



Gamification-based Virtual Reality and Post-burn Rehabilitation: How Promising Is That?

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Dear Editor

Approximately 265,000 die from fires worldwide. In the United States, burn care services cost an estimated \$480,000 annually. Despite significant advances in burn treatment approaches, burns remain one of the leading causes of complications due to long hospitalization, disfigurement, and disabilities [1, 2]. Due to medical advancements, the number of burn survivors with severe burns is growing. Every year, over 9,000 patients are discharged from the intensive care unit and require inpatient rehabilitation care, making it the second most prevalent condition following hospital discharge [3]. Physical stress and psychological suffering will be experienced by burn trauma patients as a result of hospital treatments such as surgical debridement and changing wound dressings [2].

When considering the physical and emotional aspects, non-pharmacological approaches for treating the burnt patient are complementary to medicinal therapy, providing an integrated approach to care. Several non-pharmacological techniques such as cognitive-behavioral therapy, hypnosis, relaxation

techniques, and interaction through television, music, and storytelling, have been demonstrated to have an excellent therapeutic effect on pain reduction [4, 5].

In post-burn rehabilitation, new advanced technologies such as virtual reality immersion therapy (VRIT) and simulation for therapy (SFT) have recently been used. Immersion therapy (VRIT) is a distraction-based cognitive-behavioral technique used to alleviate physical and psychological pain. Experimental studies showed that VR reduces anxiety and depressive symptoms and improves adherence to treatment in burn patients [2]. A meta-analysis of nine clinical trials demonstrated that VR technology with pharmaceutical analgesics was significantly more effective in reducing pain and anxiety in burned patients. Furthermore, the findings of this study revealed that VR distracts patients' minds from anxiety and tension, thus, facilitating treatment and physical therapy [6].

On the other hand, the combined use of related methods such as interactive game consoles (IGC) is increasingly being employed to improve therapeutic effectiveness in rehabilitation settings such as post-burn conditions [1, 2]. IGCs are preferred over other

forms of VR [5], since they are less demanding to utilize in burn rehabilitation and VR rehabilitative settings [7]. Modern IGCs combine virtual reality features with patients' favorite imagery to create a more immersive experience than previous consoles [7]. It plays a constructive function in the content and process of rehabilitation and treatment, such as providing a distraction for the children or encouraging patient self-treatment. Virtual reality games can be used as effective and appealing therapy that enables the child to be entertained by artificial scenes, with objects and events, that appear and feel like real-world scenes. It can help with concentration and motivation for therapeutic objectives [8]. A randomized trial found those who received gamified-VR rehabilitation therapy experienced a greater pain reduction, particularly those who had severe pain at baseline [7].

In conclusion, burn rehabilitation is one of the essential treatment steps for these patients, considering both physical and emotional aspects. Therefore, non-pharmacological approaches to treating burned patients can provide an integrated system of treatment. Some of the applications for virtual reality that are based on gamification are reducing pain, stress, and distraction in children and assisting in proper rehabilitation, particularly for the elderly. Another application for virtual reality based on gamification is cognitive-behavioral rehabilitation for those suffering from PTSD as a result of trauma.

In general, new technological developments such as interactive virtual reality, gamification, powerful computers, and portable tablets, as well as their widespread adoption, presently offer an opportunity to integrate clinical practice knowledge, neuroscience information, and design ideas. In addition, the wide range of virtual communication

options and computer games provide physicians the opportunity to select appropriate instruments to aid in treatment.

In fact, due to its flexibility and various cognitive science elements, including a wide range of neuroscience designs and components, gamification can have a perspective that evaluates the challenges and opportunities to connect neuroscience knowledge, game design thinking, and physical therapy in clinical practice to create an additional toolkit for therapists. This perspective aims to illustrate the potential of game design principles to provide more motivation and content for integrated therapy in an appropriate technological context, such as virtual reality.

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