

VIRTUAL REALITY IN DENTISTRY

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ABSTRACT

The most challenging aspect of the dental care of patient is management of anxiety and pain. Application of Virtual reality (VR) technology during dental treatment improve the treatment experience by breaking the cycle of negative experiences leading to positive memories and expectations about future treatment. VR distraction during aversive experiences can improve coping with pain and reduce the perceived duration of procedures. VR technology can be successfully used in the educational health sector for student as well as patient education.

KEY WORDS: Virtual Reality, Dentistry, VR device, Dental Anxiety

INTRODUCTION:

The dentistry become mature with the application of technology. Computer based technology always remain fascinating. It has been successfully used in various field of dentistry. Virtual Reality (VR) is a most recent computer based technology which provides comfortable treatment, better experience and psychological benefit to the patients during dental treatment.

Morton Leonard Heiling was a pioneer in VR technology. His famous invention of the Sensorama machine which provided immersive, motor-sensory stereoscopic 3D visuals and sound was the reason he was considered as the father of Virtual Reality.¹ In **1968, Ivan Sutherland** at the university of Utah, with the help of his student **Bob Sproull** created the first Virtual Reality head mounted display system.¹ Since its appearance, VR has been used in different fields. In **1995,** researchers determined that an Audio-Visual system using Virtual reality can effectively relax adults during dental treatments.² VR offered a real world, inside 3D model and according to the display it creates the true virtual world in user's eyes.³

VR DEVICE:

The VR device is a human-computer interface that enables the user to interact dynamically with the computer generated environment. In contrast to the less complex Audiovisual (A/V) device, VR uses sophisticated systems, such as head-mounted, wide field of view; three dimensional head-mount displays (HMDS) and motion sensing systems that measure the user's head and hand positions. VR Headset serves as superior tool comparing to traditional distraction methods because it offers more immersive images due to the occlusive headsets that project the images right in front of the eyes of the user and, depending on the model used, block out real-world stimuli including auditory, visual or both. The VR combines the audio, visual, and kinesthetic sensory modalities. The person's attention will be more or less "drained" from the real-world depending on how immersive the presented stimuli, leaving less attention available to real-world processes, including painful stimuli. Immersion is particularly increased during VR, because the use of HMDs prevents patients from seeing what is happening in the real-world.⁴ (Figure 1)



Figure 1: VR device

VR AS A DISTRACTION TOOL TO REDUCE ANXIETY & PAIN:

Distraction is thought to help the person to cope with pain and other aversive experiences and is often combined with Relaxation or Pleasant imagery.⁵ This is considered as safe and inexpensive technique and gives rise to an effective relaxed experience in dental procedure.⁶

Conventional distraction techniques include counting the breath, listening to music or stories and watching videos. **Gardner and Licklider** introduced Auditory analgesia in dental field for the first time in **1959** and termed it as "White noise".⁷ Distraction techniques in managing anxious patient or managing pain in medical and dental settings are generally categorized into Interactive, Passive and Active distraction.⁸

Interactive distraction requires cognitive engagement with a distracting stimulus. Passive distraction can be used when person needs to remain calm and quite during the procedure. In this, the patient receives the distracting stimuli from watching television or listening to music. Active distraction works by involving the person in some activity during the procedure. In Active distraction, interactive devices like Virtual Reality (VR) eyeglasses that plays movies or video games at close proximity which blocks the peripheral vision of the person, Controlled breathing, Guided imaginary and Relaxation are used.⁸⁹

The ideal distractor requires "an optimal amount of conciousness involving multiple sensory modalities (visual, auditory, and kinesthetic) and active emotional involvement that ensures patient participation, to compete with signals from noxious stimuli.¹⁰ Recently developed advanced Audio Visual (A/V) technology meet these requirements than the traditional distraction methods mentioned earlier.

Some new techniques use only visual stimuli, but the majority apply Visual stimuli in combination with audio stimulation and distract the patient by exposing him or her to two-dimensional (2D) or three-dimensional (3D) videos. These techniques are termed as Virtual Reality (VR) audiovisual systems, A/V eyeglass systems, or simply A/V distraction.⁴

Normal A/V distraction techniques do not allow any interaction between the users and the stimuli they are exposed to, and no use is made of kinesthetic stimuli. Virtual Reality is termed as an interactive computer-based system that immerses the user in a Virtual Environment (VE) (Heim, 1998).¹¹ The most advanced distraction technique, VR makes up for this lack of interaction and kinesthetic stimulation and provide excellent experience to the patient.

VR IN DENTAL EDUCATION:

The use of virtual reality provides the advantages of augmentation of theoretical dental knowledge, proper use of dental instruments, ergonomic positioning, students self-evaluation, faster acquisition of skills and positive student perception.¹²

VR IN SIMULATION OF DENTAL OFFICE:

VR can be used to simulate dental office design to the patients to alleviate dental anxiety before commencing the treatment.

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VR IN EXPLANATION OF PROCEDURE:

Education of patient about oral anatomy and oral diseases can be given using VR technology that improves understanding of patient regarding oral health.

CONCLUSION:

VR technology can improve patient centred communication by developing healthy relationship. It could be an effectivel tool in alleviation of anxiety, pain and behaviour guidance in patient. It's a novel addition in educational health sector which is safe and economical.

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