**VR for acute pain reduction in adolescents undergoing burn wound care.**

Analysis

The pain experienced during burn wound care is clinically well-known, yet poorly researched for teenagers. Due to the nature of burns, repeated painful wound care and dressing changes are required regularly to facilitate wound healing.

The range of adjunctive non-pharmacological interventions available for use in pediatric and adolescent acute pain management is varied. Psychological and distraction-based approaches such as, parental participation, hypnosis, music, movies and VR related technologies are commonly taken into account for practice.

This study was a prospective randomized controlled trial with a parallel group design.

Summarize

This study assessed off-the-shelf VR for its effect on reducing acute pain intensity during adolescent burn wound care and its clinical utility in a busy hospital setting.

The group of adolescents using the off-the-shelf VR did not reduce pain level, length of treatment times or adverse pain events more than standard distraction. While adolescents exposed to VR had a trend of lower mean pain scores, the only difference that reached statistical significance was for nursing staff observation during dressing removal, and significantly less rescue doses of Etonox for the VR exposed patients.

Comparison

While this study showed some positive results, it is clear that it was carried out quite a long time ago, and the pieces of hardware have developed since then, along with the way the applications are developed and their effective quality.

We aim to focus on immersion qualities of our application. In order to distract teenagers nowadays, we need to be very creative and develop a very distracting and immersive environment or scene in order to distract the patient as much as possible.

**Trauma management therapy with VR augmented exposure therapy for combat-related PTSD**

Virtual reality exposure therapy (VRET) realistically incorporates traumatic cues into exposure therapy and holds promise in the treatment of combat-related posttraumatic stress disorder (PTSD). In a randomized controlled trial of 92 Iraq and Afghanistan veterans and active duty military personnel with combat-related PTSD, the experiment compared the efficacy of Trauma Management Therapy (TMT; VRET plus a group treatment for anger, depression, and social isolation) to VRET plus a psychoeducation control condition. Efficacy was evaluated at mid- and post-treatment, and at 3- and 6-month follow-up. Consistent with the hypothesis, VRET resulted in significant decreases on the Clinician Administered PTSD Scale and the PTSD Checklist-Military version for both groups. Also consistent with the hypothesis, significant decreases in social isolation occurred only for those participants who received the TMT group component. There were significant decreases for depression and anger for both groups, although these occurred after VRET and before group treatment. All treatment gains were maintained six-months later. Although not part of the original hypotheses, sleep was not improved by either intervention and remained problematic. The results support the use of VRET as an efficacious treatment for combat-related PTSD, but suggest that VRET alone does not result in optimal treatment outcomes across domains associated with PTSD.

We researched a bit of this are of VR application in trauma management in order to notice if other if VR exposure would benefit other aspects of our main application of the project.

**The effects of intraoperative Progressive Muscle Relaxation and VR application on Anxiety, Vital Signs and Satisfaction**

This randomized controlled study investigated the effects of intraoperative PMR and VR application on anxiety before and after a knee arthroscopy operation, the satisfaction levels of patients after the operation, and the effects on blood pressure and heart rate during the operation.

As a conclusion of this study, PMR and VR were not found to be effective in reducing anxiety in the intraoperative period. PMR and VR were found to be effective in increasing patients’ satisfaction. However, PMR and VR are inexpensive and easy methods that can be applied during surgery and are considered to have positive and smoothing effects on systolic and diastolic blood pressures, heart rate, and patient satisfaction.

While this experiment conclusion is not very positive, compared to the hypothesis, we learned that the application will not necessarily be effective in the way we want it to be, but we could try to mitigate the downsides and focus on what works and improve the user satisfaction overall, while attempting to also increase the effectiveness of the soothing and pain-reducing aspect.

**Virtual Reality and Cognitive-Behavioral Therapy for Driving Anxiety and Aggression in Veterans: A Pilot Study**

Analysis:

The main goal of the research is to reduce driving anxiety and aggression in veterans in order to mitigate the public health impact of MVAs (motor vehicle accidents). Virtual reality exposure therapy (VRET) offers safe, controlled exposure to distressing stimuli.

Although VRET has demonstrated preliminary utility for treating driving-related anxiety, prior studies have not integrated VRET and CBT (cognitive behavioral intervention)methods to address both driving-related anxiety and aggression.

Summarize:

The current study piloted a level virtual reality and cognitive behavioral intervention (VRET + CBT) for veterans that integrated both anxiety and anger management components. Virtual reality driving scenarios were delivered in a driving simulator and tailored for the military population. Six previously deployed veterans completed eight intervention sessions, as well as pre/post, one month follow-up and six to nine month follow-up assessments. Repeated measures ANOVAs demonstrated significant decline and large effect sizes for PTSD symptoms, driving phobia, hyperarousal in driving situations, anxiety/anger-related thoughts and behaviors, and risky driving. Hyperarousal in driving situations declined by 69%, aggressive driving declined by 29%, and risky driving declined by 21%. Treatment gains were maintained at follow-up.

Comparison:

Since our project focuses more on handling the way patients feel during painful treatments and actual pain reduction by distracting the subject, it can be said that it is not very similar. One similarity it is the way the anxiety level decreases after the “treatment” was applied several times.

**Virtual reality applications toward medical field**

Analysis:

The objective of this paper is to understand the capabilities of VR in medicine. Paper is to identify the status of the process of VR in the medical field. This study is to provide significant benefits of VR technologies to learn the procedure of treatment and surgery. The main objective of this paper is to identify the potential applications of VR technology in the medical field, along with a brief description.

Summarize:

VR provides a simulated environment to interact with the 3D world. Medical professionals are developing and implementing this technology for training, diagnosis and virtual treatment during a critical situation. The study sees that there is good potential for VR in the medical field. We also studied the processes involved in implementing this technology in the medical field. Finally, this paper identifies fourteen major applications of VR in the medical field with description. This technology is helping to create quality healthcare services during complicated cases.

VR is used effectively for better surgical technique. It creates detailed virtual models of a patient's anatomy. It helps physicians to effectively move around and view virtual 3D images from different angles. This technology is currently applied in cardiology and Neurology for monitoring and improves patient outcomes. It plays a significant role to help physician related to trauma and other fractures

Comparison:

So since this study is only a research with results, it is not wise to compare it with our project. But it helped us understand the need of VR in the medical field and VR holds promising techniques to save and improve the life of the patient. It quickly addresses any deficiency regarding the skill of the surgeon. This immersive technology addresses training in the operating room environment anytime and anywhere.

**The effects of a virtual reality treatment program for online gaming addiction**

Analysis:

Online gaming addiction (OGA) has considerable importance in public health, education, and related fields. Typically, OGA is defined as a pattern of excessive and prolonged online gaming that results in a cluster of cognitive and behavioral symptoms, including progressive loss of control over gaming, tolerance, and withdrawal symptoms. The current study was designed as a four-week, prospective trial, including pre-treatment evaluation, active treatment (CBT or VRT, eight sessions, twice a week), and post-treatment evaluation.

Summarize:

Twenty-four adults with OGA were randomly assigned to a cognitive behavior therapy (CBT) group or VRT group. Before and after the four-week treatment period, the severity of OGA was evaluated with Young’s Internet Addiction Scale (YIAS). Using functional magnetic resonance imaging, the amplitude of low-frequency fluctuation (ALFF) and FC from the posterior cingulate cortex (PCC) seed to other brain areas were evaluated. Twelve casual game users were also recruited and underwent only baseline assessment. After treatment, both CBT and VRT groups showed reductions in YIAS scores. At baseline, the OGA group showed a smaller ALFF within the right middle frontal gyrus and reduced FC in the cortico-striatal-limbic circuit. In the VRT group, connectivity from the PCC seed to the left middle frontal and bilateral temporal lobe increased after VRT.

Comparison:

This whole study helped us decide how our project is going to work. It also showed us that the effectiveness of such projects and procedures (or how they call them “treatments”) are visible. It would be amazing if after the whole project is done, we will test it on subjects and analyse the effects it has on them.

**The role of virtual and augmented reality in orthopedic in trauma surgery: From diagnosis to rehabilitation**

Analysis:

Virtual and augmented systems are applied to multiple situations in medicine. They are a cheap and efficient alternative in most stages of patient treatment and to perform many procedures. Some types of treatments frequently require exposing the patient to visual stimuli, e.g., psychological diseases, pain management or several vestibular rehabilitation exercises. Multiple computer-assisted tools were developed for orthopedics, mainly focusing on fracture reduction-related procedures. In this paper, there are a number of aspect that are taken into consideration such as interpretation of medical images and fragments, virtual reduction, design of fixation and prosthesis, the process of the actual surgery and the rehabilitation exercises.

Summarize:

The usefulness, weaknesses and perspective of the authors are discussed in order to make these technologies more feasible for this medical specialty in the future. Moreover, the integral process of a fracture reduction is specified, going from diagnosis to rehabilitation. A per-task study is carried out, assessing the possibilities of VR/AR systems from the point of view of computer graphics. A brief explanation of technologies and applications of virtual and augmented reality is also presented. The primary goal of this research was to introduce novel researchers to current VR/AR applications present in orthopedic trauma surgery and propose new lines of research. These systems support collaborative diagnosis but, in spite of being technology-feasible, it is an almost unexplored field, especially in orthopedics. In this context, virtual and augmented reality limit their use to visualize the models and are not concerned about more complex interactions related to bone fragments adjustment, e.g., fragment picking, labeling, etc.

Comparison:

The most relevant conclusion is that virtual reality is an appropriate technology to assist in pre-surgical tasks, mainly focusing on visualization in training systems. They also represent an excellent choice to treat several pathologies or perform rehabilitation exercises. Virtual and augmented reality add an immersive component to diagnosis and an alternative method to visualize medical images, allowing the access to several hidden parts of human anatomy.

**A randomized, controlled trial of immersive virtual reality analgesia, during physical therapy for pediatric burns**

Analysis:

Traditionally, pre-procedure systemic opioid administration has been the treatment method of choice for management of rehabilitation-related pain. Due to inadequate pain control with opioid analgesics alone, nonpharmacologic analgesic techniques have been promoted as clinically useful adjuncts. Such techniques as hypnosis, imagery, and biofeedback have been shown to significantly reduce pain when used to augment pharmacologic analgesics. More recently, immersive virtual reality has been suggested as an additional choice. This treatment may be particularly effective because it provides an interactive, computer-generated virtual environment that is highly distracting to the user/patient. By drawing heavily upon conscious attention, virtual reality distraction theoretically leaves fewer cognitive resources available to evaluate nociceptive input, resulting in less pain during otherwise painful procedures.

Summarize:

The goal of the present study was to address these limitations by evaluating the effectiveness of immersive virtual reality analgesia over multiple days of treatment in a large, specifically pediatric, inpatient burn population. The results of this study provide further evidence that user interaction in a virtual environment can be a useful adjunct to pharmacologic analgesia in helping to control acute, procedural, rehabilitationrelated pain in pediatric burn patients. Subjects reported significant and substantial decreases in three subjective pain experience components with virtual reality – sensory pain, cognitive pain,and affective pain. A reduction inpainseverity of 30% or more is considered to be clinically meaningful by patients, and has also been deemed to represent a clinically meaningful decrease in pain by at least one consensus group of experts representing academic, industry, and government pain researchers. The average effects of VR analgesia exceeded this benchmark for cognitive pain (44% reduction) and affective pain (32% reduction), and approached this benchmark for sensory pain (27% reduction) in this sample population. Moreover, mean pain ratings showed no indication that VR analgesia diminished in effectiveness when used repeatedly.

Comparison:

Immersive virtual reality is a useful and powerful adjunct for enhancing pain control during rehabilitation therapy in the pediatric burn population. When added to standard pharmacologic analgesia, virtual reality distraction therapy produced a statistically significant and clinically meaningful reduction in subjective patient pain ratings, as well as a significant increase in perceived ‘‘fun.’’ The concern for potential negative side effects of opioids in the pediatric population, as well as the widespread need for effective nonpharmacologic adjuncts, supports continued research into the efficacy of virtual reality analgesia.

**Individualized Augmented Reality Training Reduces Phantom Pain and Cortical Reorganization in Amputees: A Proof of Concept Study**

Analysis:

Phantom limb pain (PLP) frequently affects amputees and is difficult to treat. Previous approaches to manage PLP include visual representation of an intact limb. However, a common perception amongst amputees with phantom limbs is that their phantom has retracted proximally, also known as telescoping. In this study, a 2-week AR-intervention was targeted to maximize the coherence to the internal body representation of amputees experiencing a telescoped phantom, by using a volitionally controlled virtual phantom visualization, adapted to the individual patients’ perception. AR-training included 3 AR-tasks aimed at reengaging the neural circuits related to the lost limb. Cortical changes, PLP scores, telescoping, embodiment, sense of agency, location, and ownership were monitored to assess the relationships between each of these variables.

Summarize:

Patients were recruited from a database of limb amputees at the Central Institute of Mental Health in Mannheim, Germany. A sample of 8 patients (3 female) with a major upper limb unilateral amputation were initially enrolled in the study, 6 were transhumeral amputees. One patient was excluded from the study after the initial session due to nausea during the initial AR-training session, bringing the total sample size to 7. Approval from an ethical committee was received from the Medical Ethics Commission II of the Medical Faculty Mannheim, Heidelberg University, and written informed consent was obtained from all participants. The study protocol adhered to the Declaration of Helsinki.

Comparison:

An augmented reality-based intervention showed significant efficacy in modulation of PLP. Neural changes associated with the intervention were also found, potentially indicating cortical reorganization. Furthermore, telescoping changed significantly during intervention and agency was correlated to reduction in PLP severity. Despite a short intervention period, the intervention resulted in up to 52% PLP severity reductions and indications of cortical reorganization in a group of phantom limb patients with telescoping.