Chapter 38
Virtual Reality as Distraction Technique for Pain Management in Children and Adolescents

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ABSTRACT

For a growing number of medical procedures, patients remain awake during the procedure, they feel pain during the medical procedure, and they remember the pain after the procedure is over. Inadequately controlled pain during medical procedures using pain medications alone for pain control is a worldwide medical problem. Having patients conscious and feeling pain during medical procedures is especially problematic in children who need repeated medical procedures, such as pediatric patients with large severe burn injuries. Because pain has a strong psychological component, a number of unhelpful psychological factors can unintentionally amplify how much pain, fear, and anxiety children experience during painful medical procedures. Fortunately, psychological treatments can be used to help reduce pain and anxiety. Virtual reality is one promising adjunctive analgesic. There is a growing literature showing the potential of immersive virtual reality as a psychological pain control technique that can be used in addition to traditional pain medications the patient is already receiving. The current chapter reviews a number of studies on virtual reality analgesia in pediatric patients, towards the goal of helping reduce excessive pain in children during medical procedures. The current chapter evaluates the effectiveness of VR during several painful procedures in pediatric and adolescent patients, its applicability, and the potential for wider dissemination of VR analgesia in clinical settings. The current review considers factors involved in the effectiveness of VR analgesia, such as the quality of the VR system used.

DOI: 10.4018/978-1-5225-7489-7.ch038

INTRODUCTION

The problem: uncontrolled pain during medical procedures. For many medical procedures, patients remain awake during the procedure, they feel pain during the procedure, and they remember pain and unpleasantness they experienced, long after the procedure is over. These memories for the painful experience(s) can influence the patient's attitudes towards receiving healthcare, increases avoidance of medical visits that could help prevent medical problems. For example, a child who has a very painful or anxiety provoking dental procedure is more likely to become avoidant of dentists. The consequences of avoidance can be expensive. Many dental problems that could be easily prevented or corrected early on with regular checkups (e.g, filling a cavity), become much more expensive and painful problems, as the disease progresses untreated (e.g., root canal and tooth extraction) for patients who refuse to visit the dentist. Excessive pain during medical procedures is a worldwide problem, and affects a wide range of patient populations. For example, patients with a wide range of medical problems often get intravenous (IV) ports inserted "incanulation". Once inserted, healing medications, nutrients and fluids can be administered into the patient's bloodstream through the IV port. But the initial implantation of the IV port (e.g., sticking the IV port into the patient's arm) is often surprisingly painful. The same painful port insertion procedure is used with cancer patients, burn patients, patients being prepared for surgery, and a long list of other medical problems. And IV port placement is just one of large number of medical procedures where excessive pain is common.

Some medical procedures sound fairly painless, but patients' fears and anxiety associated with the procedures can amplify the patient's negative experience. For example, with blood draws, a fairly large percentage of people faint during blood draws, despite the short duration of the procedure.

A number of psychological influences can amplify or increase how much pain patients experience during medical procedures. High anxiety can increase sensitivity to pain. Some patients must receive medical procedures repeatedly. For example, children with large severe burn injuries receive several painful medical procedures per week, often daily wound cleaning and painful physical therapy skin stretching exercises, and the most painful segments of the wound care procedures often last 25 minutes or longer. If the patient has an extremely high pain during wound care, their memory for previous painful wound care sessions can increase their subjective experience of pain during subsequent wound care procedures, and make it harder to control the patient's pain using pain medications alone. There are concerns that repeated painful medical procedures can be made worse if the patient has pre-existing psychological problems such as depression or PTSD. These conditions can reduce the effectiveness of opioid analgesics. And repeated painful medical procedures during hospitalization may increase patients' risk of developing chronic pain or chronic PTSD. There has lately been a growing realization in the medical community for the need for more effective non-pharmacologic pain control during medical procedures. Use of higher doses of pain medications may increase analgesia, but also increase undesirable medical side effects of the pain medications such as nausea, delirium, constipation, urinary retention, sleeping through meals, and interference with sleeping at night. Diversion of pain medications is another concern. On the streets of the U.S.A., addiction to opioids has become a major medical problem in itself. According to the CDC, overdose deaths involving prescription opioids have quadrupled since 1999, and set a new record high in 2014 (CDC, 2016).

Because pain has a strong psychological component, in theory, psychological interventions can be used to help counteract some of the negative psychological influences. In other words, there is growing interest in using psychological techniques to help reduce pain. Typically, psychological techniques can