

## Intervention Program based on Virtual Reality for Pediatric Burns

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### Abstract:

In this study, we propose an intervention program based on virtual reality (VR) for the treatment of pediatric patients who have suffered from burns, based on the scientific contributions that have shown the effectiveness of VR at reducing the pain caused by injuries. The program is structured in two phases: I) Information/Preparation. The process and expected effects will be explained to patients; and II) Intervention. In this phase, in order to observe the differential effects of virtual reality, patients will be divided into two groups: Group a) will receive training on imagination/distraction techniques and Group b) will be treated with VR. Based on the emotional effect caused by burns, the application of VR technology is expected to reduce the anxiety which young patients experience, favoring control and pain management during medical procedures and avoiding anticipation of pain.

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### INTRODUCTION

Virtual reality (VR) has proven an effective technique for managing and controlling the pain of burn injuries. It produces beneficial effects by reducing the sensory and emotional component (Hoffman, Patterson, Carrougher and Sharar, 2001). Several studies have shown the efficacy of VR in treating severe pain (Morris, Louw and Grimmer-Somers, 2009; Malloy and Milling, 2010; Hoffman, Chambers, Meyer, Arceneaux, Rusell et al., 2011). The technique consists in VR-based behavioral interventions to alleviate the pain experienced by patients who must undergo painful medical procedures such as treatments for burn injuries (Hoffman, Patterson, Magula, Carrougher, Zeltzer et al., 2004; Hoffman, Patterson, Seibel, Soltani, Jewett-Leahy et al., 2008). The goal of these interventions is to distract the patient to keep him/her from focusing on the signs of pain (Maani, Hoffman, Desocio, Morrow, Galin et al., 2008). On the other hand, although the pain experienced during burn treatments has been clinically established, the pediatric population has received little attention from researchers (Kipping, Rodger, Miller and Kimble, 2012).

Pain and anxiety can prolong the recovery time of children who have suffered from burn injuries and pharmacological therapy alone is not enough to alleviate these reactions (Das, Grimer, Sparnon, MacRae and Thomas, 2005). Recent findings have shown that VR can be effective in these cases either on its own or in combination with other treatments. In this

case, cognitive procedures were combined with augmented reality (AR). The studies show an improvement among the treated patients and highlight the motivational factor that appears in this type of therapy (Brown, Rodger, Ware, Kimble and Cuttle, 2012).

### OBJECTIVE

To present an RV-based intervention program for the treatment of pediatric patients with burn injuries. The results of previous studies (Delgado, Moreno, Miralles and Gómez-Cía, 2008; Delgado, Moreno and Gómez-Cía, 2010) and the bibliography accumulated over the past decade on VR support the use of this technology for the treatment of burn injuries (Schmitt, Hoffman, Blough, Patterson, Jensen et al. 2011)

### METHOD

Taking into account the study's objectives, we propose implementing the treatment program in the morning when patient burns are treated (wound cleansing and dressing changes) for several days. Before starting the intervention, the minors will be randomly assigned to one of two groups. The study involves two phases although in Phase II, the intervention will be different for each of the two groups:

*Phase I:* Participants receive information and prepping for the procedure that will take place during the intervention.

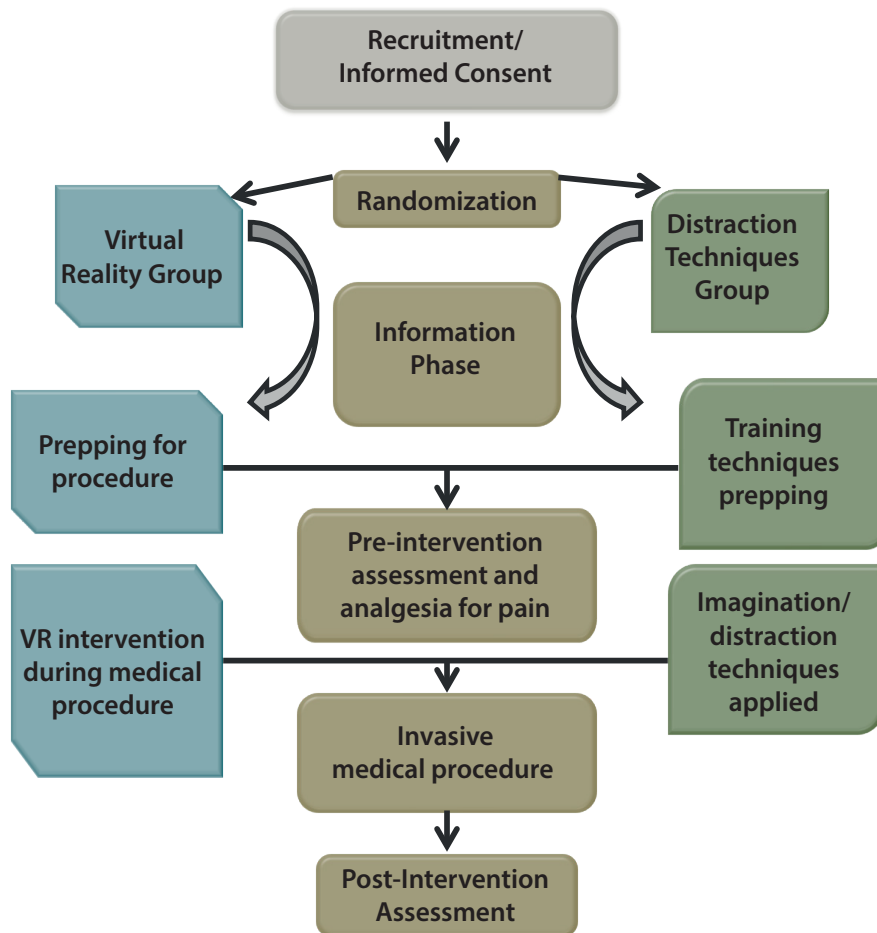
*Phase II:*

*-Pre-Intervention Assessment:* Pain, anxiety and psychophysiological responses

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Figure 1: Flow Chart of the RV-Based Intervention Program



*-Intervention during the medical procedure:* Subjects will be divided into two treatment groups; the contents of the techniques will vary for each group. Both will receive the prescribed analgesia to cope with the wound care.

*Group 1):* Training in imagination/distraction techniques.

*Group 2):* Instructions to learn to control the VR game.

*-Post-Intervention Assessment.*

In both phases, the assessments will be done by third party observers. Self-reporting techniques and objective pain scales will be used.

## DISCUSSION AND CONCLUSIONS

Studies have already shown that when combined with pharmacological treatment with minimum secondary effects, VR is a valid option for handling and alleviating the severe pain caused by burns (Das, Grimmer Sparnon, MacRae and Thomas, 2005) and an adequate strategy when used in con-

junction with the usual pharmacological treatments (Hoffman *et al.*, 2004). Its effects have been tested in an adult population (Hoffman, Doctor, Patterson, Carrougher and Furness, 2000) and among children who have suffered from burns (Hoffman, Patterson, Carrougher and Sharar, 2001). At the same time, VR can help reduce dependency on opioid analgesics while reducing the possibility of the psychological pathologies that can develop over time. VR is successful at reducing the pain experience from the very first day it is used and the treated minors find that it is a fun, appealing experience (Schmitt, Hoffman, Blough, Patterson, Jensen *et al.*, 2011). Other studies have suggested that VR's efficacy should be corroborated by comparing it with standard treatments (pharmacological) and other distraction methods (watching TV, listening to music, etc.) (Van Twillert, Bremer and Faber, 2007).

In conclusion, there is evidence that VR can be beneficial as a supplementary method to reduce the severe pain associated with burns in a pediatric and adolescent population in comparison to standard (pharmacological) treatment alone. The efficacy of the technique improves when it is applied in conjunction with other distraction techniques.

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