Perspective

Virtual reality's contribution to oral surgery

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ABSTRACT

Care for the oral cavity is strongly correlated with feelings of discomfort and anxiety. There are several options available to oral health professionals to lessen patients' anxiety, and one non-drug approach has become more popular: the use of Virtual Reality (VR). The purpose of this review is to draw attention to how virtual reality headsets can help patients undergoing oral surgery feel less anxious.

INTRODUCTION

A condition of psychic illness brought on by a dread of danger is known as anxiety, and a painful experience is known as pain. Despite the fact that pain and anxiety are purely subjective feelings, oral cavity care is closely related to both of these emotions. As a result, one of the key factors preventing a significant portion of the population from seeking care is fear of the oral health professional (including a dentist, oral surgeon, maxillofacial surgeon, etc.). Because the mouth is such a private area of the body, this true dread has been implanted in people's minds. The oral cavity is a location for love, sensual intimacy, and seclusion, as well as a tool for communication and taste recognition. This makes it necessary to see a specialist on a frequent basis because maintaining proper oral hygiene contributes to overall wellbeing (notions of pleasure, and satisfaction). This can be explained by the Freudian theory, although there is no scientific consensus, which claims that the oral stage, which is characterized by the oral and esophageal sphere preferred as an erogenous zone and supported by the motor activity of sucking, is where the discovery of the body linked with sexuality would begin.

There are various strategies available to oral health professionals to lessen patients' fears of anxiety and painful sensations. The practitioner has access to medical tools in addition to the psychological approach and cognitive-behavioral therapy (tell-show-do, modify vocabulary, include the patient in the therapeutic project). Anxiolytics (hydroxyzine) are used as the first step in the therapeutic gradient, followed by conscious sedation (EMONO, an equimolar mixture of oxygen and nitrous oxide), and, as the last option, general anesthesia. Virtual reality use has grown as an alternate non-drug method. This innovative technology has been used in other disciplines, like health, particularly for the management of pain and anxiety. It is known for its entertainment value (development of virtual worlds that immerse individuals in a simulated world). The goal of this article was to examine how virtual reality headsets can help patients experience less fear and pain during and after oral surgical operations. What role do virtual reality headsets play in lowering patient anxiety and pain connected to intra- and post-operative oral surgical procedures, according to a search strategy of the literature on Medline and Cochrane Library? One author (AF) used the research equation shown below, using Boolean operators to the key words that addressed the research topic ("virtual reality" AND "oral surgery" AND ("anxiety OR pain")). The inclusion criteria included participants of both sexes, of all ages, in good health, and having no contraindications to the use of virtual reality (no sight/hearing problems or psychotic disorders). Original papers such as study protocols, reported clinical cases, and clinical studies were also considered. Animal studies, in vitro studies, studies that were not published in English or French or for which full texts were not available, studies in which the use of virtual reality was inappropriate

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for the purposes of our study (VR intended for practitioners for clinical situations, interventions unrelated to oral surgery), and other studies were also disregarded. After the duplicates were eliminated, two independent reviewers looked at the titles and abstracts of the remaining possibly pertinent papers in accordance with the research inclusion and exclusion criteria. Studies that might have been suitable were subjected to thorough text analysis. The two reviewers separately extracted and summarized data from each of the included papers using the same data extraction form. Through questionnaires and the measurement of physiological parameters, two clinical studies demonstrated statistically significant results on the outcome measures of preoperative and postoperative anxiety and pain felt. Discovered that the group's postoperative visual analog pain measures were much lower than they had been preoperative. Additionally, preoperatively and postoperatively for the two groups, the oxygen saturation values (the effect of anxiety on hemodynamic parameters) were much superior. Observed a statistically significant difference between the VR group and the control group in the need for rescue analgesics during the procedures that were thought to be the most painful (adenoidectomy and tonsillectomy). The authors suggested in perspective a specific investigation on these aspects, which is the analysis of donning a VR headset depending on the type of intervention, as these results were not included in the study's key outcomes. Last but not least, the Wiederhold et AL study suggested that using VR headsets could reduce fear and anxiety, but the results were not statistically significant. Several techniques for evaluating the primary and secondary judgment criteria because it diverts the mind's attention to vibrant, animated children's worlds, virtual reality has the power to lessen suffering (accompanied by relaxation music for some VR headsets). Since humans have a limited capacity for attention, which is necessary for the perception of pain, diverting our focus helps us to react to pain signals as they emerge more slowly. The use of entertainment mechanisms to lessen pain has been around for a long time, but because of its intense immersion, virtual reality appears to be more efficient than more conventional methods shielding the patient from interactions outside of this virtual environment, the virtual reality headset reduces the amount of unwanted visual and audio impulses. In fact, the majority of the time, the instruments used in oral surgery are metallic, sharp, and bloody, which adds to patient anxiety. When the headset is installed on the chair, the patient is not aware of the syringe being used for local or loco-regional anesthesia, which is the first surgical stage after antisepsis. Additionally, the VR gadget can provide the user a sense of presence in the virtual world, which can help the patient focus and, as a result, reduce their perception of pain. Nociceptive receptors, which are present all throughout the body, send pain signals to the central nervous system via the A-delta and C fibers. Contrary to virtual reality, which affects pain perception and signaling through attention, emotion, focus, and memory, many analgesics function by blocking C fibers.

Additionally, virtual reality interacts naturally with the amygdala, a structure in the limbic system that is involved in associative learning, the recognition and assessment of the emotional valence of sensory stimuli, and the associated behavioral and vegetative responses, particularly in the case of fear and anxiety. Virtual reality is useful when confronted with intrusive actions or anxious situations since the amygdala would act as an alert system. These VR headsets are comparable to hypnosis among the methods for treating pain. According to the definition of hypnosis, it is a modification of consciousness in which, with the subject's permission, some personality traits are downplayed or placed in passive standby. The patient's focus shifts to an altered level of consciousness that they have never before encountered in this virtual reality-like procedure. Thus, virtual reality follows a similar framework to hypnosis, building a connection with staging, enhancing respiration, making suggestions to deepen hypnosis, and making suggestions to promote analgesia after hypnosis. The audiovisual headset takes the place of many of the stimuli that the patient would often envisage during hypnosis sessions. The main difference between VR and that technology is that in VR, the induction is done by the equipment rather than a human being. Both the patient and the doctor may find VR headsets to be highly cumbersome. In actuality, these devices weigh 700 grams on average, and the patient may not be adequately supported by this weight, especially when used on a child. The practitioner should not change positions to administer the treatment because of the close closeness of the mouth cavity and the support surface of the helmets; nevertheless, some helmets feature disposable hygiene kits that can cover them. On the other hand, it is possible for the mask to move throughout the procedure and need to be repositioned by the assistant who is not wearing sterile clothing. In order to prevent cross-transmission, it is crucial to urge that this equipment be subject to stringent hygiene regulations, including surface disinfection (on non-serializable materials). There is no mask that currently allows for single use, but using a disposable tip—like an ear tip, for instance—is an alternative. For the sake of analgesia and anxiety reduction during oral surgery operations, this review's goal was to outline the benefits and drawbacks of this novel technology. To establish its efficacy and ongoing value to patients' well-being, more research is required. In the field of virtual reality, different anatomical parts of the body are evaluated for the purposes of diagnosis, planning, and surgical training. With the aid of semi-transparent glasses, augmented reality superimposes a genuine environment tailored to a particular patient onto the operating table. This study's objective is to present a summary of the literature on the use of virtual and augmented reality in oral and maxillofacial surgery. Virtual world the art and science of building a virtual environment that offers standardized, secure, and adaptable platforms for the evaluation of different anatomical parts of the body for examination, diagnosis, planning, and surgical training is known as "near reality." The user of this technology should be exposed to realistic, multidimensional visual stimulation in order to accomplish this goal. This enables the operator's cognitive, physical, and mental activities to be fully integrated. Therefore, a computer-generated environment that can be easily explored and interacted with by a person is referred to as virtual reality. By using a complex registration method to create an integral image that augments the virtual scene with the real one, augmented reality fuses virtual reality with a 3D real world tailored to each particular patient. Semi-transparent glass is used to overlay the integrated image on the surrounding surroundings. Virtual reality technology can be broadly divided into immersive and non-immersive categories based on the

degree of presence felt by a user. Interactivity and user interaction inside the virtual environment help to establish a sense of presence in the environment, which is one of the fundamental components of an immersive reality experience. Immersive virtual reality combines virtual reality with the extra features of the captured environment to give the user a sense of being in the scene, the ability to visualize the recorded image in, and the ability to interact using a high-tech wearable that tracks hand leaps and detects eye movements. In non-immersive virtual reality, the user interacts with a virtual environment with a mouse while experiencing computer-generated experiences on a desktop. This category includes traditional surgical simulators. Because of improvements in computing power, it is now considerably quicker and more realistic to create simulated images.

The creation of specialized software to modify the 3D recordings of the dental and oro-facial morphology is required for the idea of virtual reality. Therefore, it is crucial to emphasize the existing techniques for capturing the 3D skeletal, soft tissue, and dental features of the dent facial anatomy and be aware of both their advantages and disadvantages. To create 3D virtual models for analysis and surgery planning, various systems have been developed for gathering dental, face soft tissue, and hard tissue data. The limitations of 2D images and radiography were addressed with the aid of these techniques. Cone-beam computed tomography, structured light scanners, stereo photogrammetry, and other 3D imaging techniques have all been utilized to record dental and oro-facial features. These are necessary for virtual planning of surgical correction of dent facial abnormalities, maxillofacial reconstruction following cancer excision, and simulation of facial fractures. The 3D capture of the different tissues in the head and neck region offers a realistic teaching environment for maxillofacial procedures.