The ETIOBE Project: A Supporting System for Children Obesity

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The aim of ETIOBE project is to develop a cognitive-behavioural program for the treatment of obesity in children supported by new technologies (Internet, virtual reality) in order to potentate the efficacy and efficiency of the treatment program. Specifically, the system pretends to improve the treatment adherence by strengthening the auto-control mechanisms in the patients, in order to achieve the maintenance of therapeutic gains (change in eating habits and physical activity) and to prevent relapses by restoring healthy life habits.

ETIOBE consists of a tele-therapy system that includes three main applications:

1) Clinician Supporting Application. This application facilitates the therapists to personalize the acting-intervention protocol, according to the specific characteristics to each patient.

2) Home Supporting Application. This application permits the communication between the child and parents with the therapist from home. With this system the child will also have access to the therapeutic contents stated by the therapist and to do some of the therapy assignments.

3) Mobile Supporting Application. This application permits the child, by using mobile devices, to self-register in the context and real time and to access from the therapeutic advices and instructions using a “virtual agent”. In the present work a detailed description of the system is presented.
The Butler Project: Elderly people’s satisfaction with new technologies

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The Butler Project consists of a cognitive and emotional tele-assistance system for the elderly. Specifically, this system creates the ability to carry out early diagnosis, intervention, and follow-up of the physical, cognitive, and emotional state of elderly people, and in this way to improve their quality of life and to prevent their social isolation. Moreover, the Butler system offers several professional advantages; for the psychologist, this system offers an early detection of emotional state, diagnosis, easy assessment and therapy tool. For the geriatric hospitals, this system can be used like an occupational therapy tool. Through this, the professional (psychologist and geriatric hospital) can be warned through the Butler Project when it detects a severe emotional state. From the technological point of view, the Butler system offers the elderly several tools based in telecommunication (e-mail, chat, and videoconference adapted to the users’ needs) and Virtual Reality techniques. One of the telecommunication tools addressed to prevent social isolation that characterises this population is the Book of life. The Book of life is used in order to create an individual memory space composed by several audiovisual stimuli related to their own life and share it with other users (e.g., videos, music, images or sentences). For instance, a user can share a photograph or a video associated to a piece of music of his/her family/friends with other users. The aim of this work is to present the results obtained in a case study about the satisfaction of real user with the book of life.
Is presence in a physical environment influenced by arousal and attention? A study conducted on researchers in cyberpsychology.

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Almost all researchers on presence agree with the simple definition of presence, which is the feeling of being there in the virtual environment. However, this is where the consensus stops. There is no general agreement on the nature of presence, what constitutes an acceptable operational definition, which factors play a key role to create a strong illusion of non-mediation or how to best suspend disbelief.

Despite this lack of agreement, researchers continue to conduct experimental research on presence. Given the increased interest on the relationship between presence and anxiety, it is essential to differentiated presence, arousal and attention. Do researchers in the field confound the impression of being somewhere in the virtual environment with arousal or increased attention? In the physical reality, a person attending a conference should be able to recognize where he or she is (i.e., in the conference room) and that should not be influenced by emotional arousal. When aroused, a person could feel more emotions or an increase in attention towards specific stimuli, he or she but should not be more “here” in the room than he or she already is. The aim of the current study is to test if researchers in the field of cyberpsychology rate their feeling of being present in the physical environment differently following changes in arousal and attention.

The present study was conducted live during the conference, without the conference attendees’ awareness. At the beginning of the symposium on presence, one of the co-chair of the symposium (Stéphane Bouchard) invited attendees to participate in a study on presence. Participants received three sheets of paper: (a) a blue one for collecting descriptive data, their awareness of the upcoming manipulation and the baseline level of presence, (b) a green one for recording the current level of presence after the third talk, and (c) a yellow one for recording the Post experiment level of presence during the experimenter’s oral talk. The level of presence was measured using the following single-item scale (in percentage): “To what extent did you feel present in this conference room in the last 20 seconds?”. In order to set the scene for the experimental manipulation, the experimenter received three phone calls on his cell phone during the conference, just prior to various oral talks. The experimental manipulation of arousal and attention occurred during the experimenter’s talk and was as follow: 90 seconds after starting to give his oral talk, the experimenter received a phone call, picked-up and promptly said “I’m in the middle of a conference! I can’t talk to you right now! Just tell your lawyer that I don’t care about the house, all I want is joint custody of the kids!”. Then the experimenter asked attendees to record the Post experiment rating of presence and give their answers to research assistants who entered the data and completed the analyses while the experimenter completed his talk. Results were included in the final minutes of the experimenter’s talk and are available on the conference web site at www.interactivemediainstitute.com/index_conf.html, under the 2008 conference, Powerpoint presentations, Presence symposium. Results were discussed in the light of researcher’s ability to differentiate between presence and arousal or attention.
Cognitive Display

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Despite the rapid development of cyber technologies, today we still have very limited attention and communication bandwidth to process the increasing information flow. The goal of the Cognitive Display is to develop a context-aware filter to match the information load with particular needs and capacities. The functions include: bandwidth-resolution, trade-off, and user context modeling. From the empirical lab studies, it is found that the resolution of images can be reduced in orders of magnitude if the viewer knows what is looking for particular features. The adaptive display queue is optimized with real-time operational conditions and user's inquiry history. Instead of measuring the operator's behavior directly, ubiquitous computing models are developed to anticipate the user's behavior deriving from the operational environment data. A case study of the video stream monitoring for transit security is discussed in this paper. In addition, the presentation addresses the future direction of coherent human-machine vision systems.
Virtual Reality for the ecological training of planning and memory abilities in elderly population

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The use of virtual reality (VR) in clinical psychology has become more widespread. The key characteristics of virtual environments for most clinical applications are the high levels of control of the interaction with the tool, and the enriched experience provided to the patient.

Cognitive and rehabilitation psychology are two branches of psychological sciences in which VR stands to have significant impact.

Specifically, VR offers the potential to deliver systematic human testing, training, and treatment situations, that are fully functioning, dynamic and actual prototypes of relevant activities, within which sophisticated behavioral recording is possible.

A large amount of literature has investigated the effect of aging on high-order cognitive functions (named “executive functions”). Specifically, some components of executive functioning observed to decline with aging are working memory, efficiency of task switching and planning actions in a complex environment. Many studies have also found that cognitive stimulation can improve general performance and prevent these difficulties. Particularly, the involvement in activities no longer as simply observers, but active participants can support their commitment and a generalized learning.

In this regard, much like a surgical simulator serves to test and train surgical skills, virtual environments can be developed to present ecological simulations that may be used in the assessment and training of planning and memory abilities.

Previous studies have investigated aging effects on planning and memory abilities, mainly using laboratory-based neuropsychological tasks such as the Tower of London. In this study we used the free virtual reality toolkit NeuroVR (http://www.neurovr.org) to develop the setting for more naturalistic tasks, such as organizing shopping errands. In the study, the subject enters the front door of a Virtual Supermarket for a virtual shopping trip. The user has a predefined shopping list that he/she can take to the store with him/her.

One group of participants (20 elderly subjects aged from 50 to 65) experienced the virtual supermarket task. In the first part of the virtual shopping trip, participants were required to find and collect the items included in the shopping list. In the second half of the trial, they were signaled by an auditory message to execute an intentional and voluntarily switch from their current task.

The results of this “in progress” study will be discussed in the context of using realistic virtual assessment for future functional planning and memory assessment/training applications with elderly persons having cognitive decline.
“Reality tests” increase the efficacy of in virtuo exposure for claustrophobics

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Conducting exposure in virtual reality (in virtuo exposure) is a promising and effective approach for the treatment of anxiety disorders. But since the user immersed in virtuo is not exposed to a physical phobicogenic stimulus, one can wonder if it would be beneficial for the patient to “test” his improvements in the physical reality. Some studies conducted with imagination exposure (Gauthier & Marshall, 1977) showed a consolidation effect when the patient can confirm his or her treatment gain. It is important to note however, that these “reality rests” do not represent additional in vivo exposure exercises. In the Gauthier and Marshall study, the patient was told only “to see what they can do now”. This is significantly different from confronting their feared stimuli or to wait for a significant amount of time until the anxiety decreases. The impact of the consolidation experience can be best explained in the context of self-efficacy. Performing the feared behaviour, even for a brief moment, allows the patient to see that he or she can actually do it (Bandura, 1996).

The goal of this study is to assess whether the addition of a brief “reality check” can improve the efficacy of in virtuo exposure. Our hypothesis is that a consolidation experience would increase the impact of the treatment.

The sample consists of 18 participants aged between 24 and 66 year old, diagnosed with claustrophobia according to the Structured Clinical Interview for DSM-IV. Participants were randomly assigned to two conditions: (a) Virtual Reality only (VR; traditional VR exposure treatment), or (b) Virtual Reality plus consolidation (VR+). In the VR+ condition, participants received the same treatment as in the VR condition, except that the last 10 minutes of each session were devoted to the consolidation. For the consolidation, participants were told “You have the chance to test for real how much progress you made in therapy today. You can enter the closet, close or lock the door and stay in there if you want. You do not have to do it and you can stop whenever you want. You do not have to push yourself, as you would do during exposure or the pre/post therapy assessment. This is just an opportunity to see how good you are now.”

During each of the seven weekly 90-minute therapy sessions, participants were immersed in one of the two VR environments sold by Previ™ for claustrophobia (i.e. virtual elevator or magic room). The treatment outcome was measured with two main variables: the claustrophobia questionnaire and a behavior avoidance test. The behavior avoidance test consisted of getting inside a dark 22 by 31 inches closet, locking the door and staying there alone for up to five minutes. Other questionnaires were also administered, such as the Claustrophobic Scale, the Fear Questionnaire, the Fear Survey Schedule-II, the State-Trait Anxiety Inventory, the Beck Depression Inventory, the Presence Questionnaire, the Simulator Sickness Questionnaire and brief ratings using a 100% Subjective Units of Discomfort Scale were during the immersion.

Repeated measures ANOVAs were used to compare the two conditions pre and post therapy. The analyses confirmed our hypothesis, with a significant Condition X Time interaction between the VR group and the VR+ group on the Claustrophobia Questionnaire [F = 5.124, p < .05] and the behaviour avoidance test [F = 44.138, p < .001].

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Low Cost Webcam and Off The Shelf Game Interfaces to Produce VR Systems for Motor Rehabilitation After Traumatic Brain Injury, Spinal Cord Injury and Amputation

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Current research indicates that TBI-related loss of motor function can be recovered or improved via a repetitive task-oriented motor training regimen that practices activities targeting specific relevant movement, and is intensified in a hierarchical fashion based on patient progress. Early research suggests that Virtual Reality game-based technology can be used to improve motor skill rehabilitation of functional deficits including reaching, hand function and walking. However, clinic and home-based systems need to be affordable and easy to deploy and maintain, while still providing the interactional fidelity required to produce the meaningful motor rehabilitation activity needed to foster transfer to the real world. High-end laboratory-based systems do not meet cost and deployability requirements. This paper will discuss the initial set up and preliminary findings of a Virtual Reality and game-based motor rehabilitation area within a Physical Therapy Clinic for patients with Spinal Cord Injury (SCI), Traumatic Brain Injury (TBI) and Amputation. The VR systems chosen for this research were the Sony PlayStation® 2 EyeToyTM, Nintendo® WiiTM, and Novint® FalconTM and a Light tracking system developed at the Institute for Creative Technologies. The main purpose of this research was to 1) define the game/model characteristics that are enjoyed most by the players; 2) develop new games, or manipulate the current games to address these user-defined characteristics; 3) develop and start a training protocol that will improve strength, sensation, balance, cognition, reaction time, endurance, and/or function. This presentation will discuss the findings from the first phase of the study. This first phase, currently in progress, is a focus study consisting of 15 participants with SCI (n = 5), TBI (n = 5) and amputation (n = 5). Participants are provided with demonstrations of the light tracking system and standard games from the Sony PlayStation® 2 EyeToyTM, Nintendo® WiiTM, and Novint® FalconTM. Participants are then asked to complete a questionnaire regarding their perception on the each system’s usability, appeal and enjoyment. The participants are then able to use each of the systems for approximately five minutes at a time to avoid fatigue. A final questionnaire is then completed by participants regarding their perception of each of the systems and they are then given the opportunity to provide ideas or comment about what they would like from each of the systems or games. The findings from this focus group will be discussed in terms of what each group of participants (SCI, TBI and amputee) liked and disliked about each of the systems following observation of the investigators using the systems and then following their own experience with each of the systems. The future directions of the research will also be discussed. It is anticipated that this study will develop Virtual Reality game-based tools that can be used for motor rehabilitation training within clinics or as part of a home-based exercise regime.
New assessment for old addictions
The use of Virtual Reality in the alcoholism

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The assessment with alcoholism-dependent subjects involves the use of a traditional case history. Semi-structured interviews are the main approach used to explore the circumstances that have led to the first appointment being made and exploring the alcoholic’s history. But, this procedure could be considered threatening for the patients because they may be coming with the expectation that if they admit the reality of their behaviour they are putting themselves at risk. He or she is exposing themselves to a reaction of people they do not know, and they may be afraid of being demeaned by stranger (Edwards, Marshall & Cook, 2006). The case history obtained will then be filtered through these defenses and may be inaccurate. These risks are dangerous for the assessment of the individual and for his/her therapy program; the use of Virtual Reality (VR) could be a way to reduce these risks. The aim of this study is to explore the use of VR and its empowerment in a case-history setting. The sample is composed by 40 alcohol dependent patients (20 experimental group and 20 control group) asking for treatment to the Italian National Service Care. We administered to experimental group two self report questionnaire (Self efficacy scale and MAC 2-A) at start and at the end of assessment; and a VR protocol based on four different virtual environments (park, apartment, workplace and restaurant). The control group completed only two questionnaires at first and last appointment. All the patients edited the Eysenk Personality Inventory as well.

In actuality, the study is in progress, but the preliminary results show that the sense of self-efficacy and the motivation for change increase in the final session, only in experimental group. The patients enrolled in the VR protocol were more available to start a therapy and they are more oriented to “Action” than control group. Furthermore, experimental group was more satisfied and pleasure of new assessment form.

These preliminary results indicate that VR could be a new instrument to assess alcohol dependent patients, because the procedure is easy to administer and gives a lot of information about many aspects of patients’ past and present life, relationships, family history, attitudes, intentions and drinking habits.
SECTER: Simulated Environment for Counseling, Training, Evaluation and Rehabilitation

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When conducting office-based therapy, clinicians often face the challenges of client comfort level and resistance; cognitive impairment (both transient and chronic); and difficulty transcending the physical environment and client/clinician roles. These issues are often most significant when conducting imaginal or role play therapy, or practicing resistance and social skills. In such instances, there is not only a need to process past and possible future events that the client may find uncomfortable, but also a heavy load placed on the memory and imagination of all involved. For instance, when conducting a role play session to practice skills for dealing with difficult social settings, the client and therapist must imagine a specific setting, act out their roles, stick to the plot, and keep a running record of the activity for later review and analysis. Such an activity requires powerful cognitive skills that many do not possess. Multi-user virtual environments (MUVEs) have the potential to remediate many of these issues, as well as lay a foundation for the development of new interventions.

For the past two years, in conjunction with our partners at CFG Health Systems, we have been developing and testing SECTER (Simulated Environment for Counseling, Training, Evaluation, and Rehabilitation), built on the OLIVE platform from Forterra Systems. In SECTER, therapists and clients can meet one-on-one and in groups. The settings and objects are malleable, allowing for changes in venue and environmental conventions. Interaction occurs naturally through speech communication facilitated by voice over IP (VOIP) that is integrated into the auto-gestures of avatars, meaning that when one talks, his/her avatar’s mouth moves accordingly. SECTER not only has tools for rich real-time interaction, but also for dynamic action review (AAR) -- therapists and clients can review a session on-screen and control the viewing perspective in real-time. Additionally, there is the capability to perform in-ear coaching, where the therapist can invisibly observe real-time action and provide discrete coaching directly to the ear-set of any of the other users. Such coaching has been used not only in group therapy sessions but to train mental health professionals. Currently, SECTER is installed on three residential adolescent treatment wards, and at the McGuire Air Force Base, being used to treat oppositional defiant disorder (ODD); trauma spectrum disorders; drug and alcohol abuse; anger management; attachment issues; self-esteem issues; developmental disabilities; and a variety of other disorders. Early data is encouraging, with clinicians easily applying their existing skills in the virtual world, clients reporting high satisfaction, and evidence of improved achievement of many therapeutic goals. In this paper, we will discuss some of the lessons learned in the past two years of SECTER research and development; the types of interactions clinicians have enacted in the virtual world; how SECTER use has expanded the therapeutic process; and what is planned for future development.
Projet de résumé pour le CT_{13}
A Virtual Arm to Stop Smoking. A comparative study.

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We reported in a pilot study presented at last year’s Cybertherapy Conference (Girard & Turcotte, 2007) that using an action-cue exposure strategy in virtual reality (ACE-VR; crushing virtual cigarettes) might be useful in the treatment of tobacco addiction.

We are pursuing research in this area with a randomized control trial based on 90 smokers who will receive a brief psychosocial smoking cessation program (25 people are enrolled so far and we expect to finish the study before the conference). During the first four weeks of an eight-session psychoeducational and motivational program, all participants will be immersed in VR. During the immersions in VR, 45 of the participants will use a virtual arm to catch and crush virtual cigarettes. The other half of the sample will use the virtual arm to catch virtual fruits (control condition).

The smoking frequency, and abstinence, will be assessed with a daily diary and exhaled carbon monoxide tests (the CO\(_2\) tests will provide an objective confirmation of the abstinence reported in the diaries). The success the program will be based on the number of subjects who quit or reduced their smoking frequency. The severity of addiction will be assessed with two questionnaires, the Fagerstrom and the Horn tests. Craving and withdrawal effects will be measured with the Minnesota Nicotine Withdrawal Scale (MNWS) and the Brief Questionnaire of Smoking Urges (QSU-Brief) at the baseline and at the visits from weeks 1 through 4, 6, 12 and at the end of the program. Before the VR immersion, the Immersive Tendencies Questionnaire will be administered and after each VR session participants will fill two questionnaires addressing presence and cybersickness. The comparative impact of both treatments will be tested with repeated measures ANOVAs (and planned contrasts) with sufficient power to detect medium effect sizes.

The main goal of our study is to show that crushing virtual cigarettes can boost the impact of a behavioral program dedicated to cigarette addiction. We will present at CT13 the results of data collected up to the first and third months follow up.
The potential of Virtual Reality as anxiety management tool: a randomised controlled study in a sample of patients affected by Generalized Anxiety Disorder

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Generalized anxiety disorder (GAD) is a psychiatric disorder characterized by a constant and unspecific anxiety that interferes with daily-life activities. Its high prevalence in the general population and the severe limitation it causes in patients affected by it, illustrates the necessity to find new and efficient strategies to treat it. Together with the cognitive-behavioural treatments, relaxation represents a useful approach for the treatment of GAD, but it has the limitation that it is hard to be learned by subjects. To overcome this limitation we propose to use virtual reality to facilitate the relaxation process by visually presenting key images to facilitate relaxation and acceptance. The visual presentation of a virtual calm scenario can facilitate the patients’ practice and mastery of relaxation, making the experience more vivid and real than the one that most subjects can create using their own imagination and memory, and triggering a broad empowerment process within the experience induced by a high sense of presence. According to these premises, the aim of the present study is to investigate the advantages of using a VR-based relaxation protocol in reducing anxiety in patients affected by GAD.

The trial is based on a randomized controlled study, including three groups of 15 patients each: (1) the VR group, (2) the non-VR group and (3) the waiting list (WL) group. Patients in the VR group will be taught to relax using a VR relaxing environment and audio-visual mobile narratives. Patients in the non-VR group will be taught to relax using the same relaxing narratives proposed to the VR group, but without the VR support and patients in the WL group will not receive any kind of relaxation training. Psychometric and psychophysiological outcomes will serve as quantitative dependent variables, while subjective reports of participants will be used as qualitative dependent variables.

We believe that the use of VR for relaxation represents a promising approach in the treatment of GAD since it enhances the quality of the relaxing experience through the elicitation of the sense of presence. This controlled trial will be able to evaluate the effects of the use of VR in relaxation while preserving the benefits of randomization to reduce bias. Its design takes into account the need for internal and external validity and that the results are attributable to the intervention.

Data analysis will start soon and the results will be ready in few months for inclusion in this manuscript and in the conference presentation.
The influence of media content and media form in the induction of emotional experience.  
A preliminary study

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The aim of this work is to check if the induction of emotional experience can be influenced through multimedia (audio/video) contents. Moreover, the authors want to evaluate the relationship between the media content and the media form during the emotions induction process. The hypotheses are:
• different multimedia contents induce an emotional change in subjects;
• media form does not influence the emotions induction process;
• media form does not influence the sense of presence.

This study has a mixed design (3x6). The first independent variable refers to media form and is measured between subjects on three levels: mobile phone (MP), pc desktop (PD) and Head Mounted Display (HMD). The second independent variable refers to media content (6 video clips presented to the subject) and it is measured with repeated measures analysis. It is a within subjects analysis. The dependent variables are: emotional state induction and sense of presence.

The project sample includes 46 subjects, college students aged between 20-30 years old (23 females and 23 males). The sample has been randomized for "media" condition. Each participant watched 6 clips using three different media. Six video clips (Gross & Levenson, 1995) will be used in order to induce different emotional states. These emotional states are: amusement, fear, sadness, anger, surprise and neutral.

Each participant was administered the following questionnaire:
• before the experience:
  • EPI (Eysenck Personality Inventory, 1975);
  • Vas (Visual Analogue Scale, Gross & Levenson, 1995).
• after the experience:
  • Vas (Visual Analogue Scale, Gross & Levenson, 1995);
  • Panas Beta(Positive Affect Negative Affect Scale, Watson e coll, 1988);
  • Ucl-Sus (Slater & coll, 1994);
  • Post-film questionnaire (Gross & Levenson, 1995).

Biofeedback was also used for monitoring physiological changes before and after the multimedia experience.
At the moment the study is in progress. Final results will be presented at the 2008 Cybertherapy Conference.
Psychophysiological Aspects of Tobacco Use and Craving

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Studies of smokers in both laboratory and naturalistic environments have confirmed a positive relationship between exposure to smoking cues and measurable changes in subjective and physiological responses (e.g., Baumann & Sayette, 2006; Bordnick, Graap, Copp, Brooks, & Ferrer, 2005; Dols, Willems, van den Hout, & Bittoun, 2000; Harakeh, Engels, van Baaren, & Scholte, 2007). The craving to smoke seems to increase particularly in the presence of smoking-related cues (Carter & Tiffany 1999) and has led to cue exposure research aimed at stimulating craving in participants under a myriad of conditions. This study uses principles of cue exposure and non-invasive sensors to investigate the biometric signature associated with elicited arousal and tobacco craving. It is anticipated that comparisons of physiological responses to arousal and tobacco craving in different groups may enable researchers to differentiate arousal due to stress reactivity and craving. Although the study is not aimed at advancing the cue reactivity literature per se, there are several gaps in this field that the proposed study may be able to bridge. For example: Can physiological responses to cue exposure be used to predict behavior? How do physiological arousal/craving patterns differ between deprived smokers and non-deprived smokers in response to smoking cues? Does psychophysiological arousal differ between smokers and non-smokers? The study proposed herein builds on findings from a pilot study, conducted and presented at CyberTherapy in 2006 (Jordan, Jerome & Faraj, 2006). Pilot mediation analysis suggested psychological variables mediated the relationship between physiological indicators and smoking behavior (Baron & Kenny, 1986); findings that are consistent with previous research that has demonstrated strong physiological connections between emotional expression and physiological arousal (e.g., skin conductance, temperature, respiration, blood flow) (Nasoz et al., 2004; Picard, 2001). Our follow-up study, currently under way, hypothesizes that biometric data can identify and predict arousal patterns associated with tobacco use behavior. It is further hypothesized that examining physiological and psychological patterns of cue reactivity can differentiate between psychological craving and physiological arousal in smokers. Participants in this semi-randomized four-group design include non-smokers (n=23); former smokers (n=23); current smokers (n=23); and deprived smokers (for 6-8 hours, n=23). In addition to a 3-day naturalistic baseline, individual experimental sessions are structured to include: a) an attenuation/calibration phase; b) a standardized elicited stress activity to collect baseline readings of arousal; and c) a cue exposure presentation consisting of 12 validated video clips to elicit various types of arousal (Rottenberg, Ray, & Gross, 2006). Participants rate their craving and arousal levels following the presentation of each film clip (Sloan, 2004). In addition to a more detailed discussion of the research methodology and statistical analysis plan, preliminary data will be presented. Standardized cue exposure challenges under controlled laboratory conditions, provide a powerful paradigm to examine the multidimensional aspects of arousal and craving and to test the full scope, and mediating and moderating mechanisms of the relationship between substance use cues and craving.

(#510)
The illusion of virtual body ownership during visual-motor movement

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When I decide to write, I do not need to look for my hand in the same way that I have to look for a pen or a piece of paper, because my hand is “always there”, present with me. The term ‘body ownership’ has been given to this experience. This sense of one’s own body as part of the self is a fundamental aspect of self-consciousness. The sense of body ownership presumably depends on afferent sensations arising within the body itself, but also on the coherence of current sensory input with pre-existing cognitive representations of the body. Psychological and neurological studies classically distinguish at least two internal representations of the body, often called body schema and body image. The link between these representations and the phenomenal sense of ownership has not been explored. In this study, we compared the strength of virtual hand illusion, like rubber hand illusion, induced by synchronously and asynchronously (scale factor controlled) movement, to investigate the contributions of visual-motor stimulation and ownership to body awareness. The system was implemented in 3D Game Studio A6 as windows-based application program to present Virtual Environment (VE) and a 3 degree of freedom tracker to measure the participants’ forearm angle. In the VE, participants moved the virtual hand toward randomized target angle with visual feedback. Participants saw the virtual image through the head mounted display (HMD). The experiment tasks consisted of a one synchronous condition and four asynchronous conditions. In the synchronous condition, the virtual hand angle corresponded to the real hand angle (real hand angle ‘1), while the asynchronous conditions showed the virtual hand angle scaled by a scale factor of the real hand angle (real hand angle ‘0.5, 0.7, 1.2, 1.5). Participants repeated each condition until they felt the virtual hand to be their real hand. If they had ownership to the virtual hand, then they moved the virtual hand toward target angle without visual feedback that repeated 5 times. At that time, the error of real hand angle to target angle was measured. Three kinds of measurement were obtained in this study. One is self-report to directly assess participants’ ownership experiences, another is the error of real hand angle, and the other is questionnaire of virtual hand ownership. Three healthy right-handed volunteers (average age: 24.3, range: 22~ 27, SD: 2.51), 3 male subjects, were recruited for this study. The results show that the number of average trials that occurred ownership was 9.1 trials in the synchronous condition and 12.3 trials in the asynchronous condition. The average scores from the ownership questionnaire, synchronous condition and asynchronous conditions were 18 and 13.6, respectively. The average error that real hand angle was at 4.3 degrees in synchronous condition and 15.8, 9.5, 8.6, 12.8 degrees in each asynchronous condition (real hand angle ‘0.5, 0.7, 1.2, 1.5). According to the results, we conclude that the synchronous visual-motor movement causes the illusion of virtual body ownership more than asynchronous visual-motor movement. The illusion of virtual body ownership affect visual-motor program.
Adaptation of the virtual reality system EMMA to infancy

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New Communication and Information Technologies (CITs) are being used in several health specialities. A new application has been developed in Health and Clinical Psychology, for the psychological treatment of different anxiety disorders and, being relevant in the therapy of post-traumatic stress disorder in adults (Botella et al, 2006). The virtual reality program named EMMA (Engaging Media for Mental Health Applications), allows us to work with the negative emotions related to the psychological problem. We present the first adaptation and application worldwide of EMMA’s system in maltreated children with severe traumatic reactions.

The adaptation of EMMA to therapy with children consisted of the following modifications: introduction of symbols, specific images about social and family issues (e.g., photographs of male and female children faces showing different emotional expressions, diverse family groups, a father and/or mother with an aggressive attitude towards children, a child hidden under a table…), modelling of significant characters of heroes within the children’s world (superman, supermenas, and Kim Possible). In the Database Screen, the redesign (retesturado) of the Book of Life and the Drain and modifications in the scenarios included elements in each of them that favour the perception of children’s world (a hut in the meadows, an igloo in the snow-covered town, a tent and a sand castle in the beach and, a cave in the desert).

Besides, a tests presentation and data collection system addressed to facilitate the storage of each case has been introduced together with the recording of tales and other elements that make the application of EMMA easier for children. In this work, a detailed description of the modifications made in the EMMA system for an adequate use in infancy is presented.
Pulse!! The Virtual Clinical Learning Lab: Preliminary Findings on Usability and Playability

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Background

Pulse!! The Virtual Clinical Learning Lab is a federally-funded research project designed to develop state-of-the-art virtual-world technology to create subject matter for clinical medical learning. Pulse!! is a high-tech response to a coalescing host of adverse factors compelling innovative means to provide clinical experience and practical knowledge rooted in critical thinking, not only for degree-based education but also continuing education for medical practitioners.

Method

The Pulse!! learning platform looks and acts like a videogame. Users navigate the platform’s three-dimensional space using a standard computer “mouse” and keyboard. The virtual space is totally navigable. Users interact with a high-fidelity virtual patient and with other virtual medical personnel to conduct examinations, order tests and administer medication. The virtual patient is modeled to respond accordingly and in real time.

Users in the beta field test completed demographic questionnaires at the beginning and reaction questionnaires at the end of their sessions. A subset were interviewed in detail to assess platform usability and recommend improvements to the design team.

Results

Participants in this study (n=23) were represent a variety of specialties and experience, from medical students through physicians. This sampling method ensured that the interface was usable across a variety of learners. Participants came from two teaching hospitals in the Northeast.

Our goal was twofold: to gather specific comments for necessary updates to the system; and to make a global assessment of participants’ reactions. The first analysis yielded numerous recommendations for changes to the interface and simulation. These data were crucial to development of an “in-game” tutorial that now guides participants through use of the interface prior to initiating a case.

To assess participants’ reactions, we collected data and asked participants to answer a series of open-ended questions. Our data indicated that the overwhelming majority (82%) of participants reacted positively to the Pulse!! platform. Over 80% reported that the platform held their interest. All but one respondent reported that the platform was visually appealing. These data suggest high motivation to learn in the Pulse!! platform.

A majority of participants reported that the system was easy to use. A majority of participants reported that the platform could provide training relevant to their jobs and that they would recommend Pulse!! to a colleague. Our expert (anecdotal) assessment was that most participants were able to interact effectively with the system after a few minutes of familiarization. We observed that the biggest challenge for participants with little or no video-game experience was navigating the virtual world.

Conclusions

Preliminary results indicate that the Pulse!! platform appears to be a viable environment in which to embed instruction. Participants responded well to the technology and expressed enthusiasm regarding its utility as a learning tool.

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Background: Warriors returning from the combat theatres of Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) have been noted to have significant rates of mental health disorders such as posttraumatic stress disorder (PTSD). Additionally, mild traumatic brain injury (mTBI), is defined by the exposure to a head injury in conjunction with either alteration in consciousness and/or memory, this has been reported to affect nearly 15% of returning OIF/OEF soldiers. The relationship of mTBI and PTSD is complex due to high co-morbidity and several overlapping symptoms between the two conditions. Virtual reality graded exposure therapy (VRGET) has been shown to be an effective treatment for warriors returning from Iraq and Afghanistan that have been diagnosed with PTSD, including those cases complicated by mTBI. Previous studies have demonstrated that some individuals cannot tolerate virtual reality (VR) treatments due to the occurrence of cybersickness. Some of the risk factors for cybersickness include: fatigue, sleep disturbance, high anxiety, or disturbances in sensory, perceptual or vestibular systems, which are common in patients with PTSD and/or mTBI. Therefore, our aim was to describe the prevalence of cybersickness in a combat PTSD population, the relationship between PTSD symptoms, mTBI and cybersickness and the tolerability of VRGET with combat PTSD and mTBI.

Methods: As a part of the standard assessment battery for the larger VRGET study, the PTSD Checklist-Military (PCL-M) and a blast exposure questionnaire were administered to participants at baseline to assess for PTSD and mTBI, respectively. Of 37 persons assessed, 18 Military personnel were randomized to VR and sustained at least 5 sessions of VRGET treatment and were therefore administered the Simulator Sickness Questionnaire (SSQ) to assess for the occurrence of cybersickness symptoms during the VR portion of the treatment.

Results: Fifty-six percent of the participants met strict criteria for PTSD (n = 10). Half of the participants (n = 9) met criteria for mTBI. Increased PTSD severity, is determined by higher scores on the PCL-M, were positively correlated with increased cybersickness symptoms as determined by higher SSQ scores (r = 0.79, p = 0.00). Independent samples t-test analyses indicated a trend between higher SSQ scores and presence of mTBI (p = 0.08). When the presence of mTBI was controlled for, the relationship between cybersickness and PTSD was no longer significant (p = 0.30). Only 17% (n = 3) of participants had to stop VRGET sessions at any time due to cybersickness symptomatology. There was no relationship found between intolerance of the VR and SSQ scores or presence of mTBI.

Conclusion: In this sample, those patients reporting greater severity of PTSD symptoms also reported greater amounts of cybersickness while immersed in a virtual simulation of their combat experience. Therefore, autonomic dysregulation found in PTSD might contribute to the occurrence of cybersickness. The presence of mTBI appears to mitigate this relationship, but its mechanism is not quite clear, perhaps due to the small sample size of this study. Contrary to previous findings, cybersickness did not decrease tolerability of the virtual environment in the patients in this sample.
An innovative project of Cyber-Clinic for children with ADHD: Impacts on diagnostic evaluation, treatment and clinical research

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Attention Deficit and Hyperactivity Disorder (ADHD) is one of the most important disorders in childhood. It affects approximately 5 to 9\% of school age children and for an important proportion of those affected, the symptoms persist until adulthood resulting in difficulties of adaptation in school, social and family life (Comings, 2001). It is thus important to develop effective intervention strategies for this population and to continue clinical research, to aid in improving diagnostic evaluation and treatment. The cognitive remediation is an innovative approach in ADHD treatment and it aims to improve deficient cognitive functions with computerized exercises (Klingberg et al., 2002; 2005). One of the principal limits of this approach is its accessibility, directly related to the intensity of the treatment (3 to 4 times/week).

Our team of researchers and clinicians developed and established a unique and innovative model of Cyber-Clinic which on one hand, aims to improve the quality and the accessibility of the clinical services offered and, on the other hand, to facilitate and to multiply the activities of clinical research on the diagnostic evaluation and on the treatments offered to the children with ADHD.

The main objective of this presentation is to explain the functions of the four components of the Cyber-Clinic that are accessible by the Internet for all the patients, their parents and the healthcare professionals involved in the treatment.

The first component is a unit of control of files which, among other things, allows the personal information of each patient involved to be recorded and updated into the system.

The second component is a unit of control of the evaluations which allows digitizing all the data relating to the diagnostic evaluation. This includes the results of the behavioural questionnaires and the results of the neuropsychological measures of our standardized procedure for assessment. The neuropsychological measures make it possible to evaluate the cognitive deficits associated with ADHD. The third component allows the control of the treatment by the setting in network of the computerized exercises of cognitive remediation. Thus, the patient can easily have access to his intervention of cognitive remediation, at school or at home. Moreover, the therapist can easily follow the progression of his patients because all the data associated with the cognitive remediation programme are recorded on the website of the Cyber-Clinic.

The last component of our Cyber-Clinic is a data base. The data is recorded automatically from the three other components. Thus, for all the patients of the Cyber-Clinic, all the data associated with the diagnostic evaluation and the cognitive remediation treatments are compiled. In sum, this new technology makes it possible to multiply the possibilities of clinical research with children with ADHD.
Presence as cognitive process: the link between Self, intention and action

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Abstract: In this chapter we will present a conceptual framework that uses the concept of “Presence” – the feeling of being and acting in a world outside us - to link the enaction of our intentions with the understanding of other people’s intentions. Specifically we suggest that humans develop intentionality and Self by prereflexively evaluating agency in relation to the constraints imposed by the environment (Presence): they are "present" if they are able to enact in it their intentions. This capacity also enables them to go beyond the surface appearance of behavior to draw inferences about other individuals’ intentions (Social Presence): others are “present” to us if we are able to recognize their intentions. Both Presence and Social Presence evolve in time, and their evolution is strictly related to the proposed by Damasio (Proto-Self, Core Self, Autobiographical Self). We can identify higher levels of Presence and Social Presence associated to higher levels of intentional granularity: the higher is the level of Presence and Social Presence experienced by the Self, the higher is the complexity of the expressed and recognized intentions. Furthermore, Presence and Social Presence converge within the social and cooperative activities. In particular, is through their interaction that the Self improves his intentional action and interaction: the higher is the Presence and Social Presence experienced during narrative/interactive practices, the more is the possibility that the goals and motives of the narratives/interaction will be internalized.
**NeuroVR 1.5: A Free Virtual Reality Platform for Clinical Psychology and Behavioral Neurosciences**

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**Abstract.** Virtual reality (VR) can be considered to be an embodied technology whose potential is wider than the simple reproduction of real worlds. By designing meaningful embodied activities, VR may be used to facilitate cognitive modelling and change. However, the diffusion of this approach is still limited by three main issues: poor usability, lack of technical expertise among clinical professionals, and high costs. To address these challenges, we introduced last year NeuroVR (http://www.neurovr.org – http://www.neuroitiv.org), a cost-free virtual reality platform based on open-source software, that allows non-expert users to adapt the content of a pre-designed virtual environment to meet the specific needs of the clinical or experimental setting. Following the feedbacks of the users we developed a new version – NeuroVR 1.5 – that improves the possibility for the therapist to enhance the patient’s feeling of familiarity and intimacy with the virtual scene, by using external sounds, photos or videos. Specifically, the new version now includes full sound support and the ability to trigger external sounds and videos using the keyboard. The NeuroVR platform runs on standard personal computers with Microsoft Windows; the only requirement for the hardware is related to the graphics card, which must support OpenGL.
What would influence mental health professionals working in Native / First Nations reserves to refer their patient to telepsychotherapy services?

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Context:
The Technology Acceptance Model (TAM; Davis, 1989, 1993; Venkatesh, 2000) is a well-known theory suggesting that two major factors contribute in the intention of using a specific technology: a) the Perceived Ease of Use and; b) the Perceived Usefulness. Bertrand and Bouchard (2007) adapted and tested how the TAM applies to the use of virtual reality (VR) in mental health settings. Using Structural Equation Modeling with data collected on 141 professionals using VR, they found that intention to use VR is essentially predicted only by the perceived usefulness of this technology. Their results are somewhat surprising given the impression shared by many researchers in the field of VR that others factors would play a significant role, such as costs, perceive self-efficacy to use the technology, attitude towards VR or computer anxiety. Would these unexpected findings also be found in telehealth, especially with professional who are not yet familiar with the technology involved?

The aim of the study is explore factors related to the intention of referring their patients to videoconference-based telepsychotherapy among mental health professionals working on Natives / First Nations reserves. A paper and pencil version of Bertrand and Bouchard’s questionnaire was reworded to be applied to videoconference technology and used in the present study.

Method:
A full-day workshop on pathological gambling was offered in 12 different Native / First Nations reserves in the province of Quebec. After the workshop, 76 mental health professionals working in the community agreed to complete a questionnaire about telepsychotherapy. Most of the sample consists of women (74.5%). About half of the sample is aged between 40-59 years (43.1%) and speaks French (52.7% French; 47.3% English). Participants have a variety of training or professional background: social workers (30%), nurses (3.6%), psychoeducators (2.7%), etc. The study is still underway as we are targeting a sample of 180 participants (a goal that will be reached in the next few months) spread over 27 reserves.

Results:
The internal consistency of each scale is excellent (Cronbach’s α ranging from 82 to .97). Results from a multiple regression analysis \[ F_{(4,73)} = 30.67, p < .001, Adj. R^2 = .64 \] show that the Perceived Usefulness \( \beta = .40, t = 3.78, p < .001, sr^2 = .27 \) and the Perceived Ease of Use \( \beta = .38, t = 2.66, p < .01, sr^2 = .19 \) are both predictors of the intention to use telehealth with their patients. Comfort and therapists attitude towards telehealth were not significant predictors in the regression.

Discussion:
Our preliminary results confirm Bertrand & Bouchard’s (2007) findings that perceived usefulness is a key predictor, over and above more personal variables such as attitude towards the technology. However, as proposed in the original TAM model, perceived ease of use seems to also play a significant role as well. Our results suggest that we need educate professionals on how videoconferencing can be a useful tool that is easy to use instead of putting our efforts on factors such as costs or attitude toward the technology.
Motor Vehicle Accidents (MVAs) are a serious concern in the western part of Europe, especially in Portugal, where the figures in 2007 alone ascend to 99,685 accidents, 31,000 injuries and 741 dead. Therefore, the scope of this project is to develop a virtual reality (VR) application which can be used to treat MVAs victims that developed Post-traumatic Stress Disorder (PTSD) or Acute Stress Disorder (ASD), after the traumatic event. This paper presents the results of the first clinical trial in a psychiatric hospital in Lisbon, with a 42-year old female; over a 12 session VR graded exposure therapy. The patient was exposed through a trans-lucid screen to a virtual highway with an increasing anxiety triggering events (traffic intensity; horns; proximity of the surrounding buildings; tunnels; crossovers). PTSD was diagnosed through a structured clinical interview for DSM-IV (CAPS). The patient was evaluated through psychophysiological (ECG; GSR) and self-report measures (IES, ITC-SOPI and HADS). The results indicated that the patient had a severe decrease in PTSD symptoms, namely in the IES (Intrusion and Avoidance dimensions) and in the HADS (Anxiety and Depression dimensions). As far as the psychophysiological activation concerns, the distribution GSR and ECG values during the 12 sessions followed the expected pattern being reduced during the final session with statistically significant differences between sessions for ECG ($F(11) = 2.842; p < .05$). However, the most relevant fact is that this decrease led to the patient being able to drive again.

Keywords: MVA, PTSD, VR exposure, Psychophysiology.
Development of Simulated Auditory Hallucination Exposure Environments: Pilot Study

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Schizophrenia is a brain disease, which affects general cognitive functions as delusion, hallucination, thought disorder, blurred expression of emotions, social withdrawal, and awareness of confusion. Auditory hallucination is among the symptoms of schizophrenia that designates the phenomenon that someone hears or seems to hear when even the sound does not exist.

Patients with schizophrenia could be disturbed by the sounds that are irrelevant to a real situation such as auditory hallucination, while healthy people can ignore properly those sounds. Conventional therapies for treating hallucination were used with medication and cognitive behavior therapy. But, in conventional cognitive behavior therapy, it is very difficult to simulate the stimulus of such an auditory hallucination. In addition, there are some problems about nonobjective assessments due to the dependence of the therapist’s ability to assess the patient’s state or training effectively. Virtual Reality (VR) techniques could overcome these shortcomings. Especially, they can simulate the auditory hallucination with controlled 3D virtual environments by generating irrelevant sound stimulation. Therefore, in this study, we developed the VR system to present an effective auditory hallucination stimulus and to measure the subject’s response to simulated auditory hallucinations. The developed VR system consisted of a PC, head mounted display (HMD), orientation tracking sensor, and a joystick. Virtual environment tasks consisted of four situations: ‘errand to the grocery store’, ‘packing for travel’, ‘having medical treatment at hospital’, and ‘getting order and serving at fast-food store’. Auditory hallucinations were provided during each task. Four healthy participants (3 male and 1 female) were recruited. Movement pathway (trajectory), performance time (during experience each situation), and the number of simulated hallucinations were obtained during participant’s experience of the developed virtual reality system. Moreover, Launay-Slade Hallucination Scale (LSHS) and the hallucination experience scale (asking understanding about auditory hallucination) was answered after the experiences. In the results, there was positive correlation between the LSHS score, performance time and the number of simulated hallucinations. Hence, it could be explained that the participant who shows more proneness to auditory hallucination are more influenced by the simulated auditory hallucinations in virtual reality, and the participants show more understanding about auditory hallucination after experience of virtual reality system than before experience. It can be considered that the developed virtual reality systems can provide effective auditory hallucinations and assessment of behavioral characteristic about the hallucination. This is a pilot study for the development of an auditory hallucination exposure system using virtual reality. A follow-up study will be about clinical experiment with schizophrenia group for verifying cognitive behavioral characteristic to auditory hallucination.

Keyword: Virtual Reality, Auditory Hallucination

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The Influence of mTBI on Autonomic Dysregulation in Combat Veterans with PTSD

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Navy and Marine veterans of OIF/OEF who were referred to treatment with a diagnosis of PTSD were assessed at baseline (N=37) and post-treatment follow-up (N=9) for psychophysiological reactivity and PTSD symptoms. Psychophysiological measures (Skin Conductance and Heart Rate Variability) were assessed across three, five-minute conditions: Baseline, Stress Recall (tell us about the most disturbing memory of your most recent deployment), and Recovery (please sit quietly for the next five minutes). About half of the PTSD patients assessed and treated reported blast exposure (N=18), with a sub-set exposed becoming dazed and confused (N=8), and a sub-set of those having memory temporary loss (N=4). Cumulative blast complications were scored as “0” (no exposure), “1” (blast exposure), “2” (blast exposure plus being dazed and confused), and “3” (blast exposure, dazed and confused, and memory loss).

Pre-treatment Analysis: Repeated measures ANOVA revealed that patients at time 1 became aroused with stress recall, but were unable to reduce arousal during the recovery phase (p<.0001), with arousal in fact continuing to increase during the recovery phase (p<.007). A Blast Exposure x Condition at time 1 indicated that the increase in SC scores during recovery was found for PTSD patients exposed to blast, but not for non-blast exposed PTSD patients (p<.05). Further, the more effects of blast (exposure, dazed and confused, memory loss) the greater the autonomic dysregulation (SC and HRV), and the less likely to be able to recover, compared to those with no blast exposure.

Post-treatment Analysis: This difference was not found following Virtual Reality Assisted Graded Exposure Therapy (VRGET), this indicated that this type of treatment was successful in training patients with combat PTSD in autonomic control in the face of a stress recall, and facilitating the ability to reduce arousal following stress. Further, cumulative blast score was directly correlated with SC at recovery at time 1 (Spearman’s rho=.448; p<.05, N=20) indicating poor pre-treatment recovery of SC, yet this was not found at time 2 (r=.281, p=.542, N=7), signifying that blast no longer had an influence on SC recovery following VRGET treatment.

Pre-Post Analysis: Repeated measures Condition (baseline, stress recall, and recovery) x Time (pre post intervention) ANOVA (N=9) revealed: 1) a significant difference for Condition (F=9.06; p<.017; Partial Eta Squared =.531 with observed power of .751), 2) a significant difference for Time (F=5.97; p<.04; Partial Eta Squared = .427 with observed power of .574), and 3) a Condition x Time interaction (F=13.12; p<.007; Partial Eta Squared = .622 with an observed power of .887). This shows that there was a statistical and clinical significant difference in response to stress recall and recovery over time. Subsequent analysis showed that even though patients had no change in baseline SC over time, patients had significantly greater control overall reactivity during stress recall and recuperation than they did at time one (see analysis, below). Patients at time-2 had 57% greater recovery than patients did at time-1. A simple regression demonstrated that cumulative blast score predicts baseline SC, stress recall SC, and recovery SC levels (p<.05 at time 1), but only predicts SC baseline at time 2, not stress or recovery. Hence, while blast patients may continue to have higher baseline SC values, they have learned how to control their autonomic reactivity following treatment.

Conclusion: While PCL-M scores decreased significantly from pre to post treatment (p<.001), there was no correlation between physiological arousal and any other PCL-M subscale or total score. This may indicate that objective physiological arousal is not always associated with conscious cognitive arousal. PTSD patients with blast exposure had higher arousal during stress recall, and still higher arousal during
Lessons learned from treating 200 motor vehicle accident victims with videogames.


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There are practical and safety issues when using Exposure Therapy (ET) in-vivo in the treatment of driving phobia following after a Motor Vehicle Accident (MVA) and a literature review suggests that this is rarely used as a treatment modality. At Cork, we developed a driving simulation programme based on the use of driving videogames projected onto a large screen (VRET) and published data supporting its use. We have continued to use this programme over the past 6 years and here reflect on ‘lessons learned’.

The last 50 consecutive patient charts were reviewed to confirm clinical impressions.

Some Observations.

1. Driving phobia for MVA victims is almost invariably an ‘Accident Phobia’ and should be treated accordingly.
2. There are usually 2 components to the phobia, a fear of driving and a fear of passenger travel. Both aspects of the phobia require treatment with the number of hour-long treatment sessions required ranging from 3-20. (Average 7 sessions.)
3. Most patients immerse with suitable driving videogames as noted by the induction of an anxiety reaction. Videogames provide a more suitable medium than VR and the software is better and cheaper for simulating driving accidents.
4. Most patients have more than one diagnosis e.g. P.T.S.D., G.A.D., Major Depression, Panic Disorder will slow progress unless it is treated; Medication is often useful in treatment of these disorders.
5. You can lead a horse to water but you can’t make it drink… The patient must be motivated to return to driving or you will fail. Need to set realistic targets.
6. In trauma work litigation often a stumbling block to successful treatment but to a lesser extent with phobic patients.
7. Some patients find simulations too immersive with marked anxiety/panic reactions that do not readily habituate despite prolonged exposure. DVD’s/ Videotapes a useful adjunct to therapy.
8. Most patients respond to treatment but often a residue of fear remains. Do not oversell the programme.

These and other observations will be illustrated with clinical cases.
Combat related Post Traumatic Stress Disorder and Mild Traumatic Brain Injury in Naval Personnel Deployed to Iraq and/or Afghanistan in Support of Operation Iraqi Freedom and/or Operation Enduring Freedom: A Retrospective Study (1;2)

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Posttraumatic stress disorder (PTSD) is one of the most disabling psychological conditions affecting the veteran population. The percentage of Army and Marine Corps personnel who participated in combat during Operation Iraqi Freedom or Operation Enduring Freedom between March and October 2003, who met screening criteria for major depression, generalized anxiety disorder or PTSD, ranged from 11.2% to 17.1%. VA officials have reported 20% of Iraq veterans who have sought VA healthcare for mental health issues. The Veterans’ Administration expects these numbers to grow since many discharged veterans, who suffer Post-traumatic Stress Disorder and other mental health illnesses, have not yet sought care. Of the 168,000 service members who have served in Iraq and have been discharged as of July 2004, about 28,000 had sought medical care from the VA; of these, about 5,400 service members reported the presence of mental health issues and nearly one-in-three of these 5,400 suffered from PTSD. It has also been reported that 12% of U.S. soldiers hospitalized following serious combat injury in Iraq were diagnosed with PTSD at 7 months following their hospitalization. Higher PTSD rates have been anticipated among troops who have been deployed to Iraq more than once.

The recent report of the President’s Commission on Care for America’s Returning Wounded Warriors concluded that PTSD occurred in 6 – 11% of veterans serving in OEF and in 12 – 20% of OIF veterans. This Report also concluded that it was not known how many service members have suffered a mild TBI that went undiagnosed. However, among 35,000 otherwise health service members returning from deployment who were screened for TBI, up to 20% screened positive for having experienced a mild TBI while deployed. The President’s Report recommended that the DOD and VA should aggressively prevent and treat PTSD and Traumatic Brain Injury. Early treatment is imperative in order to maintain personnel on active duty and to reduce the future burden of the Veterans Administration (VA) healthcare system.

Another report has suggested that 20,000 U.S. troops, who have served in Iraq and Afghanistan, have been found with signs of brain injuries or TBI. Most of these brain injuries have been classified as mild or moderate and have commonly been secondary to exposure to blasts. Given their severity, penetrating TBIs are cared for immediately. Closed TBIs, on the other hand, frequently go unrecognized and undiagnosed. This is especially the case with mild TBI. Of note, any TBI can result in short- and long-term disabilities. Importantly, for a combat veteran with a brain injury of any severity, the combination of cognitive and emotional compromise of PTSD can negatively affect recovery. Hence, quickly and properly diagnosing the presence/absence of PTSD and/or TBI in U.S. troops who have been deployed to the combat zone is conforming with the not only the recommendations of the President’s Commission on Care for America’s Returning Wounded Warriors but it is in the best interests of our warriors.

Virtual Reality Medical Center of San Diego has been awarded an Office of Naval Research (ONR) grant to complete a randomized study, at the Naval Medical Center San Diego and Navy Hospital Camp Pendleton, comparing the effects of Virtual Reality Graded Exposure Therapy (VRGET) with Cognitive Behavioral group therapy. To meet the guidelines for this study, VRMC has completed the pre-treatment assessment of 40 Naval personnel who have been deployed to the Iraq and/or to the Afghanistan combat theaters since March 2003 and who were initially diagnosed with PTSD. Many of these 40 Naval personnel were also exposed, one or more time, to blast injury during their combat deployment.

This presentation will review not only the assessment protocol for the VRMC/ONR funded study to treat combat-related PTSD with VRGET, but will also review the clinical results for the assessed personnel in terms of presence/absence of PTSD and presence/absence of TBI. Lastly, we will make suggestions concerning the future assessment of combat-veterans experiencing disabling conditions, secondary to having served in a combat zone, best described as PTSD and/or TBI in order to better maximize the accuracy of their diagnosis, facilitate their integrated and aggressive coordinated care, and the speed of their recovery.
Effects of Stereoscopic Displays and Interaction Devices on Human Motor Behavior

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Personal computers (PC) and video games provide intensive practice and unlimited repetition along with ongoing feedback, which has been explored as a therapeutic tool to retrain faulty movement patterns resulting from neurological dysfunction. However, real human performance or behavior might be biased because of the nature or limitation of interaction devices or displays. Designing an immersive virtual environment with enabling technologies composed of various display (rendering) systems, sensing systems, haptic devices or game features, and the mechanism of interaction between human and computer systems is highly sophisticated. The separation of actual human performance from behavior imposed by the computer system is significantly important, especially if it is applied to people with disabilities or motor impairment. The goal of this research was to compare the performance of different stereoscopic displays and tracking/interaction devices in the context of motor behavior and interaction quality within various Virtual Reality (VR) environments. Participants were given a series of VR tasks (ball catching, depth test, spatial rotation, reaching test) that required motor behaviors with different degrees of freedom. The VR tasks were performed using a monoscopic display, shutter glasses and an autostereoscopic display and two tracking devices (optical and magnetic). The two 3D tracking/interaction devices were used to capture continuous 3D spatial hand position with time stamps. Fifty participants completed questionnaires that evaluated display comfort and the simulation fidelity of the three displays, along with the efficiency of the two interaction devices. Motor behavior was also measured using motion tracking data. Participants completed two tasks (depth test and ball catching) using each of the three displays and three tasks (depth test, reaching test and spatial rotation) using the two different tracking devices in random order. Participants completed the ball catching and depth test tasks faster when using shutter glasses than the other two displays. Participants rated the autostereoscopic display the highest for discomfort and eyestrain and the least satisfactory overall. When using the autostereoscopic display, participants could have had difficulty maintaining a good 3D stereo picture when playing the VR game tasks due to the requirement of having to keep head movements within the limited area ("sweet spot") where 3D stereo can be seen. Overall, the optical and magnetic tracking devices scored highly in the user perception questionnaire for all tasks. The optical tracker also performed as well as magnetic tracking system for game tasks requiring motion within three degrees of freedom. However, participants were slower completing the game tasks that required motion within six degrees of freedom when using the optical tracker. These preliminary results suggest that the use of shutter glasses provides a more immersive and user-friendly display than monoscopic and autostereoscopic displays. The results also suggest that the optical tracking device, available at a fraction of the cost of the magnetic tracker, provides similar results for users in terms of functionality and usability features. The findings of this study can be considered when developing VR based systems for use in research involving 3D interactive games for motor rehabilitation techniques.