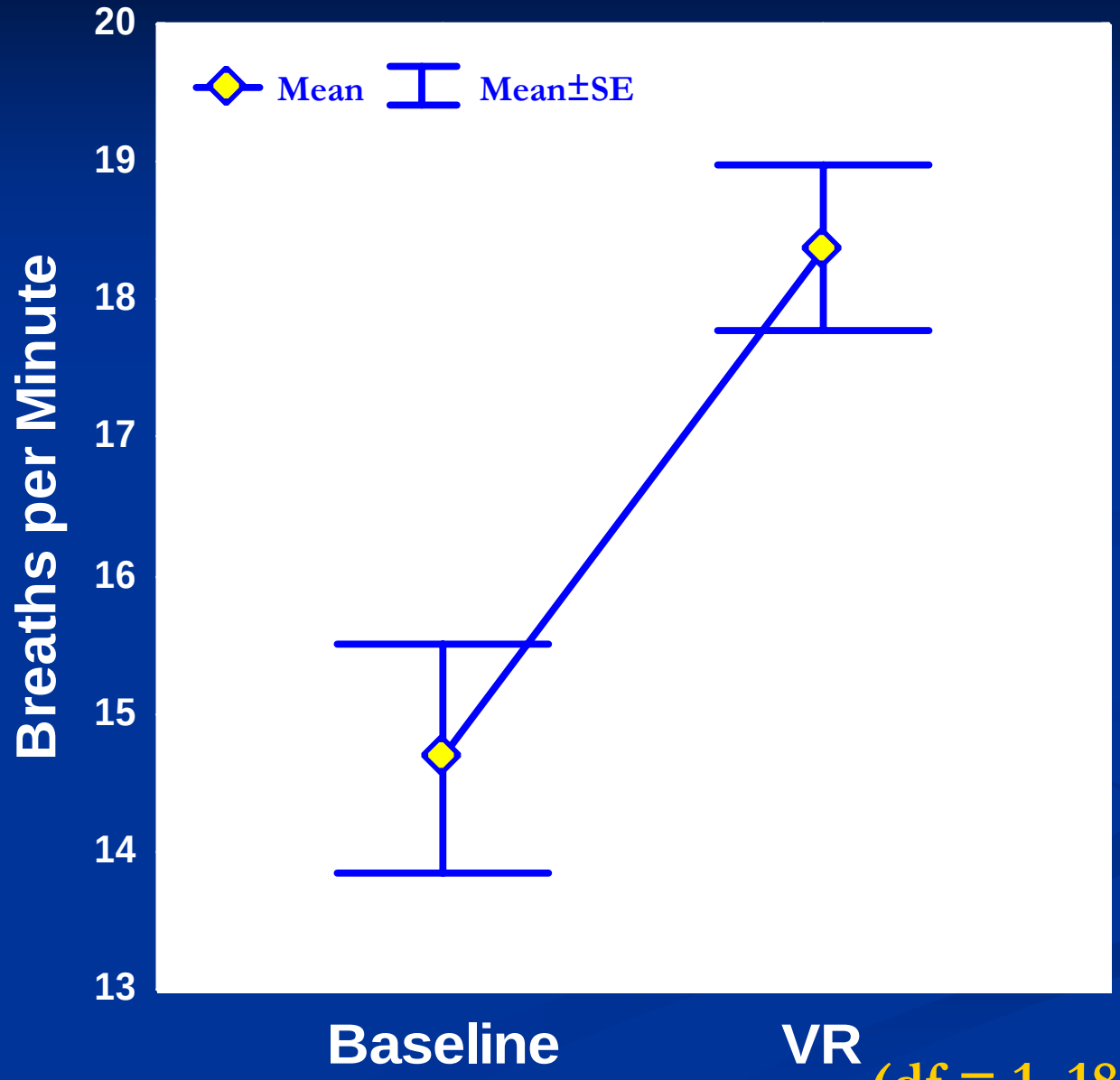
Results



Statistically significant increase in skin conductance

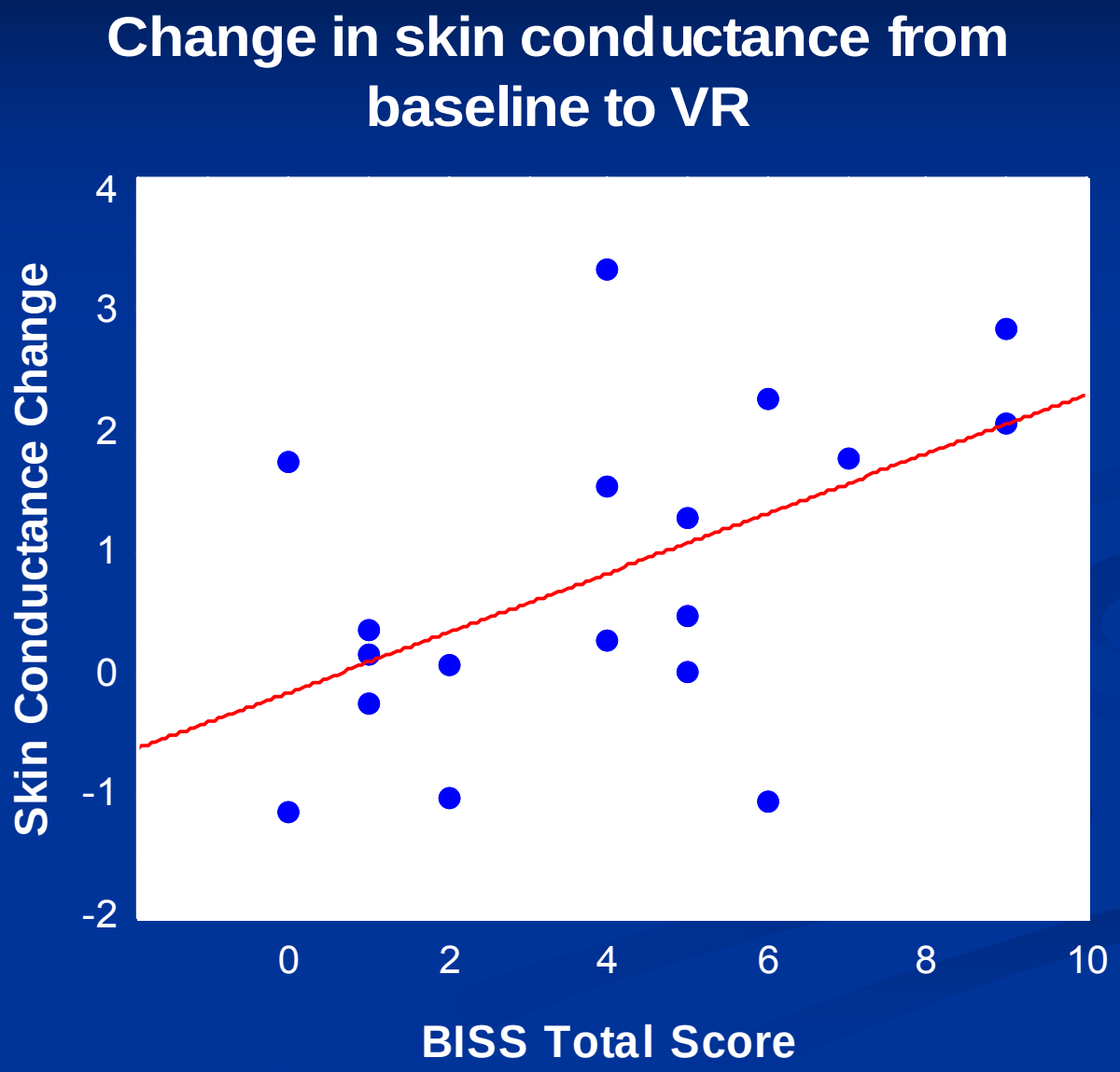
(df = 1, 17; p=0.018)

Respiration Rate



(df = 1, 18; p= 0.0003)

Total scores from the BISS were positively correlated to a change in skin conductance



Overall Results

- Skin conductance and respiration rate values increased from baseline to VR, indicating an increase in arousal due to VR exposure
- Group B revealed a larger increase in initial skin conductance values from baseline compared to Group A
- Significant correlation between self-reported anxiety and objective physiological measures of anxiety

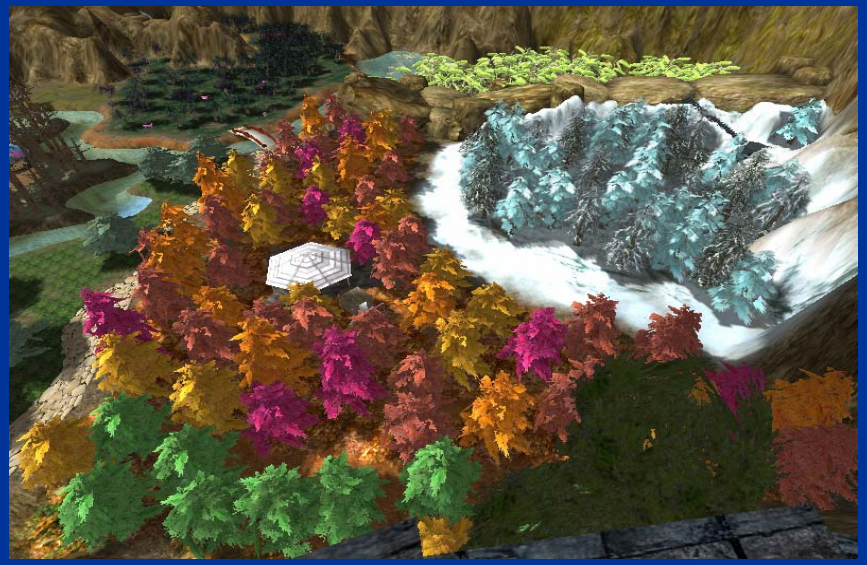
Conclusions

- Virtual cues produced significant changes in physiological arousal in normal non-phobic participants
- Increased arousal levels due to VR exposure suggest that the virtual world is an effective method of cue exposure therapy for people are afraid of blood or injections
- Results of this study are not conclusive and additional analysis must be conducted

Dental Pain Management

- *Purpose:*
  - To utilize Virtual Reality as a distraction during painful dental procedures
- *Subject Population:*
  - **400 adults** who are being treated at **Scripps Center for Dental Care**
- *Subject Recruitment:*
  - Participants for the study will be recruited with the help of the dental staff of Scripps Center for Dental Care.

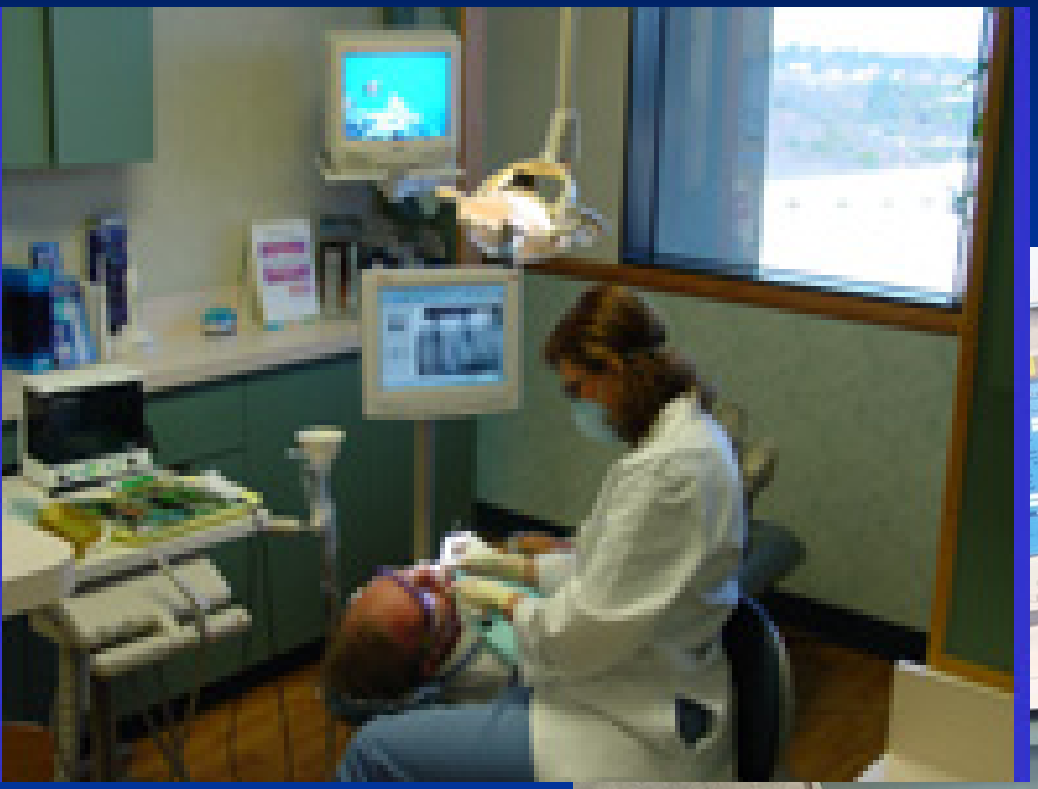
Enchanted Forest



Enchanted Forest

- The virtual world was developed by VRMC for dental patients.

Patient with HMD

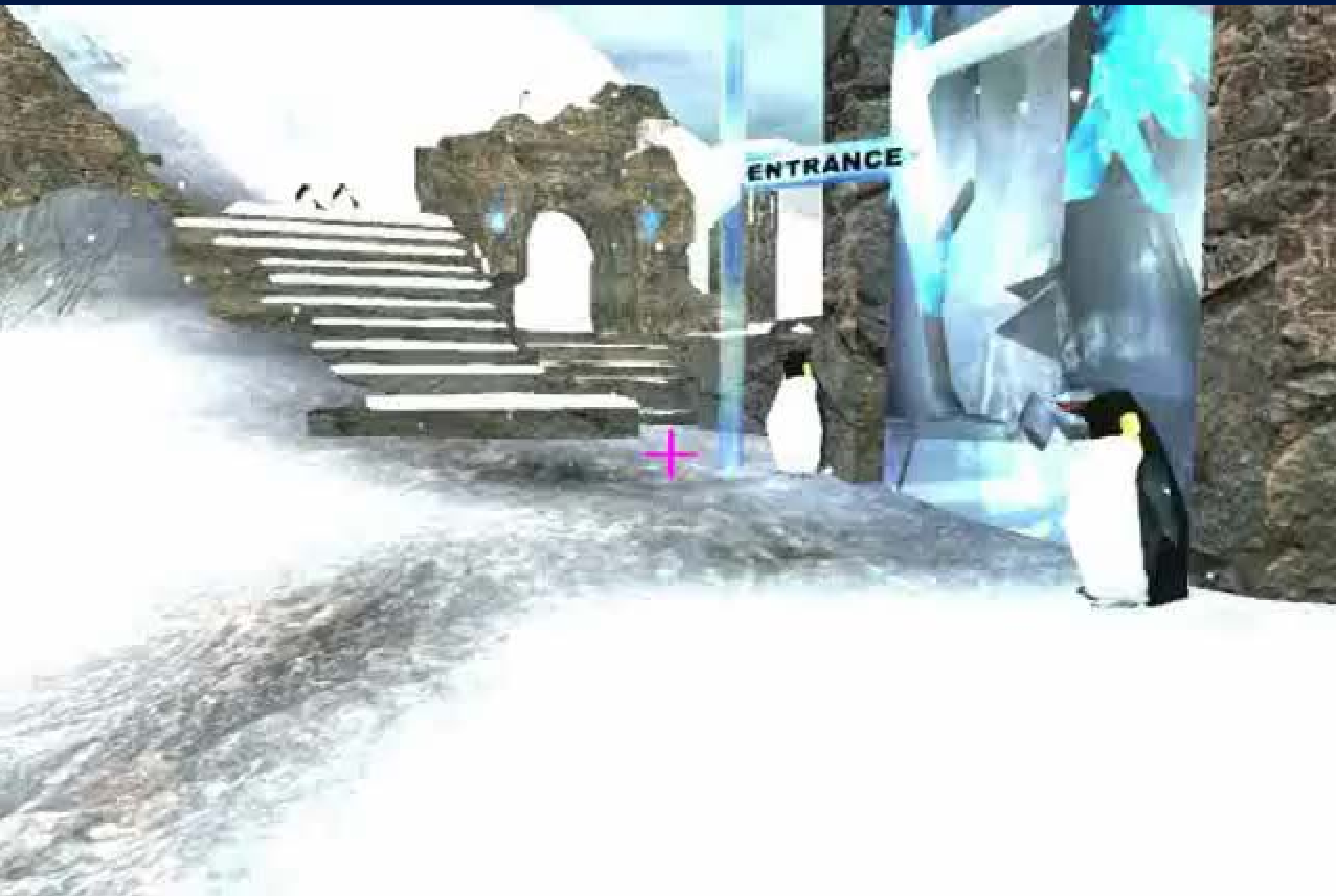


Castle Video Clip

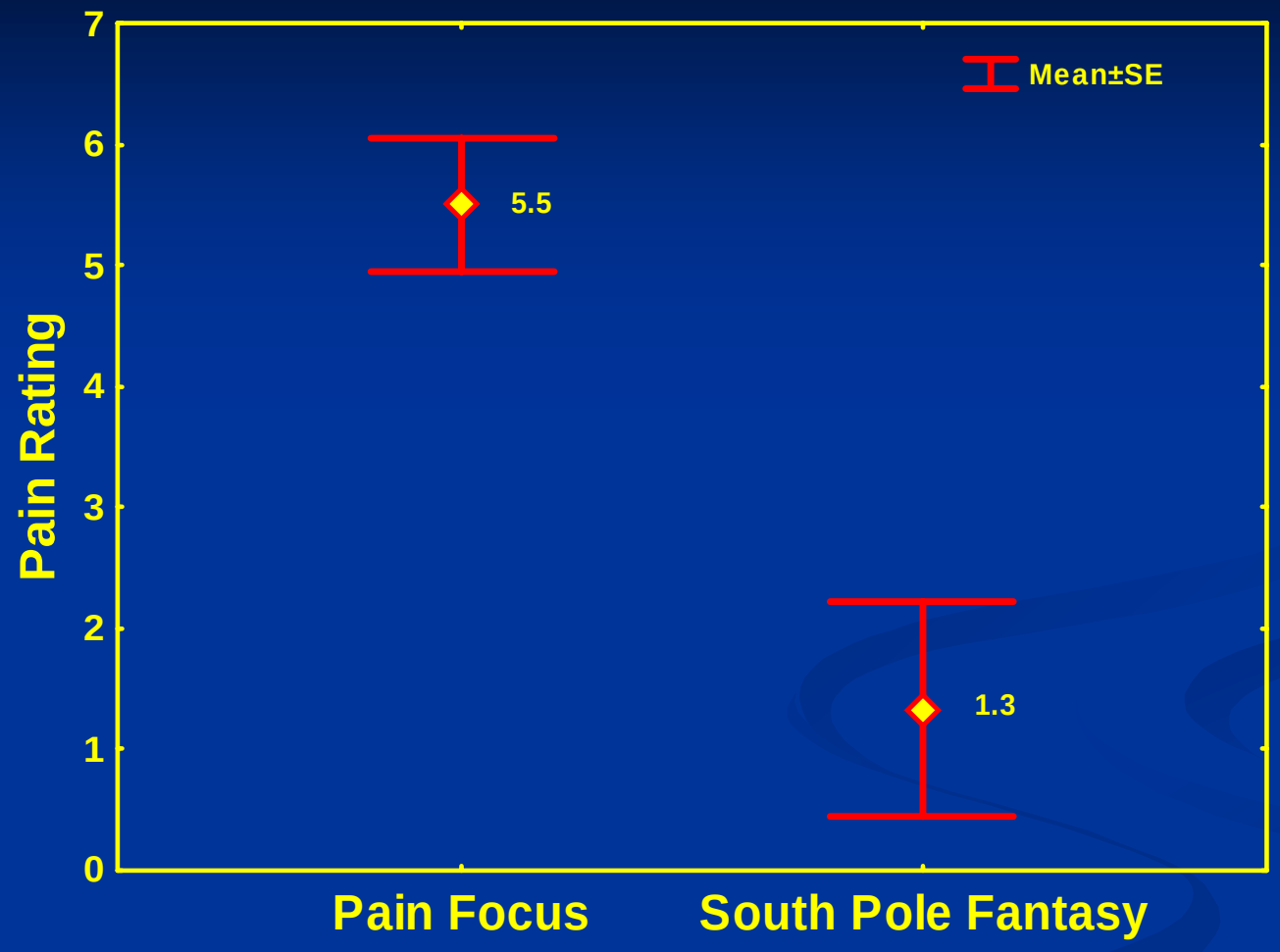
Burn Pain Distraction

- 6 normal healthy participants were placed inside South Pole Fantasy
- Navigated the virtual environment using a head mounted display (I-glasses)
- Task was to try to free as many penguins from the ice cubes as they could
- NO time limit for this objective
- Participants rated their pain while inside the virtual world

Burn Pain Distraction



VRMC Preliminary Results



p = 0.027

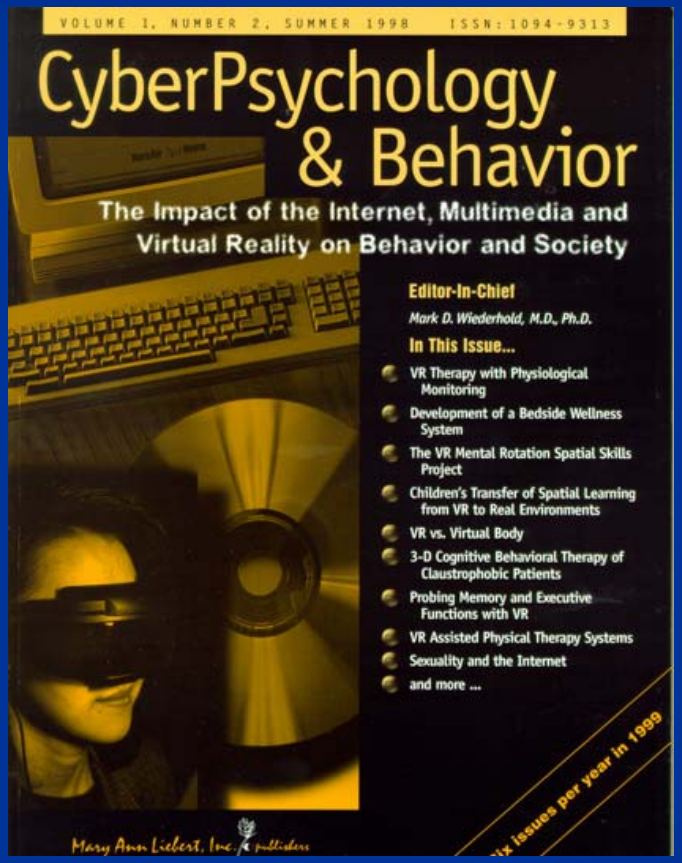
Mean pain ratings exhibited over a fourfold decrease when participants were exploring the South Pole Fantasy.

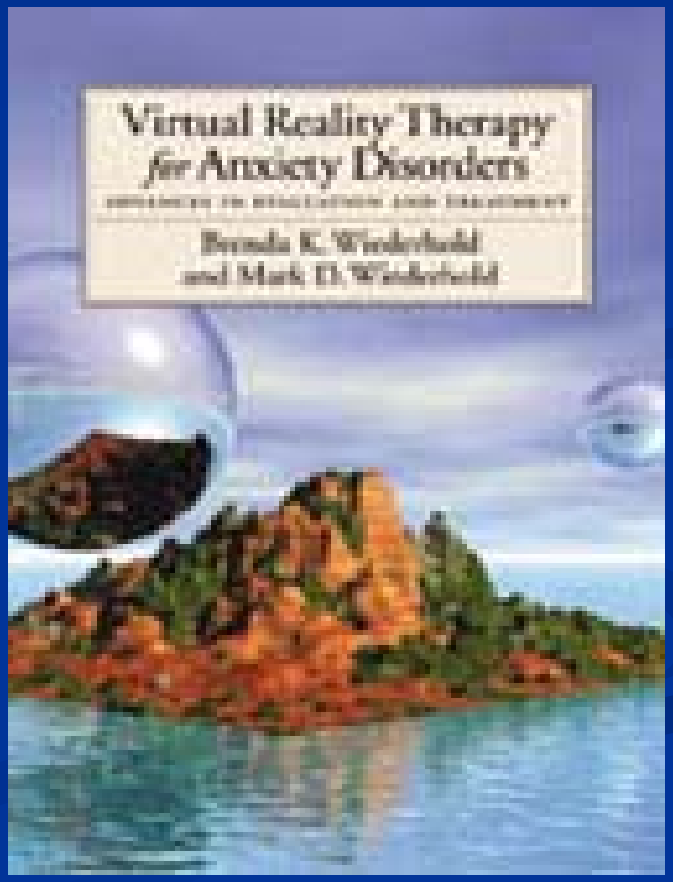
Conclusions

- Although our results have shown that VR is effective as a distraction during painful medical and dental procedures, there are still people who avoid medical and dental settings altogether due to fear and anxiety.
- Thus, VR desensitization might be the answer to this problem.

Indexed in:
- MedLine
- PsychInfo
- Excerpta Medica
- Social Sciences Citations

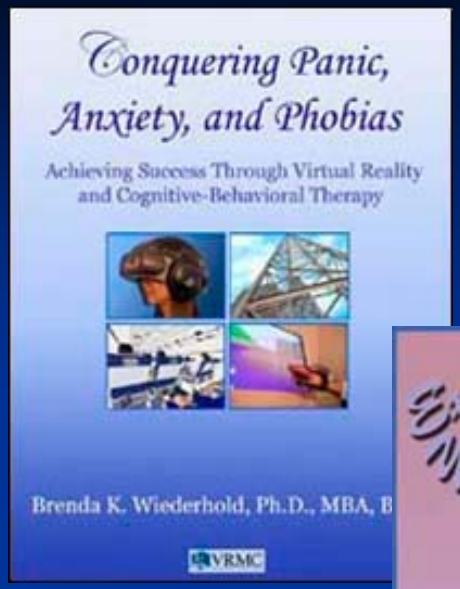
Published by:
American Psychological Association

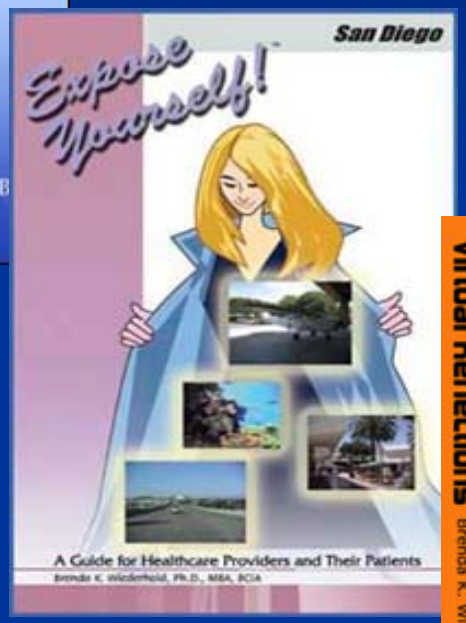


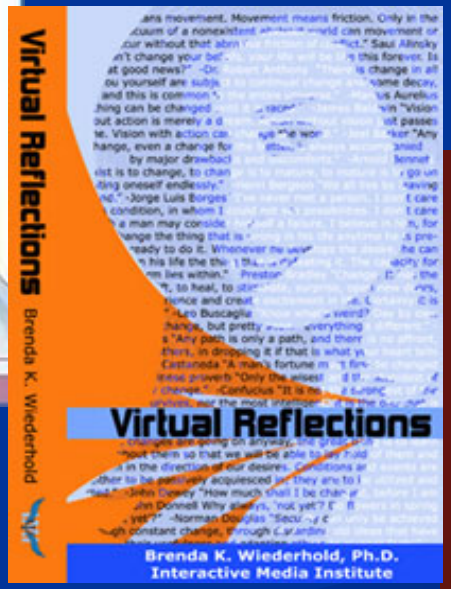


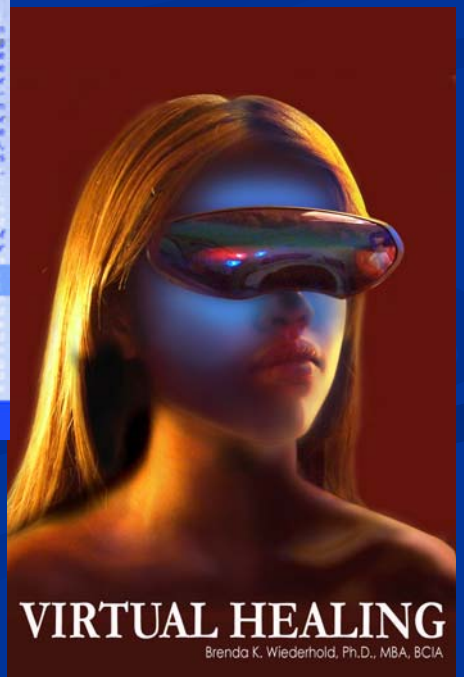
Publications

Coming in 2006:
Virtual Healers









Holiday Inn Plaza La Chaudière

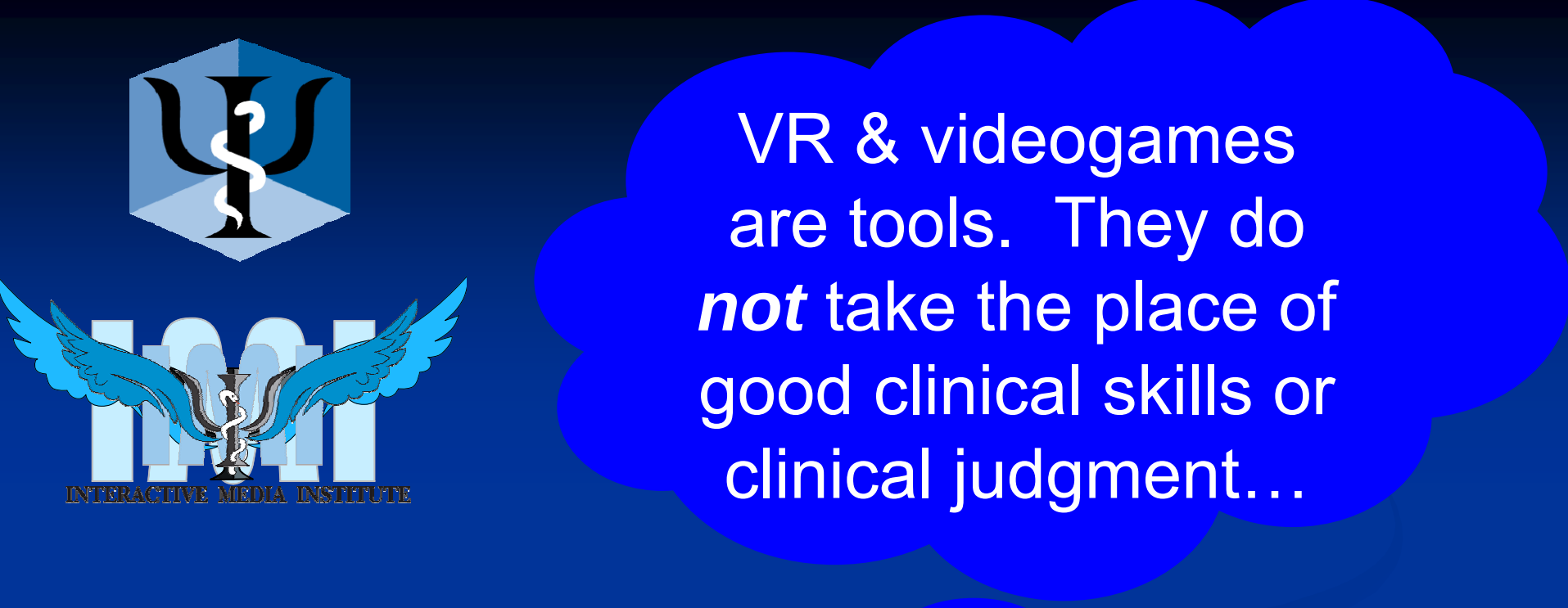
Gatineau, Canada

Conference Co-organizers:
Interactive Media Institute, a 501c3 non-profit organization
Cyberpsychology Lab, Université du Québec en Outaouais

June 12-15, 2006

CyberTherapy 11

Virtual Healing: Designing Reality



Joseph Wolpe

Carl Jung

Sigmund Freud