New Assessment for Old Addictions: The Use of Virtual Reality in Alcoholism

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The assessment with alcohol-dependent subjects involves the use of a traditional case history. Semi-structured interview is the main approach used to explore the circumstances that have led to the first appointment being made and 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 behavior they are putting themselves at risk. The patients may feel that they are exposing themselves to the reaction of a person they do not know, and they may be afraid of being demeaned by a 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, so 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 of 40 alcohol-dependent patients (20 experimental group and 20 control group) asking for treatment from the Italian National Service Care. We administered to the experimental group two self-report questionnaires (Self-efficacy Scale and MAC 2-A) at the start and at the end of the assessment, and a VR protocol based on four different virtual environments (park, apartment, workplace and restaurant). The control group completed only two questionnaires at the first and last appointments. All the patients edited Eysenk Personality Inventory too. Although the study is in progress, preliminary results show that the sense of self-efficacy and the motivation for change increase in the final session only in the experimental group. The patients enrolled in the VR protocol were more available to start a therapy and more oriented to “action” than the control group. Furthermore, the experimental group was more satisfied with the 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.

Reference

Factors Affecting Cyber-Café Addiction in Undergraduate Students in Taiwan

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Cyber-café activity has become one of the most important entertainment activities in the Taiwanese society in the last couple of years. Unfortunately, it also has created some serious social problems. However, there is little understanding of the factors affecting the behavior of cyber-café addiction. This article focuses on the impact of family factors on cyber-café activity. Collected data were used to study the effects of family environment such as parental support and socioeconomic status (SES), Internet self-efficacy, and failure tolerance on cyber-café addiction in undergraduate students. A questionnaire method by self-administered technique was used in this research. Multiple regression analysis was used to analyze the hypotheses. Hypotheses results showed Internet self-efficacy, failure tolerance, and parental support have predictive power over cyber-café addiction. Some implications of the results on cyber-café addiction are also discussed in this study.

Current Trends in Videogames and Rehabilitation

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Information and communication technologies offer innovative solutions for rehabilitating sensory motor and cognitive skills (Wiederhold & Wiederhold, 2004) in support of or substitution for traditional retraining techniques (LoPresti, Mihailidis &
A Second Life for Telehealth: Prospects for the Use of Massively Multiplayer Online Games in Clinical Psychology

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Thanks to the enormous diffusion of the World Wide Web (WWW), telepsychology, and telehealth in general, are becoming accepted and validated methods for the treatment of many different healthcare concerns. Telehealth services provide several advantages for both clinicians and patients: they have the potential to increase the range of services that therapists currently offer and the populations they treat, expanding access, increasing the quality of health care, allowing the delivery of health information and services across geographical distances, and reducing the costs of interventions. The emergence of massively multiplayer online games (MMOGs) may provide a useful approach towards the implementation of multi-user applications in telehealth. MMOGs are collaborative virtual environments characterized by the simultaneous presence of multiple users within the same simulated space, who can communicate using local chat, voice, instant messaging, and in some cases gestures and movements. Results of recent studies about avatar-based social interaction provide support to the hypothesis that MMOGs are able to convey high feelings of presence and co-presence, which increases the feeling of togetherness of remote users who are connected through some form of telecommunication medium. The aim of the present study is to investigate the possibility of using Second Life, one of the most famous MMOGs in the world, to guarantee continuity of psychological support to a patient who, after some years since the beginning of the therapy, moved to another city far away from his therapist. After a brief training during which the patient and the therapist create their own avatars and explore the Second Life world, they will virtually meet each other in a private island, created for this purpose. A series of half-hour sessions will be conducted. After each session both of them will be asked to fill in questionnaires about their experiences and to write down their impressions and comments. Data are being collected and results will be ready in a few months for inclusion within this manuscript and in the conference presentation. Limitations regarding the addictive nature of such games and the questions related to privacy and personal security will also be discussed.

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 a motor vehicle accident (MVA). A literature review suggests that this is rarely used as a treatment modality. At Cork, we developed a driving simulation program based on the use of driving videogames projected onto a large screen (VRET). We then published data supporting its use. We have continued to use this program over the past 6 years. Here we reflect on “lessons learned.” The last 50 consecutive patient charts were reviewed to confirm clinical impressions. Listed below are some of the observations noted. These and other observations will be illustrated with clinical cases.

1. Driving phobia in MVA victims is almost invariably an “accident phobia” and should be treated accordingly.
2. There are usually two components to the phobia, a fear of driving and a fear of passenger travel. Both aspects of the phobia may require treatment, with the number of hour-long treatment sessions required ranging from 3 to 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 for the present the software is better and cheaper for simulating driving accidents.
4. Most patients have more than one diagnosis (e.g., PTSD, GAD, major depression, panic disorder), which 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. Realistic targets must be set.
6. When working with traumatized patients litigation may be a stumbling block to successful treatment but to a lesser extent with phobic reactions.
7. Some patients find simulations too immersive, with marked anxiety/panic reactions that do not readily habituate despite prolonged exposure. DVDs/ videotapes are a useful adjunct to therapy.
8. Most patients respond to treatment but often a residue of fear remains. Do not oversell the program.

**Virtual Reality Gaming for Treadmill Training: Improving Functional Ambulation in Children with Cerebral Palsy**

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For children with cerebral palsy (CP), the acquisition, refinement and retention of ambulatory skills remains a primary focus of physical therapy programs. The use of the treadmill for ambulation training has been shown to be feasible for children with CP, making an impact on the spatiotemporal parameters of gait. However, one limitation of the treadmill is that it is not seen as a functional activity, especially among children; it may appear more like work. Another limitation is the amount of ambulation training time required to impact the parameters of gait. The tedium of treadmill walking may not be sufficiently stimulating to keep a child interested in walking long enough to make a significant impact. Play is a meaningful activity to children and a common way they learn to move and interact. Virtual reality (VR) has the potential to provide the missing element of play in practice on the treadmill. The purposes of this study was (1) to design and develop a VR game-based system to enhance treadmill training; (2) to test the use of a VR game game-based system as a motivational tool to enhance ambulation training on the treadmill; and (3) to determine if there is any improvement in the children’s functional ambulation status. The Standardized Walking Obstacle Course (SWOC) is a tool for testing functional ambulation in children with CP, and it was utilized in this project for a pre-post test study design. The storyboard of the game was based on a child’s story that includes a princess and a dragon. To achieve the goal of rescuing the princess, positive reinforcement was provided at uneven intervals. This reinforcement was given as the child met characters along the way, who made supportive messages, and by earning points. Points accumulated in the concrete form of diamonds and coins that adhered to a “magic shirt” that the child wore. We believe that the magic shirt helped the child feel more immersed in the game. The VR game-based system was developed by the use of lightwaves. Background music tracks were purchased in order to comply with copyright laws. A set of scenes (each 15 minutes long) was created. After designing the scenes, the video segments were rendered on a cluster of nine computers. Total rendering time was approximately 2 weeks for 24/7. The video segments were then combined in different groups. After editing and inserting music background and objects, there were 15 packets of DVDs, for a total of 9 hours of treadmill training. Preliminary results of three children with CP showed that the VR game-based system is well accepted. All of the subjects completed the 9 hours of training. None of the children had ever walked that length of time on a treadmill. The initial speed of the treadmill was based on each child’s preferred walking speed and was increased as tolerated. The SWOC showed improvements in the children’s functional ambulation status. Verbal feedback received from the children, parents, researcher, and student assistants involved with the training was both positive and constructive.

**Stroke Rehabilitation Using the Rehabilitation Gaming System**

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Stroke is a troublesome cause of dysfunction that will remain one of the main causes of disability and burden of disease, at least for the next 20 years. As a consequence, there is a need to investigate new neurorehabilitation strategies that can promote and accelerate the recovery of the deficits caused by stroke. Ideally, these should be grounded in the understanding of the neuronal organization of healthy and diseased brain. In this context, virtual reality (VR) arises as a promising tool that can be used to diagnose, monitor and induce functional recovery after lesions to the nervous system. VR-based approaches have the advantage that precise tasks can be defined on the basis of explicit hypotheses on the mechanisms underlying recovery. So far, several systems based on different paradigms and therapy concepts have been proposed, suggesting an increased impact on rehabilitation. We developed the rehabilitation gaming system (RGS), a VR tool that is currently being tested in the specific domain of the rehabilitation of motor deficits of the upper limbs. This system combines movement execution by the patient with the observation of a correlated action of virtual limbs that are displayed in a first-person perspective. The core hypothesis is that within such a scenario we can recruit the mirror neuron system, a specific population of neurons that discharge during both goal-oriented action execution and observation of the same action when performed by others. We hypothesize that through this bi-modal visuo-motor pathway we can promote cortical reorganization and accelerate and enhance recovery following lesions to the motor system. The main components of the RGS are a custom-made vision-based motion-tracking system, a gaming engine, data gloves and a conventional LCD display. The tracking system detects color patches located on the wrists and elbows of the subjects while a biomechanical model of the upper body allows for the reconstruction of the movements. These movements are subsequently mapped in real-time to the movements of a virtual character. The proposed task has graded difficulty and specificity: a “hitting” task to train stability, range of movement and speed; a “grasping” task to train end-point placement and finger flexure; and finally a “placing” task to train grasp, displacement and release. In a preliminary study of the RGS with stroke patients, we investigated performance and the transfer of movement deficits between real and virtual tasks. We observed that our system retains qualitative and quantitative information of the patient’s performance during the tasks, allowing for a detailed assessment of a patient’s deficits. Here we will report on our initial results with the clinical impact study of the RGS with acute stroke patients in a controlled randomized study. In particular, we will discuss the quantitative longitudinal impact of our system, the validity of our underlying hypotheses and the relationship between the patient’s profile and recovery dynamics.
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 traumatic brain injury (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 setup and laboratory-based systems do not meet cost and deployability requirements. This paper will discuss the initial setup 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), TBI, and amputation. The VR systems chosen for this research were the Sony PlayStation® 2 EyeToy™, Nintendo® Wii™, and Novint® Falcon™, 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; and (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 EyeToy, Nintendo Wii, and Novint Falcon. Participants are then asked to complete a questionnaire regarding their perception on each system’s usability, appeal and enjoyment. The participants are then able to use each of the systems for approximately 5 minutes at a time to avoid fatigue. A final questionnaire is completed by participants regarding their perception of each of the systems, and they are then given the opportunity to provide ideas or comments 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 the perception on each system’s usability, appeal and enjoyment. The participants are then able to use each of the systems for approximately 5 minutes at a time to avoid fatigue. A final questionnaire is completed by participants regarding their perception of each of the systems, and they are then given the opportunity to provide ideas or comments 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. Future directions for 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.

Brain-Computer Interface for Virtual Reality Control

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A brain-computer interface (BCI) is a new communication channel between the human brain and a computer. Applications of BCI systems comprise the restoration of movements, communication and environmental control. In this study experiments were made that used the BCI system to control or to navigate in virtual environments (VE) just by thoughts. BCI experiments for navigation in VR were conducted so far with synchronous BCI and asynchronous BCI systems. The synchronous BCI analyzes the EEG patterns in a predefined time window and has 2 to 3 degrees of freedom. This means if the subject imagines foot movement, for example, it can move forward; if it imagines right-hand movement it can turn right, and with left-hand movement it can turn left. The asynchronous BCI analyzes the EEG signal continuously and if a specific event is detected then the control signal is generated. If the subject images foot movement, for example, it is moving forward as long as the foot imagination is detected. Both systems are currently limited to 1 to 3 degrees of freedom and therefore a fast control mechanism cannot be realized. Here we show that BCI systems can also be realized for VR control with a high degree of freedom and high information transfer rate. Therefore we implemented a so-called P300-based BCI system. Such a P300 system analyzes the P300 EEG response that can be detected if an unlikely event occurs. The systems show between 20 and 45 commands on a computer screen and the commands are highlighted in a random order. Whenever the target command is flashing, the P300 response can be detected and a control command is initiated. In order to control a VR implementation of a house, commands for TV control, playing music, making telephone calls, navigation in the house, controlling windows and doors, were implemented. First experiments in the CAVES system showed that the new P300-based BCI system allows a very reliable control of the VR system. Of special importance is the possibility to select very rapidly the specific command out of many different choices. This eliminates the use of decision trees as previously done with BCI systems. More generally the work showed that BCI systems can also be used for goal-oriented systems. Instead of controlling a robot with move up-move back, turn left-turn right commands, the BCI system allows a command such as grasp the glass of water and put it onto the table. This is a more natural and faster way of controlling movement.

Brain Activity During Handshake with a Virtual Avatar: A Preliminary Study

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The advent of virtual avatars enables an object to act as the user in virtual environments (VEs). Virtual avatars have recently begun to be used in social psychological research. Social cognitive neuroscience also benefits considerably by using animated virtual agents. But in previous neuroscience studies using virtual avatars, the virtual avatar did not react to the user’s behaviors but just acted not relating to the user’s intention. Therefore, in this study, we purpose to develop the VEs for social cognitive neuroscience study in which the avatars react to the user behavior and apply to the subjects. In order to investigate this purpose, we performed an fMRI study using a VE in which an avatar accepted or rejected the user’s offer. In the first phase, the other virtual avatar appears in front of the user in the VE, and then the user offers his or her hand to the avatar. My virtual avatar’s hand motion synchronized with the subject’s hand motion by calculating the position of maker on the subject’s right hand. In the second phase, the other virtual avatar reacts to the user’s behavior, acceptance action or rejective action. Of the 12 pairs of avatars used in the VE, each pair of avatars has acceptance action and rejective action with different clothes. The favor of the virtual avatars is balanced as neutral. For the fMRI experiment, three normal, healthy, right-handed subjects were recruited. The fMRI scan was conducted with a 1.5T machine (GE Medical System). After the fMRI experiment, subjects were asked to complete the questionnaire about the user’s feelings toward the other virtual avatars. The fMRI data were analyzed with AFNI and data from the other virtual avatar acting duration. In the results of the questionnaire, the user feels the other avatar’s acceptance action as positive and suitable. In contrast, the user feels that the other avatar’s rejective action is negative and disapproving. In the fMRI analysis results, the primary visual area, the visual association area, the SMA, the prefrontal area, the cerebellum, etc., activate in common with the other avatar’s acceptance action and rejective action. The temporal pole related to unpleasant emotions was more activated during the other avatar’s rejective actions in contrast to acceptance actions. The middle frontal area and inferior frontal area were more activated during the other avatar’s acceptance actions in contrast to rejective actions. This fMRI results in the user’s perception and recognition of not only the virtual avatar’s appearances and motions but also emotions and social meanings. These results show that the subject recognizes not only avatars as social objects but also avatar’s action as socially meaningful action. In this study, we develop the VEs for a social cognitive neuroscience study, showing that it is possible to interact with the virtual avatars reacting to the user’s behavior. The social interaction methods would be practicable in various social cognitive neuroscience studies.

A fMRI Study for Feeling of Telepresence While Watching a Movie

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Have you ever felt totally immersed while watching a movie? Or have you felt as if you were physically present with contacts on the other line during a teleconference? The term telepresence refers to the feeling of “being there” through a form of media. As various technologies such as teleconference emerge, the feeling of telepresence at various experimental settings was investigated with behavioral characteristics and subjective scores. The feeling of telepresence represents one’s state of being fully immersed in a situation and felt in another place provided by a media. During telepresence, the person feels somehow dissociated from the immediate surroundings, which might be due to a distortion of the sense of self-location, self-awareness and embodiment. In this paper, we aimed to investigate the neural correlates associated with the feeling of telepresence through analyzing brain mechanisms. We investigated the neural correlates associated with telepresence while experiencing stimuli provided by a media. The ANCOVA analysis prominently revealed the brain areas that are related to the feeling of telepresence. They were the right precuneus, left anterior cingulated cortex, left supramarginal gyrus, and right parahippocampal gyrus. They could be part of functional network for generating another place in imagination, generating reflective self-awareness, and associating with the spatial mislocalization of the self in relation to the physical body. The neural correlates represented in this study showed that telepresence could be explained with brain mechanism regarding the generation of a virtual place and localizing the self into the generated place.

The Future Direction of Coherent Human-Machine Vision Systems

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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.

The ETIOBE Project: A Supporting System for Children Obesity

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The aim of the ETIOBE project is to develop a cognitive behavioral program for the treatment of obesity in children.
supported by new technologies (Internet, virtual reality) in order to potentiate 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 teletherapy system that includes three main applications: clinician supporting application facilitates the therapists to personalize the acting-intervention protocol, according to the specific characteristics of each patient; home supporting 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; and mobile supporting 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.” A detailed description of the system is presented in this paper.

**VR-enhanced Treatment of Emotional Eating in Obese Female In-patients: A Follow-up Study**

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To help obese individuals cope and manage the negative emotions related to emotional eating, we developed and tested a VR-enhanced therapeutic protocol integrating different clinical components: progressive muscular relaxation, deep breathing exercises, and cognitive behavioral auto-monitoring technique. Further, it incorporates some elements from emotion-focused therapy: emotion awareness and the induction of good feelings. Specifically, the protocol is composed of 12 clinical and training sessions: nine VR-based (six relaxing and three exposing to stressful situations) and three therapist-based (psychological support). During the VR sessions, subjects are immersed in the “Green Valley”—a virtual mountain valley—in which they experience and learn relaxation by applying different relaxation techniques, listening to different therapeutic and relaxing narratives. The protocol also includes self-administered sessions, during which individuals continue relaxation exercises individually through the support of a multimedia mobile phone: they experience a video of the mountain valley matched with a relaxing narrative. The clinical treatment lasts two weeks and is administered in 12 daily sessions. The aim of this 3-month follow-up study is to explore the mid-term effects on BMI, emotional eating, trait-anxiety, depression, and eating control. To assess the hypothesized mid-term effect of the protocol, three conditions are compared: VR treatment, a similar relaxing protocol not supported by VR technology, and a control condition. The questionnaires considered are the trait version of State-Trait Anxiety Inventory (STAI-Y), the Emotional Overeating Questionnaire Revised (EOQ-R), the Weight Efficacy Life-Style Questionnaire (WELSQ), and the Beck Depression Inventory (BDI). To date we have received follow-up data from 30 participants out of 60. Data analysis will start after receiving a high number of follow-up responses; the results will be ready in a few months for inclusion in this paper and in the conference presentation.

**A Virtual Arm to Stop Smoking: A Comparative Study**

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In a pilot study presented at last year’s Cybertherapy Conference (Girard & Turcotte, 2007), we reported 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 4 weeks of an eight-session psychoeducational and motivational program, all participants will be immersed in VR. During the VR immersions, 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 CO₂ tests will provide an objective confirmation of the abstinence reported in the diaries. The success of the program will be based on the number of subjects who have 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 in two questionnaires addressing presence and cyber-sickness. 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. At CT13, we will present the results of data collected up to the first- and third-month follow-ups.

**Reference**


**Psychophysiological Aspects of Tobacco Use and Craving**

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In a pilot study presented at last year’s Cybertherapy Conference (Girard & Turcotte, 2007), we reported 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 4 weeks of an eight-session psychoeducational and motivational program, all participants will be immersed in VR. During the VR immersions, 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 CO₂ tests will provide an objective confirmation of the abstinence reported in the diaries. The success of the program will be based on the number of subjects who have 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 in two questionnaires addressing presence and cyber-sickness. 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. At CT13, we will present the results of data collected up to the first- and third-month follow-ups.

**Reference**

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 & Farar, 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 physiologic connections between emotional expression and physiologic arousal (e.g., skin conductance, temperature, respiration, blood flow) (Nasoz et al., 2004; Picard, 2001). Our follow-up study, currently underway, 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 ($n = 24$); former smokers ($n = 23$); current smokers ($n = 15$); and deprived smokers (for 6-8 hours, $n = 15$). 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.

**Development of Virtual Aversive Environments: A Preliminary Study of Virtual Covert Sensitization for Alcohol Craving**

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Although the harmful effects of excessive alcohol consumption are widely known, cessation of risky drinking is difficult, even for those who have a strong desire to stop drinking. Craving is generally considered to be a major factor related to alcohol use and relapse in addicts. The most powerful predictor of abstinence is the loss of craving or urge to use. Aversive treatments, which are grounded in classical conditioning, aim to eliminate cravings and to induce aversion to abused drugs by repeatedly pairing a maladaptive behavior with unpleasant stimuli such as electric shock or chemicals. Covert sensitization is a verbal aversion procedure that presents aversive stimuli (e.g., embarrassment, physical deterioration, or nausea) through imagery rather than actual overt aversive stimuli. It is relatively risk-free compared with other aversive treatments, both medically and ethically, and is known to be effective in some measure. However, the disadvantage is that the effectiveness of covert sensitization relies largely on the individual’s ability to imagine. The virtual reality (VR) technique was expected to solve the problem of the classical imagery-based covert sensitization method by stimulating one’s imagination. We have developed virtual environments and scenarios to elicit alcohol aversion. Clinical trials for a new technique—VR-covert sensitization—for alcohol-dependent in-patients are ready to be conducted. In the presentation, we will discuss explicit measures of craving and implicit measures of alcohol attitude as they imply the efficacy of the program. We expect that using VR to enhance an individual’s ability to imagine aversive situations will lead to a decrease in cravings in alcoholics and could be a useful method to treat substance-dependent people.

**The Butler Project: Elderly People’s Satisfaction with New Technologies**

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The Butler Project consists of a cognitive and emotional teleassistance 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 states 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, there is 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 characterizes 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 to share it with other users (e.g., videos, music, images, or sentences). For instance, a user can share a photograph or a video associated with a piece of music of his or her family or friends with other users. The aim of this work is to present the results obtained in a case study about the satisfaction of a real user with the Book of Life.

Supporting Low-ability Readers with Interactive Augmented Reality
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Augmented reality (AR) is a technology that allows the overlay of 3D virtual images on the real world. It has been used to develop various educational applications. As well as letting the user experience the real world augmented with computer-generated content, AR enables the user to intuitively interact with content in real time. By actively involving the learner, AR offers interesting possibilities for creating engaging educational media. To study how interactive AR affects different kinds of learners, we used an AR-based storybook designed for early literacy education. The storybook consisted of text (shown on a computer screen and, upon request, read to the user) and AR sequences requiring the user to solve interactive tasks using tracked handheld paddles as interactive devices. Six and seven year olds from two primary schools read and interacted with the AR book. One group of nine children were identified by their teacher as good and avid readers. The other group of twelve children were below average readers. All children read and interacted with the book in pairs or individually in a controlled experimental setting. With some initial help, most children were able to interact with the system without much prompting. After they finished the storybook, retell and recall performances were scored in an interview without much prompting. Most of the information needed by sighted people to construct cognitive maps of spaces is gathered through the visual channel. Unfortunately, people who are blind or who have low vision lack the ability to collect the required visual information either in advance or in situ. For most people who are blind, walking in an unknown environment can be unpleasant, uncomfortable, and unsafe, even after extensive orientation and mobility rehabilitation training. Over the past few years, the use of virtual reality in domains such as simulation-based training, gaming, and the entertainment industries has been on the rise. It has also been used as a rehabilitation and learning tool for people with disabilities. This study is based on the assumption that the supply of appropriate spatial information (perceptual and conceptual) through compensatory sensorial channels (e.g., haptic and audio) within a virtual environment simulating a space in advance may assist people who are blind in their anticipatory exploration and cognitive mapping of the unknown space. In this study we developed and tested the BlindAid system that combines 3D audio with a Phantom haptic interface so as to allow the user to touch a virtual environment through a handheld stylus. The three main goals of the study were: (a) development of the BlindAid system, which allows people who are blind to explore an unknown virtual space; (b) evaluation of different types of haptic feedback, audio feedback, and navigation tools and their effects on user behavior and spatial cognition; and (c) determination of spatial cognitive mapping employed by people who are blind. Our experiments included four participants who are totally blind (without any visual ability) and who had previous experience with computer applications, but no previous experience with virtual environments or the Phantom device. The findings supply strong evidence about the type of haptic feedback the users prefer and confirmation that haptic feedback helped them explore and navigate in the virtual environment. The results also show that audio feedback helped the users orient themselves in the space. In general, the system provided a robust foundation for the participants’ development of comprehensive cognitive maps. This study was supported by a grant from the National Eye Institute, NIH (Bethesda, MD).

BlindAid: A Virtual Exploration Tool for People Who are Blind
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Computer-aided Articulatory Model for Tamil Speech Sounds
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Hearing loss or impairment (HI) leads to speech and language disorders in children. The most common articulation disorder of HI children is substitution. In this paper, we present the development of a computer-aided articulation tutor (CAAT) and detailed experimental study on articulatory training. HI children suffer from certain drawbacks due to hidden articulators in the place of articulation of laterals, trills and stops. Thus lip articulators alone cannot help HI
children in learning articulation. The tongue plays an extremely important role in this as it helps to produce the desired speech. As our requirement was the movement of the inner articulators during speech, we decided to use MR imaging techniques to capture the required data. MRI corpus for twelve speech sounds was developed to construct the inner articulatory vocal tract model. The graphical user interface with necessary navigation controls of CAAT was developed. The three-dimensional vocal tract (3D VT) simulator was used to train 10 HI children (5 boys and 5 girls in the age group of 4-6 years) in laterals, trills and stops. In all the experiments, children underwent a pre-training test, training sessions and post-training test. For laterals and trills, the pre-test mean score of 9, SD: 1.15; and post-test mean score of 18.5, SD: 1.35; the misarticulated words 5.50. The results indicated a significant difference between pre- and post-training test scores with very high scores on the post-training test. The results indicated that the computer-aided VT articulatory model was effective in providing articulatory training to Tamil HI children.

The Implementation of Graphic Mode Phoneme Learning System for Hearing Impaired

Yun-Long Lay, Justin S. Lay, and Hui-Jen Yang

In general, language training needs a professional instrument to analyze speech for supporting the pronunciation of hearing-impaired people. However, the non-professional speech spectrum equipment is very expensive and its output is not easy for hearing-impaired people to understand and learn. The purpose of this research is to propose a graphic mode displaying system (GMDS) to support the speech learning for hearing-impaired people at low cost and with better learning performance. The components of GMDS include a computer that connects to a microphone as input device to capture the speech features; a neural network to extract the features for speech recognition; a needle pointer graph to display the voice message on the screen to support the hearing-impaired people to learn speech. A system usage evaluation of GMDS was performed after the system was implemented.

Virtual Reality Exposure: Efficacious Treatment for Combat PTSD?

Sarah D. Miyahira, Hunter G. Hoffman, Raymond A. Folen, and Azucena Garcia-Palacios

One of the most disabling psychological disorders affecting warfighters and military veterans exposed to combat is post-traumatic stress disorder (PTSD). The intense nature of the violence experienced in war and frequent encounters with death increases their risk of developing PTSD. More than 19% of U.S. Army and Marine Corps personnel returning from deployment to Iraq were found to have current mental health problems. Significantly higher rates of PTSD were reported after combat duty in Iraq compared to pre-deployment rates. It is particularly noteworthy that a year after returning from Iraq, 35% of the warfighters sought mental health services, and greater than 50% of those who were referred for treatment received follow-up care. As the conflict continues and becomes more combative, the reported incidence of PTSD may increase among the thousands of U.S. military personnel serving in this hostile environment. There is an urgent need to insure that effective and efficient means are available to treat emergent cases of combat-related PTSD among deployed military personnel. Early intervention of PTSD can leverage combat readiness by improving the probability of warfighters returning to duty and avoiding its chronic, debilitating consequences. Two evidenced-based forms of cognitive behavioral therapies (CBT) (i.e., prolonged exposure and cognitive processing therapies) have...
been particularly effective in reducing PTSD symptoms. The research project to be discussed builds upon the strengths of these two CBT interventions by using virtual reality (VR) exposure to treat combat PTSD in warfighters returning from Iraq and Afghanistan. Preliminary studies indicate that VR may have several comparative advantages over other CBT approaches such as: (1) control over the pace and level of intensity of exposure to the traumatic event, which allows patients to develop a sense of mastery at each exposure level; (2) direct experience and opportunity to confront combat-related trauma in a safe, therapeutic environment; and (3) is not reliant upon a patient’s ability to imagine or to sustain the imagery. The current study is a randomized controlled clinical trial that evaluates the efficacy of a novel 10-session VR exposure treatment intervention in reducing symptoms in warfighters diagnosed with PTSD resulting from traumatic events encountered in the Iraq and Afghanistan combat theaters. Outcomes for the VR exposure treatment group will be compared to that of a minimal attention, delayed treatment group. Data collection is ongoing, and preliminary data will be discussed as well as methodological and process issues. Anecdotal information about the nature of self-reported participant trauma and their responses to VR exposure therapy will also be presented.

**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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Post-traumatic stress disorder (PTSD) is one of the most disabling psychological conditions affecting the veteran population. The percentage of U.S. 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 health care 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 have 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 mild traumatic brain injuries (TBI) that went undiagnosed. However, among 35,000 otherwise healthy 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 TBI. 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 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, especially the case with mild TBI. Of note, any TBI can result in short- or 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, quick and proper diagnosis of the presence/absence of PTSD and/or TBI in U.S. troops who have been deployed to the combat zone conforms with not only the recommendations of the President’s Commission on Care for America’s Returning Wounded Warriors but is in the best interest of our warriors. The Virtual Reality Medical Center (VRMC) 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 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 times, 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, best described as PTSD and/or TBI, in order to better maximize the accuracy of their diagnosis and facilitate their integrated and aggressive coordinated care and speed of recovery.

**Virtual Iraq: VR PTSD Exposure Therapy with Active Duty Iraq War Combatants**

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War is perhaps one of the most challenging situations that a human being can experience. The physical, emotional, cognitive and psychological demands of a combat environment place enormous stress on even the best-prepared military per-
sonnel. In the first systematic study of mental health problems due to the Iraq/Afghanistan conflicts, results indicated that, “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). Among the many approaches that have been used to treat persons with PTSD, graduated exposure therapy appears to have the best-documented therapeutic efficacy (Rothbaum, 2001; Bryant et al., 2005; NAS Report, 2007). Based on this, we have developed a “Virtual Iraq” simulation and over the past year we have been running an open clinical trial to evaluate its efficacy for treatment of PTSD in active duty OIF/OEF military personnel at the Naval Medical Center—San Diego/Camp Pendleton (NMCSD). The current Virtual Iraq application consists of a series of virtual scenarios designed to represent relevant contexts for VR exposure therapy, including city and desert road environments. In addition to the visual stimuli presented in the VR head-mounted display, directional 3D audio, vibrotactile and olfactory stimuli of relevance can be delivered into the simulation. Stimulus presentation is controlled by the clinician via a separate “wizard of oz” interface, with the clinician in full audio contact with the patient. User-centered tests with the application were conducted at the NMCSD, within an army combat stress control team in Iraq and at Madigan Army Medical Center at Ft. Lewis. This feedback from non-diagnosed personnel provided information on the content and usability of our application that fed an iterative design process leading to the creation of the current clinical scenarios. The current NMCSD treatment protocol consists of 1.5 hour prolonged exposure sessions two times weekly over 5 weeks. The system is also in use with PTSD-diagnosed personnel at other clinical sites. At the time of this writing, 11 out of 14 (79%) treatment completers did not meet DSM criteria for PTSD by the end of treatment at NMCSD. PCL-M average pre/post scores decreased from 54.57 to 35.85 and paired t-tests produced significant pre/post differences (p < 0.001). Correcting for the PCL-M baseline value (score of 18 = no symptoms) produced an average 50% drop in PTSD symptoms across all patients. Results from such initial data reports are difficult to generalize from, and we are cautious not to make excessive claims based on these early results. While encouraged by these early successes, we continue to gather feedback from the patients regarding the therapy and the Virtual Iraq environment in order to continue our iterative system development process and find out how to make this form of exposure therapy more appealing and effective. A detailed description of the protocol with outcomes from patients now undergoing treatment will be presented at the conference.

References

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 5-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 5 minutes). About half of the PTSD patients assessed and treated reported blast exposure (n = 18), with a subset exposed becoming dazed and confused (n = 8), and a sub-set of those having temporary memory 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 < 0.0001), with arousal in fact continuing to increase during the recovery phase (p < 0.007). 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 < 0.05). Further, the greater the 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), which 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 in facilitating the ability to reduce arousal following stress. Further, the cumulative blast score was directly correlated with SC at recovery time 1 (Spearman’s rho = 0.448; p < 0.05, n = 20), indicating poor pre-treatment recovery of SC, yet this was not found at time 2 (r = 0.281, p < 0.542, 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 < 0.017; partial Eta squared = 0.531 with observed power of 0.751); (2) a significant difference for time (F = 5.97; p < 0.04; partial Eta squared = 0.427 with observed power of 0.574); and (3) a condition x time interaction (F = 13.12; p < 0.007; partial Eta squared = 0.622, with an observed power of 0.887). 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 over reactivity during stress recall and recuperation than they did at time 1 (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 ($p < 0.05$ 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 ($p < 0.001$), 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 recovery at pre-treatment assessment indicates the importance of considering blast in treatment planning for patients with PTSD. That this distinction disappeared after treatment further suggests that VRGET is an appropriate and effective treatment for patients with PTSD with or without mTBI.

The ViRTICo Trial: Virtual Reality Therapy and Imaging in Combat Veterans


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Post-traumatic stress disorder (PTSD) and traumatic brain injury (TBI) have disabled warfighters for centuries, yet the optimal methods of diagnosis and treatment for each remain controversial. Both are common in veterans of the Global War on Terror (GWOT), making the ability to distinguish between them important. While exposure therapy is the current treatment of choice for PTSD, most regimens rely primarily on imaginal exposure, requesting that individuals who would prefer to avoid reminders of their trauma repeatedly recount their experience to their therapists in vivid detail. Not surprisingly, many are unwilling or unable to cooperate with this approach. We believe that virtual reality exposure therapy (VRET) will prove more acceptable to GWOT veterans, will prove at least as effective as imaginal exposure, and will accelerate the rate of response. Objectives: (1) Distinguish between four groups of 22 GWOT veterans, those with PTSD and TBI combined; PTSD alone; TBI alone; and neither PTSD nor TBI, using an Affective Stroop test as well as digital photographs taken in Iraq and Afghanistan, in conjunction with functional magnetic resonance imaging (fMRI). (2) Demonstrate that VRET is non-inferior to the current first-line therapy for which there is best evidence, prolonged exposure (PE), in the treatment of OIF/ OEF combat veterans with PTSD. The primary outcome measure for judging success will be a $30\%$ reduction in CAPS score at the end of treatment. Additional outcome measures will include a $30\%$ reduction in CAPS scores at the end of a 12-week follow up-period, significant reductions in scores on measures of other psychiatric disorders such as anxiety and depression, and a significant reduction in associated functional impairment at these endpoints on the SF-36 and WHODAS-II. Design: After a baseline assessment at Walter Reed Army Medical Center (WRAMC), a baseline fMRI is conducted at the National Institutes of Mental Health. Individuals with PTSD ($n = 44$) are then randomized to either PE or VRET. Each arm features 12 90-minute therapy sessions. Results: To date, eight subjects consented to participation in the study; five completed an fMRI scan, one withdrew, and two were ineligible. The three subjects with PTSD have been randomized to PE or VRET and are engaged in treatment. Preliminary results will be provided. Conclusions: The conduct of fMRI utilizing digital photographs, as well as the conduct of VRET, appears to be feasible and favorably received in GWOT veterans.

Virtual Reality Pain Distraction Treatment of Hispanic and Caucasian Children with Large Severe Burns


Children with severe burns often undergo daily passive range of motion (PROM) exercises to help retain the elasticity and counteract the healing skin’s natural tendency to shrink, which can limit mobility. Physical therapy helps reduce the number of skin grafts needed to release contractions. Strong procedural pain can discourage patients from performing their physical therapy treatments, affecting outcome. Preliminary evidence from previous studies suggests that cognitive distraction with interactive immersive virtual reality (VR) can help reduce pain during physical therapy for burn wounds in adult patients. We performed a prospective randomized controlled comparison of adjunctive VR to standard analgesic therapy in children with large severe burns receiving passive range of motion physical therapy by assessing analgesia and maximal joint range of motion immediately before and after therapy. Methods: Four in-patients (two female, two male, three Hispanic, one Caucasian) aged 7-18 (mean age = 13.5 years), with a mean total burn surface area of 64.5\% (range 45-82\%) were studied using a within-subjects design. Each patient received his or her regular pre-therapy pharmacologic analgesic regimen. Some patients received VR during PT on the first 5 days, and no VR during the second 5 days. Other patients received no VR during the first 5 days and VR during the second 5 days (order randomized). The variables measured included: (1) pain (a) FACES Scale administered pre- and post-PROM, (b) worst pain experienced while in PROM, (c) time spent thinking about the pain while in PROM, (d) how much fun the child had while in PROM, (e) unpleasantness of PROM session; and (2) anxiety, which was a pre- and post-PROM measure using the Fear Thermometer Scale. The questions were asked in either English or Spanish, as applicable. Significance was set at $p < 0.05$. During the VR condition, patients wore an occlusive VR helmet with 80 degrees diagonal field of view, head tracking and sound canceling earphones. Patients shot snowballs at snowmen, igloos, penguins and mammoths in an icy 3D canyon called Snow World. Conclusions: Pediatric in-patients undergoing passive range of motion exercises reported large reductions in pain and large increases in amount of fun during VR compared to physical therapy with no VR. Although larger studies are needed, these preliminary results suggest that virtual reality can help reduce pain and improve outcome measures of children with large severe burns undergoing painful physical therapy treatments.
Customizing Pain Management Technology to Meet Child and Clinical Challenges and Requirements

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Technology-based pain management continues to progress with the realization that tools such as virtual reality (VR), video games and more recently multi-modal distraction (MMD) have the capacity to more effectively relieve affective and anxiety-based pain pathways through higher levels of interaction and immersion. While VR allows complete immersion and therefore has shown excellent results in reducing pain reports in many acute areas, potential developmental and clinical concerns exist when using VR in the younger, school-aged child (3-10 years). MMD was developed from this concern base, and in collaboration with a pediatric burns team that required a device that matched their clinical demands. This technology advancement filled a clinical gap that now ensures access to technology-based distraction across the lifespan. The device, which has undergone various prototyping and clinical trials, has shown significant pain reduction compared to standard tools and handheld video games, in response to pediatric and clinical specific content and console development. The current frame of reference for MMD is to customize the content to meet user preference, developmental level and individual centers’ acute clinical requirements. Customization of MMD therefore is occurring in two separate ways: firstly, through enabling children to manipulate stories, games and movies to make it their own, which ensures greater motivation and control throughout a medical procedure; and secondly, by creating clinical and procedural specific procedural preparation stories, a unique resource in current technology based pain management systems. Technically this process involves quick adaptation of MMD content about a procedure to include use of hospital character logos as characters, treatment room set-up, staff, procedures and instruments to ensure continuity of care in individual centers. Customization processes, clinical trials and results of MMD to date will be presented alongside future prospects.

References

Pain Control During Wound Care for Combat-related Burn Injuries Using Custom Articulated Arm-mounted VR Goggles

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This case study explored whether adding virtual reality to usual pain medications would reduce excessive pain during wound care of a combat-related burn injury. This study was conducted on an in-patient at USAISR in San Antonio, the U.S. trauma center where all U.S. soldiers with significant burn injuries from Iraq and Afghanistan conflicts are treated. The 22-year-old male patient suffered third-degree burns on 31.5% of his body, including his right hand, during a roadside bomb terrorist attack in Iraq. The nurse administered wound care to half of the right hand during VR and the other half of the same hand during no VR (treatment order randomized). This patient was the first to use a unique custom articulated arm-mounted VR goggles developed for the current project. Three 0-10 graphic rating scale pain scores for each of the two treatment conditions served as the primary dependent variables. The patient reported less pain when distracted with VR (e.g., “time spent thinking about pain” dropped from 100% during no VR to 15% during VR, “pain unpleasantsness” ratings dropped from “moderate” (6 out of 10) to “mild” (4 out of 10). Wound care during VR was “pretty fun” (8 out of 10) vs. “no fun at all” (0 out of 10) during no VR. Although preliminary, using a within-subjects experimental design, the present study provided evidence that immersive VR can be an effective adjunctive non-pharmacologic analgesic for reducing cognitive and emotional pain of a soldier experiencing severe procedural pain during wound care of a combat-related burn injury.

Implementation of FACS for Synthetic Characters for Use in Studying Facial Expression Recognition by Survivors of Childhood Cancer

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Cure rates for childhood cancer have increased dramatically but survivors remain at risk for both acute and late-occurring sequelae associated with their disease and treatments. Many survivors never achieve adult milestones such as living independently, marrying, and procuring stable employment. Investigators have called for better assessment of psychosocial variables associated with a survivor’s ability to successfully integrate into society. One such variable that has received attention lately is facial expression recognition. Effective social interaction requires attention to and interpretation of complex nonverbal cues, including facial expressions, body language, and tone of voice. Facial expressions are a rich source of nonverbal social information. Individuals use their own expressions to achieve social goals (e.g., communicate interest or pleasure) and interpret others’ expressions to gain information about responses to their behavior (e.g., acceptance, boredom, confusion). Errors in facial
expression recognition (FER) consequently have potentially negative repercussions for social interactions (e.g., misinterpreting a smile of polite attention as one of genuine interest). Since survivors of childhood cancer often have nonverbal cognitive deficits, it is reasonable to assume that they may make more errors in FER. Indeed, the social isolation often reported in survivors may be in part due to errors they make in FER. Traditionally, studies have used the Diagnostic Analysis of Nonverbal Accuracy (DANVA2) to assess FER skill in children. This test consists of 48 photographs of adult and child faces, depicting basic low- or high-intensity expressions of happiness, sadness, anger, and fear. We are investigating a more sophisticated method using synthetic characters to assess children’s FER skill. In this research we are using both survivors and healthy children to evaluate methodology and ease of use of our FER instrument, and to assure that there is adequate variability in performance. Our hypotheses are twofold: first that the FER task will be adaptable, feasible, valid, and reliable for use with survivors of childhood cancer and healthy children, and second that survivors will make more errors when identifying facial expressions and will have a higher threshold for perceiving negatively valenced emotions than healthy children. We are systematically developing facial expressions by referring to the Facial Action Coding System (FACS) criteria. FACS uses the movement of facial muscle groups (action units) to measure facial expression. The absence of expert tools that aid in defining the AUs associated with FACS led to an investigation of a similar encoding scheme, the Moving Pictures Experts Group Facial Animation standard (MPEG-4 FA). Despite the existence of capable tools supporting MPEG-4 FA, their use was limited by subtle differences between the muscle culture coding of FACS AUs and MPEG-4 Facial Animation Parameters (FAPs). As we were disinclined to devise a complicated mapping between AUs and FAPs, particularly for the children faces that we needed, we followed a more traditional approach of defining AUs using a variety of mesh deformation techniques, rendered as a series of animation key frames. This talk will detail the development and address system- and user-testing issues surrounding the use of our FER instrument.

Pulse!! The Virtual Clinical Learning Lab: Preliminary Findings on Usability and Playability
Claudia L. McDonald, Jan Cannon-Bowers, and James R. Dunne

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. 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 was interviewed in detail to assess platform usability and recommend improvements to the design team. Participants in this study (n = 23) represented 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. 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.

Virtual Reality on Mobile Phones to Reduce Anxiety in Outpatient Surgery
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When undergoing ambulatory surgical operations, the majority of patients experience high levels of anxiety. Different experimental studies have shown that distraction techniques are effective in reducing pain and related anxiety. Since virtual reality (VR) has been demonstrated as a good distraction technique, it has been repeatedly used in hospital contexts for reducing pain in burn patients, but it has never been used during surgical operations. With the present randomized controlled study we intended to verify the effectiveness of VR in reducing anxiety in patients undergoing ambulatory operations under local or regional anesthesia. In particular, we measured the degree to which anxiety associated with surgical intervention was reduced by distracting patients with immersive VR provided through a cell phone connected to an HMD compared to a no-distraction control condition. A significant reduction of anxiety was obtained after 45 minutes of operation in the VR group, but not in the control group and, after 90 minutes, the reduction was larger in the experimental group than in other one. In conclusion, this study presents an innovative promising technique to reduce anxiety during surgical interventions, even if more studies are necessary to investigate its effectiveness in other kinds of operations and in larger numbers of patients.
Cellular Phones for Reducing Battlefield Stress: Rationale and Preliminary Research
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Battlefield stress is the consequence of man being exposed to the hostile environment of combat. One of the best strategies for dealing with stress is learning how to relax. However, relaxing is difficult to achieve in typical real world situations. In this study we developed a specific protocol based on mobile narratives to be experienced on UMTS/3G phones. Mobile narratives are audiovisual experiences, implemented on mobile devices, in which the narrative component is a critical aspect to induce a feeling of presence and engagement. A preliminary trial including 33 subjects showed the efficacy of mobile narratives in reducing the level of stress experienced during a commuter trip. These results suggest that 3G mobile handsets, even with their small screens and limited multimedia capabilities, may be used as a relaxation tool if backed by a specific therapeutic protocol and an engaging experience. Future research is needed to define and test a specific protocol targeted to battlefield stress.

Electronic Planner and Cell Phone as Rehabilitation Auxiliary for Prospective Memory Deficit
Alessandro Giustini, Rosita Galli, and Francesco Tomaiuolo

Prospective memory is defined as the ability to program and organize daily actions and to re-evocate this “daily planner” whenever necessary. So, the prospective memory is the capability we have to organize our everyday tasks; for example, to carry out our numerous obligations keeping in mind our schedule, the things to do to complete every task, the right sequence of our schedule. This brain function is dependent on the integrity of several memory components (MLT and working memory), which are frequently damaged after a cranial trauma, even if this trauma is clinically considered “mild.” Furthermore, the loss of the prospective memory is described in various studies on stroke and brain degeneration multifactor diseases (e.g., Parkinsonism or simply “brain aging”). These patients may present other disabilities, especially in their motion abilities of the lower and upper limbs. This situation clearly reduces the efficacy and handiness of taking notes (e.g., regarding the daily program) or using pen and paper or the keyboard of a cell phone. In order to cope with the prospective memory loss, the use of a classic paper planner is recommended, even though this useful instrument is nowadays surpassed by the use of a more practical and effective electronic planner. This electronic device planner should be structured as follows: it should be the size of a personal digital assistant (palm), with an easy to use touch-screen with cell phone and digital camera functions. First screen: planner (a1 screen) year to be selected (with 2 alternatives); (a2 screen) month to be selected; (a3 screen) day to be selected; (a4 screen) time to be selected. This device should also have a lateral button for recording a vocal note regarding the scheduled time meeting. It might be useful if two vocal notes could also be registered: one short (e.g., dentist appointment) and one long, inside the short one (e.g., remember to bring the panoramic X-ray). For example: one hour before the scheduled appointment, the patient will be notified of the up-coming task and the short message will be played, and (if requested) the long message as well. At 30 and 5 minutes before the appointment, a further vocal notification of the appointment will be played. Another function could be that with a single button the patient will have the list of the scheduled daily appointments, as well as the ability to see on the screen and hear all the appointments scheduled in the next 24 hours. It could also be useful to have the possibility, using the incorporated digital camera, to take visual notes for the various appointments. This instrument should be, however, personalized and more or less simple in use according to the patient’s abilities. Another important function of this electronic device could be to use it for rehabilitation treatment with computerized programs or virtual rehabilitation sessions (telemedicine), in order to sustain and maintain the cognitive functions of these subjects and to increase their self-confidence and autonomy (supporting caregivers’ activities as well).

Italian Bloggers’ Stories: Their Personalities and Interpersonal Relationship Quality
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The present paper is focused on personal blog psychological implications. Blogs represent an online space where individuals disclose themselves sharing with others’ experiences, thoughts and feelings about their lives. Unlike the traditional diaries where individuals hide their selves, bloggers use the Internet as a new form of interpersonal interaction for showing themselves to other people. Hence, the blog as a source of virtual relationships allows users to make public domains their personality declinations (Blood, 2002; Miura & Yamashita, 2004). In this framework, we investigated the relations between personality factors, interpersonal relationships levels and blog usage, specifically considering the number of owned and frequented blogs. A further goal was to explore the relation between blog usage and Internet addiction levels, assumed as an indicator of the subjects’ interpersonal relationship quality. Our purpose was basically explorative, so a descriptive, both qualitative and quantitative, approach was used. Coherently with the opinion that blogs represent a new and interesting self-disclosure online space, our results demonstrated that Italian bloggers describe themselves as individuals open to experience. They tend also to refer to themselves as “kind,” “forgiving” and “sympathetic” people (self-sacrificing interpersonal dimension) and as “friendly,” “outgoing” and “sociable” individuals (intrusive/needy Interpersonal dimension). However, they show a sort of hostile dominance that brings them to be suspicious toward other people (vindictive/self-centered interpersonal dimension). We retain that this latter result
is not indicative of a true lack of social relationship management skills. Indeed, as demonstrated by the correlation between blog usage and IAT total score, Italian bloggers are conscious of the negative consequences to their social lives due to the Internet. The moderate IAT total score reported by the majority of Italian bloggers reveals that they feel themselves more at-risk for developing an Internet addiction rather than a blog addiction.

**Sexual Sensation Seeking as a Driver of Acceptance of Cybersex, Multiple Sexual Partners and One-night Stands**

**H.Y. Lu**

This study attempts to explore the influence of sexual sensation seeking on acceptance of cybersex, multiple sexual partners and one-night stands. A total of 507 respondents completed the self-report questionnaire. The analytic results reveal that high sexual sensation seekers were more likely than low sexual sensation seekers to accept cybersex, multiple sexual partners and one-night stands. Therefore, this study suggests that designers of campus-based health prevention campaigns need to focus on appropriate targets (e.g., high sensation seekers) by adopting novel, thrilling and complex messages in an attempt to achieve the effectiveness of safe sex educational campaigns.

**Mobile Science Learning and Inclusion for Blind People**

**J. Sánchez**

The high level of abstraction in some science topics, such as genetics, makes for a particular difficulty in science learning. Technology can play a major role in explaining these concepts through simulations, reducing processes that normally take hundreds, thousands or millions of years to a matter of minutes or seconds. Technology can also promote practical learning, enabling students to manipulate and recreate natural processes. Can we use gaming for blind children through mobile technology in order to help them solve problems, learn genetics and promote their educational inclusion? Is it possible to use mobile technology to stimulate science learning in blind children and their inclusion when learning with their sighted peers? In order to answer these questions, we present AudioGene, a role-playing game for learning science and integrating blind and sighted users when learning. This game focuses mainly on the inclusion of blind users in heterogeneous environments by helping them achieve meaningful interaction with their sighted peers under the same conditions. AudioGene proposes a new way for learning science. The main accomplishments when using this game are that children take an active and constructive role, learn interactively and are highly motivated. The children enjoyed this new way of learning, were motivated and participated actively in collaboration with others during the tasks they performed. The goals of AudioGene are to integrate blind and sighted users, to learn science content focused on genetics, to create joint methods for collaboration between blind and sighted users and to use mobile devices to attain these goals. Usability tests have been administered with different users revealing that blind users felt integrated with sighted users under equal conditions when using AudioGene. These initial results demonstrate the very high and real possibilities of integrating sighted and blind users. The technology, methodology and tools used in this study can help make progress in that direction. Finally, using a mobile application allows children to learn outside their classrooms and develop capabilities naturally in non-traditional environments assisted by the technology. Thus the interaction of blind learners with places such as museums, zoos and public squares for science learning purposes also opens a new window for applications such as AudioGene.

**What Would Influence Mental Health Professionals Working in Native/First Nations Reserves to Refer their Patients to Telepsychotherapy Services?**

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The technology acceptance model (TAM) (Davis, 1989, 1993; Venkatesh, 2000) is a well-known theory suggesting that two major factors contribute to 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 other factors would play a significant role, such as costs, perceived self-efficacy to use the technology, attitude towards VR and computer anxiety. Would these unexpected findings also be found in telehealth, especially with professionals who are not yet familiar with the technology involved? The aim of our study is to explore factors related to the intention of referring 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 and applied to videoconference technology and used in the present study. 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 consisted of women (74.5%). About half of the sample is between 40 and 59 years of age (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. The internal consistency of each scale is excellent (Cronbach’s α ranging from 82 to 0.97). Results from a multiple regression analysis (F(4,73) = 30.67, p < 0.001, Adj. R² = 0.64) show that the perceived usefulness (β = 0.40, t = 3.78, p < 0.001, sr² = 0.27) and the perceived ease of use (β = 0.38, t = 2.66, p < 0.01, sr² = 0.19) are both predictors of the intention to use telehealth with these patients. Comfort and therapist’s attitude towards telehealth were not significant predictors in the regression. Our preliminary results confirm Bertrand and 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. Our results suggest that we need to educate professionals on how videoconferencing can be a useful tool that is easy to use instead of putting our efforts into factors such as costs or attitude toward the technology.

How Ethical Are Online Practitioners in Everyday Practice?

Kristie Holmes

The purpose of this proposed study is to explore the ethical practice of mental health professionals in the online modality. The research problem is to assess whether or not licensed mental health professionals currently practicing online therapy are following guidelines for the practice of online therapy. The primary research question is: Are licensed mental health practitioners currently providing services online abiding by the procedures for the practice of therapy online as outlined in the International Society for Mental Health Online (ISMHO) Principles and Ethics? This study will also explore the research question, what are the ethical issues that online mental health professionals encounter in the practice of online therapy? A Web-based survey instrument will be presented, along with sampling design, data analysis procedures, and a discussion of methodology of descriptive research. Recent research has shown that online treatment is proving to be a useful medium in addressing mental health issues. Exploration of the ethical practice and procedure of clinicians, and identification of ethical issues these encounter, will clarify the state of mental health ethics practice in this emerging therapy domain. Data produced from this study will be useful for professional organizations, educational institutions, licensing boards, and practitioners alike.

Extending the Media Equation to Emotions: An Approach for Assessing Realistic Emotional Characters

Ariel Beck, Brett Stevens, Christina Howell-Richardson, and Kim Bard

Computer-based simulation has demonstrated high potential for complex training. Examples range from the mission rehearsal exercise, which is a virtual environment (VE) for training military personnel going to serve in Iraq (Swartout et al., 2006) to FearNot, a VE for educating children on the issues of bullying (Aylett et al., 2005). Both these VEs use emotional, animated characters and have demonstrated good learning outcomes through the portrayal of realistic scenarios. Although some existing systems use computational models for emotion (Aylett et al., 2005; Swartout et al., 2006), typical system evaluation does not assess how the emotional display is perceived by observers. Indeed, it is not evident that emotions displayed by a human and by an animated character are understood in a similar way, which could exclude simulation as a training tool where the understanding of emotional cues is essential, for example, in medical consultations. However, encouraging results have been found from a social perspective with the media equation (e.g., media equals real life). It was found that humans tend to interact with technology as they do with real people even when an animated character was not present (Nass & Moon, 2000) although these experiments are all based on unconscious social rules described in social psychology and constitute autonomous social reactions. It is far from obvious that the media equation will remain true on a general basis as it is already limited on a conscious level because media are not consciously considered as social partners. Nevertheless, this trend should be reinforced by an animated character that can approximate human verbal and nonverbal communication as well as respecting etiquette. Furthermore, in order to be efficient for interview training scenarios, animated characters would have to be perceived as social partners so that trainees would be confronted with the same real-life situations that they will meet during their professional lives. Thus this paper reviews the current work on the media equation and how it can perform for the evaluation of emotional interactions with animated characters. Emotions are highly “affective” in human-human interactions. To reproduce these interactions and to be efficient for training, the animated character has to display emotions as humans do (i.e., through voice, facial expressions, and body language). To date, though, it is not known how the perception and reaction to a realistic emotional, animated character would be with real-life situations. Hence investigations should focus on how emotions are perceived and interpreted when displayed by animated characters. However, emotions have a strong social aspect: for example, we display emotions following social rules and also react to the presence of emotions in others depending on social rules and relationships (Niedenthal et al., 2006). Thus using the media equation paradigm to test the usability of emotional display would be a natural step and would lead to the assessment of realistic animated emotional display. Ultimately, if the media equation holds true for the expression of emotions, it would suggest that training using interactive, animated characters could be a promising alternative to human-human interaction.

References


Virtual Justina: A PTSD Virtual Patient for Clinical Classroom Training

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Although there are a number of perspectives on what constitutes trauma exposure in children and adolescents,
Human Errors in Evacuation Behavior During a Traumatic Emergency Using a Virtual Fire

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Unpredicted disasters have been a rapid onset and increased the risk of morbidity and mortality. An Indoor fire is the most common form of traumatic events and also can be prevented from death or serious injury by effective emergency preparedness. Comprehensive building introduction to the emergency-exit system (e.g., layout of building) helps people deal with their reactions during fire-emergency evacuations. One of the human errors in evacuation behaviours under emergency is a dependency in the crowd moving direction, namely blind following. Furthermore, the crowd’s behavior (e.g., simultaneously rushing towards the exits, shuffling, crushing, and trampling) itself may result in injuries and death. This phenomenon is particularly produced in situation having no decision-making about evacuation route or judging others’ route appropriate for evacuation. The main purpose of this study was two fold: first, to identify human evacuation behaviour during traumatic fire and, second, to examine whether emergency preparedness is useful for effective evacuation. A Virtual fire was created in shopping center which had normal appearance and participants had a first-person viewpoint and the ability to navigate using a HMD and joystick. It consisted of strong visual components (e.g., flames, smoke) and sounds (e.g., scream for help, confused footsteps, explosion) which induced evacuation behavior and stronger autonomic arousal. To identify evacuation behavior, two scenarios were simulated as an experimental condition: (1) only fire was present and (2) both fire and the crowd were present. The latter was designed to examine an evacuation behavior can be affected by blind following using an avatar (computer generated image representing a person). 25 female undergraduates allocated into one of two conditions. While 13 participants in emergency preparedness condition were instructed to train how to evacuate the shopping center along the exit route, 12 participants in no emergency preparedness were informed of the exit route by layout instead training in a virtual environment. Behavioral responses, physiological (skin conductance level) and subjective arousal were measured during an experiment. Remarkably, A 2 (group) by 2 (condition) repeated measures ANCOVA (map utility in wayfinding ability = covariate) revealed a significant interact effect for total evacuation response time ($F(1,22) = 6.83, \ p < .05$), distance ($F(1,22) = 8.17, \ p < .01$), and efficiency ($F(1,22) = 5.32, \ p < .05$). Regarding to physiological and subjective arousal, both experimental conditions were significantly higher than a baseline in SCL ($F(2,46) = 4.67, \ p < .05$) and self rating based on 10-point scale ($F(2,46) = 51.77, \ p < .01$). These results indicated that emergency preparedness is a useful training when a fire only was onset. However this advantage produced the opposite results when both a fire and the crowd were present, emergency preparedness group were more likely to follow the crowd. As a result, the conformity as a social influence is a powerful human errors in evacuation behavior under fire emergency. This is the first empirical study to examine an evacuation behavior influenced by psychological factor under traumatic emergency using a virtual environment and also it can be used in broad area of emergency management and prevention.
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 modeling 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 (www.neurovr.org; www.neurotiv.org), a cost-free virtual reality platform based on open source software, that allows nonexpert users to adapt the content of a predesigned virtual environment to meet the specific needs of the clinical or experimental setting. Following the feedback 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 and 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.

Is Presence in a Physical Environment Influenced by Arousal and Attention? A Study Conducted on Researchers in Cyberspace

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Almost all researchers investigating 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 differentiate 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 emotion or an increase in attention towards specific stimuli, but he or she 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 cyberscience rate their feeling of being present in the physical environment differently following changes in arousal and attention.

The current study was conducted live during the conference, without the conference attendees’ awareness. At the beginning of the symposium on presence, one of the co-chairs 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 follows: 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 website (www.interactivemedianstitute.com/index_conf.html) under the 2008 conference Powerpoint presentations, Presence symposium. Results were discussed in light of the researcher’s ability to differentiate between presence and arousal or attention.

Presence, Immersion and Cybersickness Assessment Through a Test Anxiety Virtual Environment

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The main goal of this study was to evaluate presence, cybersickness and immersion in a virtual exposure to test anxiety. The sample consisted of 46 students (M = 22.96 years; SD = 5.04), with 12 men and 34 women who were exposed to a test anxiety virtual situation. The experimental setup consisted of two PCs, one for psychophysiological recording and the other for VR presentation with a Cybermind HiRes800 HMD. The virtual environment was a test situation in a classroom with a teacher and some college students. During the virtual exam the participant had to mark the right answer to each question. Besides psychophysiological recordings, data were assessed by ITQ-F (Bouchard et al., 2002), PQ-F (Bouchard et al., 2002), SSQ-F (Robillard et al., 2003), RT (Sarason, 1984) and STAY (Spielberger et al., 1983). The statistical analysis was performed through one sample t tests, one-way ANOVAs and multivariate ANOVAs. The comparative analysis with the normative data of previous studies revealed a significant increase in the level of cybersickness and significantly lower level of presence. However, for immersion, no statistical differences were found, although higher values were registered when compared to normative data reported in literature. Significant statistical differences between genders were observed for BPM (F (1,41) = 11.05; p < 0.01), with higher levels of psychophysiological activation for women. The same analysis revealed significant statistical differences for immersion (F (1,44) = 8.99; p < 0.01) and presence (F (1,39) = 6.45; p < 0.05), indicating higher scores for men. The psychophysiological parameter (BPM) was influenced also by the subject’s computer.
experience \((F(3,39) = 4.19; p < 0.05)\), indicating more activation for subjects with less experience. A comparison between frequency of playing computer games also results in a significant increase in immersion \((F(3,40) = 4.55; p < 0.01)\). For immersion, a significant interaction effect between gender and subject’s VR knowledge was observed \((F(8,70) = 2.41; p < 0.05)\). These results point to different values of immersion between genders when considering VR knowledge.

**Presence as Cognitive Process: The Link Between Self, Intention, and Action**

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In this paper 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 with higher levels of intentional granularity: the higher the level of presence and social presence experienced by the self, the higher the complexity of the expressed and recognized intentions. Furthermore, presence and social presence converge within the social and cooperative activities. In particular, it is through their interaction that the self improves its intentional action and interaction. The higher the presence and social presence experienced during narrative/interactive practices, the more the possibility that the goals and motives of the narratives/interaction will be internalized.

**How Do Patients Feel Present in VR?**

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Interactions with and within virtual environments have often been investigated by a qualitative approach, analyzing the patient’s experience in terms of actions performed, or conducting a post-immersion interview. These methods, although useful, can say little about the meaning of such experience and how this meaning supports the sense of presence during the interaction. A possible solution could be using a “thinking aloud” technique to elicit a verbal description of the user’s feelings, the environment, its features, and their meaning for the subject, and to analyze this data in order to understand the process of meaning definition. But the introduction of this technique could affect the subjective experience in many ways, for example, by introducing a distraction source. In this work, effects of the thinking aloud technique on the VR experience have been investigated by comparing presence reported in two different conditions, with and without the thinking aloud assignment, in 96 immersions performed by 48 participants (24 male and 24 female), aged 18 to 36 (M = 23.92, SD = 4.17), and randomly balanced over experimental conditions. A mixed design was used: each participant performed two consecutive immersions with a 10-15 minute interval between them. Participants were randomly assigned to two conditions, performing the thinking aloud during the first immersion or during the second one. Preliminary results showed that the verbalization assignment drives participants to a higher awareness of their actions, and facilitates the perception of being in the VE with someone else. But it also requires a greater effort for the subjects, distracting them from exploring the VE once they acquire enough confidence with the VR system. Thinking aloud can help the subjects to focus on their own action, and can push them to create and define a meaning for the experience, but it should be used carefully to avoid too much distraction. A statistically significant difference emerged for the social presence questionnaire, both during the first and the second immersions. A deeper analysis showed that different subscales are influenced by the thinking aloud task. No effect of the verbalization emerged on a spatial memory test, while a significant difference has been found on the reported presence during first immersion, with higher scores for the non-thinking aloud condition. The other issue researchers should consider is the task performed by the user: while using a VR system for conducting a psychology experiment the focus should be on the cognitive process, social interaction, or any other construct investigated, and not on the VE, which should just be the context, the frame of the experience. For this reason, in this experiment an orientation task was used in order to distract the subjects from the VE and agents’ characteristic: in this way subjects were looking for boxes and not looking at the agents. Those ecological preoccupations framed this study, and must be considered while looking at its results. The feasibility of the thinking aloud technique during VR immersions can cautiously be stated, although an unclear effect on involvement has been found.

**A Grounded Theory of Presence for E-health**

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Presence methodological studies often appear to be driven by the image of presence as a mental private state, internal to the individual and located into its cognitive emotional functioning. Gambreni and Spagnolli (date?) underlined two consequences of that image: first of all, it assumes the existence of a divide among the symbolic and the physical realm; second, it locates the user either inside or outside the
that these “reality tests” 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 behavior, 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 years 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 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 × 31 inch closet, locking the door and staying there alone for up to 5 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, and the Simulator Sickness Questionnaire. Brief ratings using a 100% Subjective Units of Discomfort Scale were done 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 × time interaction between the VR group and the VR+ group on the Claustrophobia Questionnaire (F = 5.124, p < 0.05) and the behavior avoidance test (F = 44.138, p < 0.001).

**A VR-supported Tele-system for Stroke Rehabilitation**

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This research addresses a pressing need for novel, pervasive and easily deployable information technology applications in healthcare. Currently there is a shortage of qualified personnel in patient care, and the annual cost increase is outpacing inflation. We plan to address the care segment where
outpatient treatment can be a cost-effective alternative. Tele-rehabilitation methods that patients can practice at home are proposed to increase treatment access, time spent doing rehabilitation exercises and, when embedded in a game-base context, could enhance engagement and motivation. We design a flexible platform that allows application builders to rapidly design, create and deploy applications that require the transmission of delay-sensitive media streams, such as audio, video and motor data. We apply our framework to tele-rehabilitation where a therapist remotely monitors the exercise regimen and progress of a patient who previously suffered from a stroke. The therapist can communicate with the patient (audio and video) and direct the patient going through a complete practice session remotely as in clinics. Further, motor information and performance data can be sent via DSL for storage and analysis to a remote central site that can be either observed in real time or reviewed at a later point by the therapist. Virtual reality (VR) tasks are employed so that a well-defined environment can be set at patient’s home in a controlled and systematic manner with accuracy and ease. To create a virtual environment with the optimal level of immersion needed to promote therapeutic effectiveness, 3D user interfaces that support natural interaction, similar to what is typical in real world performance, are desirable. Therefore, a wireless camera-led tracking system with minimum cost (installation, operation and expense) that provides sufficient accuracy and degrees of freedom is used. Three VR tasks, targeting different motion patterns, are developed. Water pouring is a VR task to simulate the water refilling and pouring with a cup and a water tank in real life that is driven by the camera-led tracking system mentioned above. The amount of water and the size of water tank are varied to generate different difficulty levels. Ball dropping is a VR task examining the ability of hand opening and hand closing. We integrate the SDT Data Glove Ultra Wireless Kit and our camera-led tracking system to come out an innovative user interface that can support the type of motion of this VR task. The level of hand opening is a criterion that can be set to generate various difficulty levels. Flying airplane is a VR task cooperating with haptics device OMNI that focus on the motion of hand pronation. Vibration sense is delivered when the user does not perform accurate wrist rotation. A clinical test was conducted at the USC Medical School in the summer of 2007 with five stroke patients, ten health controllers and five physical therapists. Training protocol was well designed for therapists to treat the patients with the use of this system. The goal of the test is to examine the functionality and feasibility of the tele-rehabilitation system from the perspectives of both patient and therapist. The results are to be presented at the conference.

Effects of Stereoscopic Displays and Interaction Devices on Human Motor Behavior

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Personal computer (PC) and video games providing intensive practice and unlimited repetition with ongoing feedback have been explored as a therapeutic tool to retrain faulty movement patterns resulting from neurological dysfunction. However, the 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, 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 disability 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) requiring 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 evaluating display comfort and simulation fidelity of the three displays and 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 highest for discomfort and eye strain and least satisfactory overall. When using the autostereoscopic display, participants could have had difficulty maintaining a good 3D stereo picture when playing 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 3 degrees of freedom. However, participants were slower completing game tasks requiring motion within 6 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. 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.

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; cogni-
Neuropsychological Assessment of Attentional Processing Using Virtual Reality

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Attention processes are the gateway to information acquisition and serve as a necessary foundation for higher-level cognitive functioning (e.g., learning and memory). Attention abilities have been addressed using virtual reality (VR) with success and the assessment requirements for attention and other cognitive processes appear well matched to a comprehensive VR approach. Within a head-mounted display-delivered virtual environment, it is possible to systematically present cognitive tasks targeting neurocognitive performance beyond what are currently available using traditional methods. Current methods for assessing attention performance include traditional paper and pencil tests, motor reaction time tasks in response to various signaling stimuli, flat-screen computer-delivered approaches, and behavioral rating techniques. These approaches have also been criticized as limited in the area of ecological validity. The Virtual Reality Cognitive Performance Assessment Test (VRCPAT) focuses on refined analysis of neurocognitive testing using a virtual environment to assess attentional processing and recall of targets delivered within the context of a virtual city. Our project involves (1) establishing the construct validity of the VRCPAT’s attention module; and (2) establishing the construct validity of the VRCPAT’s learning and memory module. In the exploratory path scenario, the user follows an exploratory path that is well marked to minimize navigational cognitive load. The user is given regularly updated audio (radio simulation) information on targets to be acquired. In fixed position scenario, users are stationed in a fixed position in the virtual city. During the test the user is required to operate a checkpoint in which the level and complexity of passing vehicles and virtual humans targets are manipulated. Again, the user is given regularly updated audio (radio simulation) information on targets to be acquired. We acquired data on the implementation of VRCPAT in a normative sample that also received a traditional paper and pencil battery. Because the VRCPAT was designed to tap very specific neurocognitive systems and not to mirror a traditional paper and pencil battery, our goal is not to replace the traditional battery for all neurocognitive domains. We aimed to assess the psychometric properties of the VR and paper and pencil measures. Hence, scores were correlated with demographic and other performance test measures administered. Standard correlational analyses using a brief demographic survey and pencil and paper cognitive tests aid our initial assessment of both the concurrent and divergent validity properties of this form of assessment. Findings suggest that the VRCPAT scenarios developed measure capacities consistent with that of traditional measures of attentional processing, as well as learning and memory. Findings are also inconsistent with potential confounds. These scenarios provide the basis for an assessment approach that allows for naturalistic testing and training scenarios that address real world performance without the loss of experimental control typically cited as problematic with behavioral observation methodologies in actual on-the-job real world test environments.

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 en-
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 pre-defined 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 voluntary 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.

Cross-cultural Validation of Assessment Instruments for the Treatment of Anxiety Disorders with Virtual Reality in Mexican Population

Georgina Cardenas

Nowadays virtual reality therapy is used as a therapeutic tool for patients suffering from anxiety disorders. In Mexico, the National Survey on Psychiatric Epidemiology (2003) reported that the most common disorders are anxiety disorders followed by affective disorders, which are more prevalent in women than in men. When analyzing disorders individually, it was noticed that in the whole of the population, specific phobias were the most common (71.1%) followed by social phobia (4.7%). For this reason, research groups from the University Jaume I and the National Autonomous University of Mexico (UNAM for its initials in Spanish), carried out a study of the cross-cultural validation of the assessment instruments used for the treatment of fear of flying, fear of public speaking and agoraphobia, which have been used principally in the Spanish population. For this purpose a content validation was carried out by expert judges in the field that judged: (1) cultural and contextual relevance, (2) wording, that the questions were stated correctly in linguistic terms, and (3) language and clarity, that the questions used appropriate words for the Mexican population. This paper describes the results obtained from the validation process of...
psychological evaluation instruments in which ten acknowledged Mexican experts participated. It also discusses the adjustments made to the evaluation instruments derived from this process.

**Cybersickness and Postural Instability in a Virtual Moving Room**
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Historically motion sickness has been most widely associated with physical motion environments, as found in cars and on ships, trains and aircraft. However, motion sickness is not restricted to physical motion, but is also reported in virtual domains such as vehicle simulators, head-mounted displays and video games. The negative impact of cybersickness on the utility of virtual environments motivates an understanding of the malady. It is essential to assess cybersickness at a situational level. Is there a unitary cause across a multitude of situations or multiple causes that are situation-specific? The ability to predict an individual’s susceptibility may lead to changes in the development of virtual technology. We have provided evidence that instability in the control of bodily orientation is sufficient for the occurrence of cybersickness. This effect has been observed with several sources of visual motion (e.g., moving room, flight simulator, video games), which support the notion of a unitary causal link between prior changes in postural activity and cybersickness. To date, there has been no direct comparison of a virtual environment with its corresponding real environment in the context of postural instability and motion sickness. We hypothesized that motion sickness and postural instability elicited by large-field visual oscillations of a physical environment (e.g., a moving room) would extend to the visual oscillation of virtual environment presented via a video projector system. Standing participants were exposed to a computer-generated simulation of a moving room for up to 40 minutes and were instructed to discontinue the experiment if they experienced any symptoms of motion sickness. Sick incidence was assessed by the subjects’ yes/no statements, and severity was evaluated using the Simulator Sickness Questionnaire (SSQ). Postural activity was assessed by recording movements of the head and torso using a magnetic tracking system. Forty-two percent of subjects reported motion sickness, which is comparable to the incidence found in physical moving rooms. Post-test SSQ scores were higher for the sick group, but not for the well group. Motion sickness was preceded by changes in postural motion among those who became sick, relative to those who remained well. Some differences between sick and well evolved over time during exposure to the virtual moving room. This finding contrasted with studies in a physical moving room, in which all differences in postural activity between sick and well subjects were stable over time. The results indicate (1) that motion sickness occurs in both physical and virtual moving rooms, (2) that in both cases motion sickness is preceded by changes in postural activity, and (3) that physical and virtual moving rooms nevertheless differ, in terms of the development of postural instability among those subjects who eventually become motion sick. We conclude that tracking of postural activity may permit online prediction of motion sickness susceptibility in individuals, and that there may be subtle behavioral differences in responses to virtual and real environments.

**Development of Simulated Auditory Hallucination Exposure Environments: A Pilot Study**
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Schizophrenia is a brain disease that affects general cognitive function causing problems such as delusion, hallucination, thought disorder, blunted expression of emotions, social withdrawal, and awareness of confusion. Auditory hallucination, among symptoms of schizophrenia, designates the phenomenon that someone hears or seems to hear sounds that do not exist. Patients with schizophrenia could be disturbed by the sound irrelevant to real situations such as auditory hallucinations while healthy people can ignore 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 such as auditory hallucination. In addition, there are some problems with nonobjective assessment due to dependence on the therapist’s ability to assess the patient’s state or training effectively. Virtual reality (VR) techniques could overcome these shortcomings. VR techniques 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 effective auditory hallucination stimulus and to measure the subject’s response to simulated auditory hallucination. The developed VR system consists 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 an order and serving at a fast-food restaurant.” Auditory hallucinations were provided during each task. Four healthy participants (3 males and 1 female) were recruited. Movement pathway (trajectory), performance time (during experience of each situation), and the number of simulated hallucinations were obtained during participant’s experience of the developed virtual reality system. Moreover, the Launay-Slade Hallucination Scale (LSHS) and hallucination experience scale (asking understanding about auditory hallucination) were answered after experiences. In the results, there was positive correlation between the LSHS score and performance time and the number of simulated hallucinations. Hence, it could be explained that the participant who is more prone to auditory hallucinations is more influenced by the simulated auditory hallucinations in virtual reality. The participants show more understanding about auditory hallucinations after the experience with the virtual reality system than before that experience. It can be considered that the developed virtual reality system can provide effective auditory hallucinations and assessment of behavioral characteristics about 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 experiments with schizophrenia groups for verifying cognitive behavioral characteristics to auditory hallucinations.
Effects of Different Virtual Reality Environments on Experimental Pain Rating in Post-stroke Individuals With and Without Pain in Comparison to Pain-free Healthy Individuals

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Virtual reality (VR) is a computer-based, interactive multisensory simulation that occurs in real-time and has been used for pain reduction. VR can provide a means of attracting attention to a specific virtual environment or alternatively distracting attention from a painful experience. The effectiveness of VR in reducing acute procedural pain has been established; however, the effectiveness of VR for chronic pain has not been tested. In addition, it is not clear whether different VR environments have a differential effect. The objective of this pilot study was to determine whether different virtual environments had a differential effect on experimental pain rating in stroke patients with moderate to severe persistent pain. Thirty-six subjects participated in this study: twelve stroke patients without pain (age 65.25 ± 6.39), twelve stroke patients with pain in their upper limb (age 61 ± 7.21), and twelve pain-free control participants (age 61.83 ± 7.2). Quantitative sensory testing (QST) was conducted using the method of limits standard test protocol and the neurosensory analyzer on the skin of subjects’ forearm (stroke arm in patients and one arbitrary arm of the control subjects) within the range of weak to strong intensities to assess pain rating to thermal, warm and cool stimuli while subjects were immersed in a virtual reality environment viewed through a head-mounted display. After each stimulus, subjects rated their pain perception on the basis of 0–100 scale of intensity where zero represented no pain and 100 represented very severe pain. The mean of 20 minutes. After the driving simulation, all participants showed right-handedness with all items of the Edinburgh handedness questionnaire. The order of conditions was completely counterbalanced across subjects to avoid an order effect across the 10 trials (two trials per condition). To prevent simulator sickness, the entire driving time was designed to take a maximum of 20 minutes. After the driving simulation, all participants performed line bisection and quadrisection tests. In pencil and paper tests, the left quadrisection and bisection marks deviated significantly to the left. While driving, the car was significantly lateralized to the right of the lane regardless of conditions. Although the reason for overall rightward deviation of the car remains unclear, it may be related to the left lateralization of the driver’s seat and a tendency to keep away from the centerline. We therefore analyzed the relative laterality for each road condition (1, 2, 3) to check if the error of pencil and paper tests occurred in the road conditions under the overall rightward deviation. Road conditions 1 and 3 showed significant differences, which meant relative leftward laterality similar to the pencil and paper tests. We also analyzed the tendency to avoid the centerline, as this was the expected cause of rightward laterality. The results showed avoidance tendencies in road conditions 2 and 4. This study demonstrated the pseudoneglect phenomenon of driving in everyday life with quantitative measurement using a driving simulator. These findings could provide the basis for a driving behavior and safety study.

Evaluation of an Informatic Mean in the Rehabilitation of Speech Pathologies

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Aphasia is an acquired language deficit often caused by cerebral lesions, such as ischemic or hemorrhagic stroke and brain injuries. Aphasia causes a communication disability. To our knowledge, there are no tools allowing easy generation of patient tailored. The objective of our study is to evaluate the applicability of one informatic mean in the rehabilitation of people with cerebral lesions. We describe a system that facilitates the speech and communication abilities of patients in daily living activities. We started by augmenting a commercial tool (PRO-BE) with a more user-friendly interface that is particularly patient-tailored. The system consists of a series of multimodal speech applications: a tabletPC with a touch screen interface (user’s interface is simple and easy to comprehend) and a vocal control and a vocal synthesis (Loquendo) integrated. In the study we observed seven subjects affected with severe speech disturbances due to different brain injuries: traumatic (2), ischemic (1), ischemic-hemorrhagic (1), hemorrhagic (1), viral encephalopathy (1), post-anoxic (1). Some difficulties were observed in three subjects because of the important cognitive impairment associated with the serious cerebral injury while four patients easily used the tabletPC. This informal mean has been valid both in speech diseases patients and in the improvement of quality of life. In particular we found some positive aspects: (1) a useful device in patients with selected speech diseases, (2) a higher level of communication and easier interaction with other people, (3) improvement of quality of life and ADL, (4) an indirect tool in supporting the rehabilitation of upper limb motor impairments, with high customer satisfaction. We note some problems: (1) impossible to use in patients with important comprehension and/or cognitive impairment, (2) ergonomic evaluation of the hardware for hemiplegic patients (USB, weight, portability, etc.) is required, and (3) assure regulation of voice parameters. In general, we consider this tool very powerful, particularly in supporting the rehabilitation of patients with upper limb motor deficits.

Evaluation of the Nintendo Wii for Physical Exercise and Rehabilitation

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The globally popular Nintendo Wii is quickly picking up a positive reputation for not only being an entertainment device but also a means of healthy living and rehabilitation. The game console’s intuitive control design, which allows for control through natural movements, is currently being used in rehabilitation therapy for patients undergoing treatment following stroke, traumatic brain injury, spinal injury, and combat injury. Noteworthy examples of use include the Veterans’ Administration Hospital of Houston, Walter Reed Army Medical Center, and St. Mary’s Medical Center of San Francisco. Previous research on the console has demonstrated that the Wii’s active gameplay is an effective tool for physical exercise compared to sedentary videogames. These findings demonstrate that the Wii is more useful in limb extension exercises and in burning calories. In order to have a better understanding of the potential features of this console, we present an objective method for performance recording when using the Wii system. Its possible applications could involve training, occupational therapy, rehabilitation, and the reduction of sedentary behaviors. We evaluated a Mii’s (a personalized avatar within the Wii) effectiveness in providing players with more presence and motivation to play. Twenty-one participants were randomly separated into two different groups: Mii and no-Mii. Participants who were placed in the Mii groups created their own personalized Mii representing themselves. Those who were in the no-Mii group played the Wii with a default Mii guest avatar. All participants played for 20 minutes with the Wii Sports Boxing game during which physiology, physical activity, energy expenditure, power, and speed were continuously monitored by using the J&J Engineering Biofeedback System and MiniSun IDEEA. Subjective feedback about presence was generated by user-based questionnaires, and the results demonstrate a significant statistical difference in the two groups with the sense of presence being higher in the Mii group: F (1,19) = 5.285, p = 0.033, d = 1.05. For all participants, we compared physiological recordings while playing the boxing game with a baseline rest state. Results indicate that there was an increase of 23% in heart rate (boxing: M= 93.48, SD = 4.29; baseline: M = 75.76, SD = 7.24), an increase of 43% in breaths per minute (boxing: M = 19.85, SD = 3.14; baseline: M = 13.85, SD = 7.24), an increase of 71% in skin conductance (boxing: M = 9.09 μS, SD = 4.63; baseline: M = 5.29 μS, SD = 2.61), a decrease in respiratory effort of 6% (boxing: M = 535.54, SD = 73.61; baseline: M = 566.45, SD = 72.95), and a decrease of 8% in peripheral skin temperature (boxing: M = 26.95, SD = 3.42; baseline: M = 29.14, SD = 4.13). Our energy expenditure recordings indicate an average of 53.16 Kcal (SD = 15.52) consumed by our participants and a power level of 26.25 KJ (SD = 13.06). The goal of our work is to present a framework of reference for further research that involves physiological recording, rehabilitation, or the design of specific rehabilitative software for the Wii system and the Wii Fit. We will continue to contribute developments in these areas with further research in the near future.

Reference

High Accuracy Detection of Malingered Depressive Symptoms

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Aims: The objective of this study was to develop and test a brief and unobtrusive instrument to detect exaggeration and
simulation in depression. Depression is frequently faked in the legal medical setting. Previous researchers have shown that experts are hardly above chance in detecting malingering. For this reason there is an urgent need for an objective tool to be used in the detection of malingered depression. Methods: We applied a new method called Autobiographical Implicit Association Test (aIAT) previously validated as a lie-detection technique. In previous experiments we validated the capacity of the aIAT to discriminate between “guilty suspects” and “innocent suspects” in a mock crime paradigm. Guilty suspects were required to commit a mok-crime (steal a CD-ROM from the teaching assistant’s office containing a copy of the examination of a psychology course) while innocent suspects just entered the room without stealing anything. In another experiment we tested the validity of our instrument in detecting the use of cocaine/heroine. The aIAT is used here as a diagnostic tool for malingered depression. It consists of measuring reaction times in order to evaluate whether sentences describing depressive symptoms are true or false for the respondent. We developed a new method that measures the positive and negative associations a suspect has between a depressive symptoms verbal description and the evaluative dimension true. In one block, participants categorize sentences describing depressive symptoms and true sentences on the same computer key and sentences describing a “non-depressive condition” and false sentences. In a later block, the tasks are reversed and participants categorize sentences describing a “non-depressive condition” and true sentences on the same computer key and sentences describing depressive symptoms and false sentences on another computer key. An overall IAT score is computed by taking the difference between the average response times to the two test stages. The faster block will indicate either the depressive condition or the non-depressive condition is the most strictly associated with true sentences. We tested three groups of 20 subjects each. The first group included individuals with a similar pattern of depressive symptoms, whereas the other two groups consisted of individuals without depressive symptoms. Of these two groups, one acted as a control group while the second was instructed to simulate a medico-legal setting and enact a mocked depressive syndrome. Results: Responses to the “depressive symptoms, true” condition were faster than those to the “depressive symptoms, false” condition, thus indicating that there was a strong association between the category “depression” and true statements for the patients group and 17/26 of the malingering group. Therefore, 9 of 26 participants faked the test, but we found an index (based on TR) that permits distinguishing the two groups (malingers vs. controls) with an accuracy of 90%. Conclusion: Our experiments provide strong evidence that simulation can be detected with a high rate of accuracy using implicit measures of associations.

The Illusion of Virtual Body Ownership During Visual-motor Movement

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Impairment of Driving Ability According to Neuropsychological Function in Patients with MHE Disease: Using a Driving Stimulator

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Overt hepatitis encephalopathy (OHE) as a consequence of chronic liver disease is known to cause flaws in functions such as attention, movement, and orientation. However, minimal hepatitis encephalopathy (MHE) patients who do not show OHE symptoms and cognitive impairment through ordinary neuropsychological evaluation can be diagnosed by specific neuropsychological and neurophysiological evaluation. MHE patients show abnormality in cognitive functions such as attention, speed of information processing, fine motor, memory, perception, and constructive abilities. Also, MHE patients have difficulty using these cognitive functions synthetically. Therefore, this impairment of cognitive function can influence the risk of automobile accident. The aim of this study is to reveal the differences between MHE and other liver diseases in driving ability related with cognitive function through driving simulator and STIM. Participants were individuals who have been diagnosed with chronic liver disease, possess a valid driver’s license for at least 7 years, and have been driving until recently. Ultimately, 38 participants without OHE were selected. These participants were divided into four groups—chronic hepatitis group and a cirrhosis group—while the cirrhosis group was categorized into A, B, and C, according to the child’s classification. Next, STIM and driving simulators were used to evaluate cognitive function and driving ability. STIM is a computerized neuropsychological test that uses finger tapping, visual CPT, spatial memory, and the Wisconsin card sorting tests. Also, we used the Revised Global-Local Test. The driving simulator program consists of a normal road driving session and an overtaking driving session. The accuracy was much poorer and reaction time was longer in the cirrhosis group compared to that of the chronic hepatitis group in STIM (longer reaction time for visual CPT and Wisconsin card sorting test, also the accuracy of Global-Local Test). By using these STIM results, participants were divided into a “high cognitive group” and a “low cognitive group.” There were notable differences in driving time and speed, direction violation, time taken to overtake the sixth car for the low cognitive group reflecting a poor driving ability. STIM utilized in this study is helpful in evaluating the cognitive functions of chronic liver disease, especially in cirrhosis patients, making an early diagnosis of MHE possible. Also, we showed differences in driving ability between disease groups and level of cognitive function among liver cirrhosis groups through the driving simulator. We predict that this may reduce the incidence of traffic accidents caused by a decrease in driving ability.

An Innovative Project of Cyber-clinic for Children with ADHD: Impacts on Diagnostic Evaluation, Treatment, and Clinical Research
Véronique Parent, Marie-Claude Guay, Philippe Lageix, Jacques Leroux, and Mélanie Rouillard

Attention deficit and hyperactivity disorder (ADHD) is one of the most prominent childhood disorders. 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. 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 per week). Our team of researchers and clinicians developed and established a unique and innovative model of cyber-clinic which aims, on one hand, 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 accessible by 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 that, 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 behavioral 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 program are recorded on the website of the cyber-clinic. The last component of our cyber-clinic is a data base. The data are 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 treatment are compiled. In sum, this new technology makes it possible to multiply the possibilities of clinical research in diagnosing children with ADHD.

Physical Assistance in Games for Stroke Rehabilitation Through Passive and Active Haptic Guidance
Emelie Sabe, Ulrika Dreifaldt, Daniel Goude, Karljohan Lundin Palmerius, and Martin Rydmark

The consequences of a stroke vary. A common disability among stroke survivors is defect arm and hand movements, which limits activities of everyday living. Rehabilitation is essential in order to get back to everyday life. Physical assistance (or guidance) is used in rehabilitation by physiotherapists and occupational therapists to help a patient teach the boy the kinesthetics of difficult movements. Today this guidance is performed by medical personnel, but with the technology of virtual environments and haptics—i.e., computer-generated force feedback—it is possible to create guidance in a patient’s home by means of computer aid and eventually by telematics.1 In this paper an invisible guidance field is generated, which guides the patient’s hand through a desired movement pattern.2 The guidance aids the patient, through the haptic feedback, to perform a task in a virtual environment. The guidance field is designed to provide a force helping the patient to follow a predefined pattern, but is also configured to yield in case the patient moves along another path. As the patient diverges from the predefined path, either by mistake, on purpose or simply by failure, the guidance field is automatically updated to provide a guided path from the new position. The strength of the field can also
be adjusted so that a weak patient gets firm assistance while a better patient is given less help and more freedom in the movement pattern. This is unlike other similar systems where the user is forced back to the predefined “correct” path. Haptic guidance is thus made possible for any movement sequences where the locations of the next correct path endpoints can be determined. The game used in this project is a straightforward “push the button” activity, where the patient is supposed to move their hand through the space from a start position to a target button, which is pushed for completion. A new target then emerges at a new position for the patient to reach. The game is implemented in Python and X3D using the H3D API, which is a high-level system for implementing multimodal virtual environments. Haptic feedback simulating the feeling when pushing a button is provided by the H3D API and the Volume Haptics Toolkit (VHTK) is used to generate the guidance field.

The Potential of Virtual Reality as Anxiety Management Tool: A Randomized Controlled Study in a Sample of Patients Affected by Generalized Anxiety Disorder

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Generalized anxiety disorder 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 point out the necessity to find new and efficient strategies to treat it. Together with the cognitive-behavioral 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 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 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.

Providing Olfactory Cues in Virtual Reality: Challenges Encountered in a Young Adult Smoking Cue Reactivity Study

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Virtual reality (VR) may hold promise in substance abuse research and treatment as it allows exposure to complex drug cues utilizing social, physical, and affective interactions provided through environments that incorporate contextually appropriate sensory stimuli. Drug cues involving visual and auditory stimuli frequently are incorporated, but olfactory stimuli are used less often. Olfaction is unique among the senses and the relationship between olfaction, emotion, and memory makes olfactory stimuli potentially powerful drug cues that should be incorporated into VR environments to increase their realism, as well as the user’s potential for increased cue reactivity and sense of presence. Twenty nicotine-dependent young adults between the ages of 18 and 24 provided ratings related to attention to smoking cues after random assignment to experience either four VR environments that included visual, auditory, and olfactory cues or the same four VR environments with only visual and auditory cues. VR environments utilized in this study included neutral and smoking cue rooms. Neutral cue rooms consisted of narrated nature scenes with a floral scent. Smoking cue rooms were counterbalanced and consisted of a paraphernalia room with visuals of cigarettes, lighters, coffee, and ashtrays; accompanying scents (e.g., cigarette smoke, coffee, raw tobacco); and music and a party room with music playing and the sights and smells of people smoking, eating, drinking, and offering cigarettes. Participants provided a visual analog scale rating of how much attention they paid to the smell of cigarettes after exposure to each room. A repeated measures ANOVA revealed no significant differences in the attention paid to the smell of cigarettes between the groups. Qualitative interviews with the participants revealed that 40 percent of participants in the scent condition reported smelling scents, but not specifically the smell of cigarettes in the smoking cue rooms. Conversely, 30 percent of participants in the no scent condition reported smelling scents even though none were provided. These results uncovered several challenges and directions for future research in using olfactory stimuli in virtual reality environments. Manufactured scents should be tested ahead of time for accuracy and protocols for optimal presentation of scents should be developed. Larger sample sizes may provide the power necessary to detect differences between conditions, while studies focusing on participants’ suggestibility and ability to “fill in” missing stimuli may help determine if particular types of individuals are better candidates for VR applications. Finally, gaining a greater understanding of the qualitative effect of scent on individuals’...
VR experiences may assist in the development of higher quality cue exposure methodologies and provide information related to the role of sensory stimuli and their effects on the user’s sense of presence.

**Relationship of Cybersickness to Post-traumatic Stress Disorder and Mild Traumatic Brain Injury in Military Personnel Enrolled in a Virtual Reality Graded Exposure Therapy Treatment Trial**

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Warriors returning from the combat theaters of Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) have been noted to have significant rates of mental health disorders such as post-traumatic stress disorder (PTSD). Additionally, mild traumatic brain injury (mTBI), defined by exposure to head injury in conjunction with either alteration in consciousness and/or memory, 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 diagnosed with PTSD, including those cases complicated by mTBI. Previous studies have demonstrated that some individuals cannot tolerate 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. 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 five sessions of VRGET treatment and were therefore administered the Simulator Sickness Questionnaire (SSQ) to assess the occurrence of cybersickness symptoms during the VR portion of the treatment. 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, determined by higher scores on the PCL-M, was 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 intolerability of the VR and SSQ scores or presence of mTBI. 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.

**Road Civil War: Treating a MVA Victim with Virtual Reality—A Case Study**


Motor vehicle accidents (MVAs) are a serious concern in the western part of Europe, especially in Portugal, where the figures ascended to 99,685 accidents, 31,000 injuries and 741 deaths in 2007 alone. Therefore, the scope of this project is to develop a virtual reality (VR) application that can be used to treat MVA victims who 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 translucid screen to a virtual highway with an increasing number of 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 indicate 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 < 0.05). However, the most relevant fact is that this decrease led to the patient being able to drive again.

**The Use of Internet for the Consolidation of Collaboration Activities Between Two Research Groups**

Georgina Cardenas

Several disciplines have benefited from advances in information and communication technologies. Among them, psychology, where it has been successfully implemented with the use of the Internet with telepsychology programs and the use of virtual reality technologies as a tool for psychological treatment. In Mexico, on the one hand, research in the field is incipient; on the other hand, there is a high prevalence of anxiety disorders among the population. Based on the factors stated above, the research group of the Virtual Teaching Ciberpsychology Laboratory of the National Autonomous University of Mexico requested support from the group led by Dr. Botella Arbona of the Universitat Jaume I in Spain to evaluate treatment programs developed by her group on the Mexican population, inside a collaboration framework between both universities. At present, treatment programs for public speaking, fear of flying, and agoraphobia are in the cultural validation process with the fundamental purpose of contextualizing such programs for Mexi-
can idiosyncrasy. This paper will describe the process, which includes: validation of the measuring instruments, audio substitution based on colloquial communication used in Mexico, and weekly clinical supervision of the Spanish group with the group of Mexican therapists through videoconference. It is expected to have strategies for the validation of treatment programs that, even though they were developed in Spanish, require adjustments in order to observe the context and cultural pertinence of the country where they are applied. The Internet allows two research groups from two different continents to communicate so they can continue collaborating consistently in clinical supervision sessions, not only to present the most representative clinical cases, but also to form competent therapists in telepsychology programs and the use of virtual reality as a tool for psychological treatment.