



Pain Control During Wound Care for Combat-Related Burn Injuries Using Custom Articulated Arm Mounted Virtual Reality Goggles

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Introduction

U.S. soldiers injured in Iraq with significant burns are treated at the U.S. Army Institute of Surgical Research with a mean length of inpatient stay of ~25 days (1). Wounded warfighters with severe burn injury often have daily dressing changes to inspect wounds for evidence of infection and to clean areas at risk for bacterial or fungal colonization.

Servicemembers with severe burns remain conscious during daily wound care. Typically, they receive short and long-acting opioid analgesics and anxiolytics prior to debridement. Despite aggressive pain management, patients frequently experience severe pain during daily wound care (2). Excessive pain increases the amount of time it takes caregivers to complete wound care. Suboptimal burn pain control can increase the time a patient remains in the hospital before discharge.

Clinical and laboratory studies of civilians have shown large drops in subjective pain during virtual reality [VR] (3), and fMRI results with healthy volunteers show reductions in pain-related brain activity during VR analgesia (4). If VR reduces procedural pain in patients with combat-related injuries, this advanced technology could be a valuable resource for combat casualty care providers for use in far forward military environments.

Methods

- Articulated arm mounted goggles were used in a case comparison to introduce VR to reduce excessive pain during wound care of combat burns.
- Pre-treatment orientation to the unique VR goggle system.
- Wound care was divided into halves
- Treatment of wound care was performed with and without VR for each patient.
- Three 0-10 VAS scores for each of the two treatment conditions served as the primary dependent variables.

Figure 1

Patient with Articulated Arm Mounted VR Goggles.



Figure 2

Snapshot of Snow World. Interactive Snowman tosses snowballs during session.



Table 1

Patient 1 suffered 3rd degree burns on 32% of his body, including his right hand, during an IED explosion

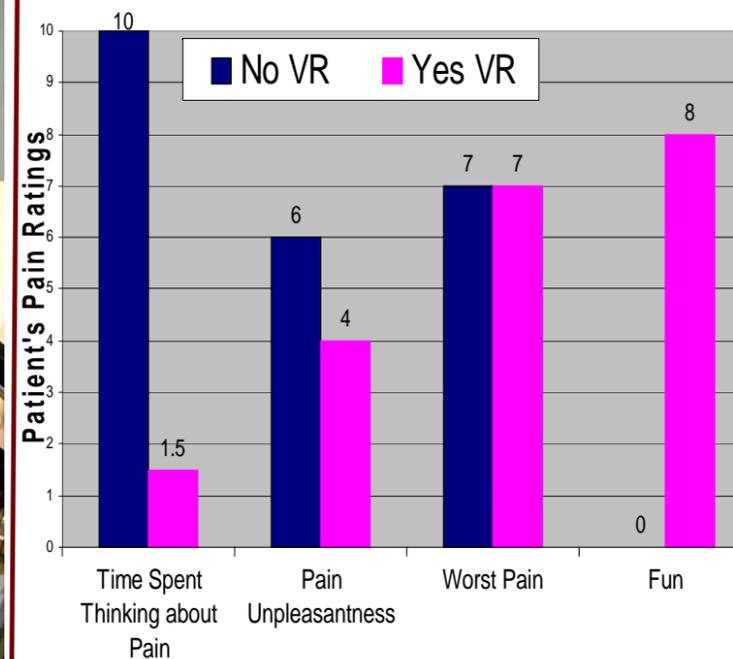
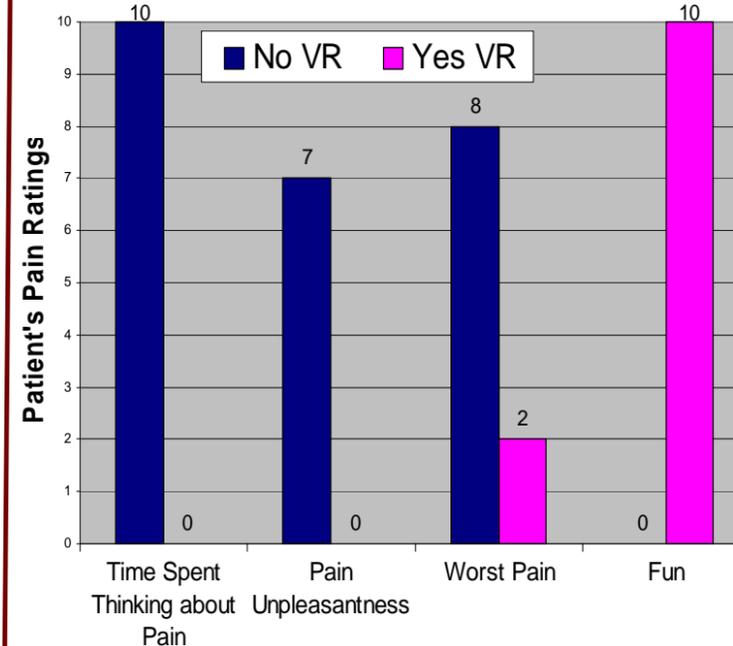


Table 2

Patient 2 suffered 2nd and 3rd degree burns in a rocket propelled grenade attack.



Results

- VR decreased amount of time spent thinking about pain
- VR reduced pain unpleasantness
- No decrease in patient 1's worst pain rating during his burn wound care with VR, but a dramatic decrease in patient 2's worst pain rating during burn wound care with VR from severe (rating of 8) to mild (rating of 2).

Discussion and Conclusions

The present case comparison, using a within-subject experimental design, demonstrates that immersive VR can be an effective non-pharmacologic analgesic adjunct. Reducing cognitive, emotional, and the sensory components of acute pain for soldiers suffering from combat related acute burn injuries during daily wound care is particularly important to a patient's physiological and psychological recovery. VR may prove an important piece of the multimodal approach to pain management.

Although randomized controlled studies are needed, these results provide the first available evidence that VR using articulated arm mounted goggles can reduce severe procedural pain (wound care and dressing changes) in patients with combat related burn injuries

Inadequate pain control during wound care for combat-related injuries remains a widespread problem. Our preliminary results demonstrate that VR may be a valuable pain control adjunct in combat trauma patients and that additional research on this modality is warranted.

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