International Journal of Health Sciences and Research
www.ijhsr.org ISSN: 2249-9571

Review Article

Virtual Reality and Pain Management

Dilek Karaman

MSc & Lecturer, Department of Health Care Services, Ahmet Erdogan Health Services Vocational School, Bulent Ecevit University, Zonguldak, Turkey.

Received: 25/10/2016 *Revised: 12/11/2016* *Accepted: 23/11/2016*

ABSTRACT

Invasive procedures, which are commonly used in diagnosis and treatment of diseases, are known as painful procedures. Cognitive behavioral implementations in pain management are used as nonpharmacological method. In the recent years, developed virtual reality, thanks to the advancement of computer technology, falls into many different methods which are used in these implementations. Virtual reality makes people to feel that they are in a different environment by using human machine interfaces. Patients give their attentions to the environment that they see and process of pain signal operations slows down and pain perceived less. In this essay, activity of virtual reality on pain in invasive procedures will be examined.

Keywords: Invasive Procedure, Pain, Virtual Reality, 3D.

INTRODUCTION

In every term of the history, confronted pain by humanity, is a subjective and complicated subject that develops with individual-specific experiences. Pain which is felt by everyone without looking age, gender or economical status, can be defined as unwanted experience that leaves inadequacy effect and persistent feelings on individuals. [1-3]

Another definition, which is accepted universally, was done by Taxonomy Committee of International Association for the Study of Pain which was founded in 1974 and still continues its studies. According to the committee, "Pain; is a sensory and emotional experience that resulted from a specific part of a body or related with potential tissue damage or not and also related with past experiences of individual." [4]

In order to emphasize the clinic importance of the evaluation of pain, American Pain Society (APS) was published "pain as 5. Vital finding" statement, in 1996. Purpose was the draw attention to the evaluation of pain by giving importance likewise other four vital findings. [5-7]

Pain, has been seen since the start of the history of mankind, despite the significant improvements in the contemporary health sciences, can still be seen and is still one of the major reasons that patients require medical assistance. Millions of patients from all around the globe, appeals to the medical facilities with a pain issue. Unfortunately, necessary precautions are ineffective and pain of the most of the patients cannot be dealt with. It is also known that, life quality of these patients decline due to the pain, hospitalization period extends and death ratios increase. [8]

In the literature, it is stated that invasive procedures that implemented by health professionals cause pain. [9-14] Efficient pain management is a human right and priority of the care. [15] Nurses who are member of occupation that plan and manage

the care, take efficient role in the diagnosis of pain, control of pain by using pharmacological and nonpharmacological methods and evaluation of results, because they are with the patient more than any other health professionals. [16]

In the invasive procedures which are implemented in health care environments, from past to today, many various non pharmacological methods and techniques that oriented at pain management, were tried. [13,17-19] In the recent years, virtual reality that developed as a result of advancement in computer technology, is used for cognitive-behavioral method in pain management.

Purpose

In this review paper, purpose; is examine the activity of virtual reality application on pain in invasive procedures.

MATERIALS AND METHODS

The studies in English published until September 2016 in Medline database were found with "virtual reality", "pain", "invasive procedure", "3D" and "nonpharmacological methods" keywords and reviewed.

Virtual Reality (VR) Application

Virtual reality (VR) application, is a concept that formed by oxymoronic virtual and reality words. According to Turkish Language Institution, virtual means imaginary, not real meaning, takes its origin from Latin word "virtualis". On the other hand, reality is defined as the real one, all of the existed things, truth. [20]

Virtual reality that appeared as a concept in 1950s, is started to use in application areas in 1900s. [20] As term, it was first used by Jaron Lamier in 1989. In those times, these systems generally were carried out with computer systems that have ability of real time animation and controlled with chief fixed device and position follower. [21]

Virtual Reality was used for space and military researches as computer-based, high-cost technology for many years, and in the recent era, with the different applications which are developed for mobile devices, its usage in medicine, education, entertainment, librarianship, museology, architecture and industrial designs areas became widespread. [20,22]

Today, three dimensional VR has been make android based smart devices which easy to reach and common. In the system, display is obtained by using a simple combination of framed optic lenses which holds patient's point of view perpendicular to the direction as holding a phone at a fixed distance. [23] Three dimensional animation devices system of work based on stereographic view features. After the installation of related applications to smart phone, device divides the screen into two. With the help of acquisition of different images for right and left eye, reflection of the spatial existence of a three-dimensional animated object is obtained. [24]

VR is a simulation model that gives reality feeling to its participants, computer based created, and gives opportunity to mutual communication. The most main feature of the VR which separates it from other similar applications, it gives individuals a reality feeling. [25]

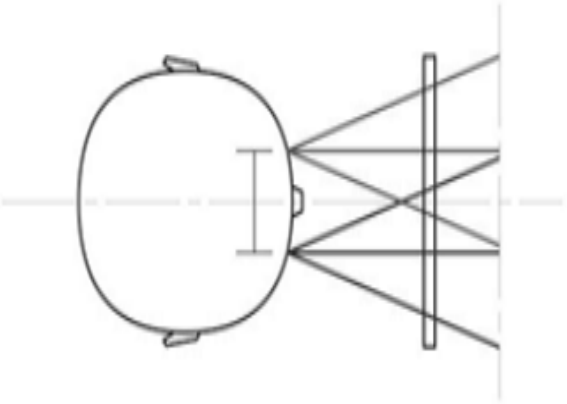

Figure 1. Three-dimensional imaging scheme in virtual reality *(*Reference: *Buchwald P, Rostanski M, Maczka K. Virtual reality and mobile devices in 3d objects designing and prototyping. Available at: http://www.ptzp.org.pl/files/konferencje/kzz/artyk_pdf_2015/T2/t2_0645.pdf. 2016).*

Virtual Reality Application in the Pain Management of Invasive Procedures

VR which is a type of computer system that uses human-machine interface, is used in many different application which

known as medical procedure, for pain management in the recent years.

According to the hypothesizes of researchers, VR works as a nonpharmacological method on complicated pain modulation system of body by using cognitive and attention processes. Despite of lack of explanation about neurobiological mechanisms, researches interestingly state that positive results are obtained in the management of pain. [26]

When the patients feel that they are in the visual, they get away from the pain efficiently. Therefore, pain attention lowers. [27]

In the recent years, as a distraction application for pain, VR is commonly used in medical care for dulling the pain. In the applications such as burn debridement, injection applications, wound care, dental pain, endoscopic treatment, and chronic phantom pain, chemotherapy applications, studies that show the activity of VR in pain management are existed. [26-29]

Biermeir et al (2007) were stated low pain point in the group which was image watched during venous access. [30] In the study of Oyama et al (1999), they stated that VR application in chemotherapy infusion lowered the pain significantly. [31]

In the randomized controlled study which was conducted by Wint et al (2002), they explained that during the lumbar puncture process in cancer diagnosed patients, patients who used virtual reality glasses, stated low pain point but there were no statistically meaning. [32]

Gold et al. (2005) examined 100 children (age 8-12 years) receiving routine outpatient blood draw and reported a lower frequency of moderate to severe levels of pain intensity compared with children in the other three conditions. [33]

CONCLUSION

Today, VR is used in painful medical procedures because it's easy to reach smart phone technology, low cost and movable features. In the conducted studies, virtual reality activity in the pain management which occurs in invasive procedures, was proved. However, in the literature there are limited number of studies exist, therefore more studies are needed.

REFERENCES

1. Quinlan-colwell A. D'arcy Y. Compact Clinical Guide To Geriatric Pain. Management. Springer Publishing Company; 2012
2. Marmo L, Arcy Y. Compact Clinical Guide To Critical Care, Trauma and Emergency Pain Management. Springer Publishing Company. 2013;3-146
3. Aslan EF. Ağrı değerlendirme yöntemleri. Cumhuriyet Üniversitesi Hemşirelik Yüksekokulu Dergisi. 2002; 6(1):9-16.
4. http://www.iasppain.org/Taxonomy#Pain.International Association for the Study of Pain. Access Date; March 2016
5. American Pain Society. Pain: Current Understanding of Assessment, Management and Treatments report. Section II: Assessment of Pain; 1996
6. Sevinir BB. Çocuklarda kanser ve ağrı. Güncel Pediatri.2004; 2: 103-108
7. Xiao H, Liu H, Jin L, Song L, Yin Y.Pain prevalence is higher than the four traditional vital signs: investigation in a China teaching hospital: 14AP4-4. European Journal of Anaesthesiology. 2014; 31:224.
8. Aslan FE, Badır A. Ağrı Kontrol Gerçeği: Hemşirelerin Ağrının Doğası, Değerlendirilmesi ve Geçirilmesine İlişkin Bilgi ve İnançları. Ağrı. 2005; 17: 44-51.
9. Tee FY, Low CSL, Matizha P. Patient Perceptions and Experience of Pain, Anxiety and Comfort during Peripheral Intravenous Cannulation in Medical Wards: Topical Anaesthesia, Effective Communication, and Empowerment. International Journal of Nursing Science. 2015; 5:41-46.
10. Kara D. İntramüsküler enjeksiyona bağlı gelişen ağrının azaltılmasına yönelik yöntemler. Gümüşhane Üniversitesi Sağlık Bilimleri Dergisi. 2013;2(1):169-182.
11. Sinha PK, Tandon AA, Singh SD. Evaluating the efficacy of valsalva manuever on venous cannulation pain: A prospective randomized study. Anaesthesia and Analgesi. 2005; 101:1230–1232.
12. Newton M, Newton D.W, Fudin J. Reviewing the "big three" injection routes. Nursing. 1992; 22(2):34-42.
13. Whelan HM, Kunselman AR, Thomas NJ, Moore J, Tamburro RF. The Impact of a Locally Applied Vibrating Device on Outpatient Venipuncture in Children.

Clinical Pediatrics. 2014; 1-7. doi: 10.1177/0009922814538494.
14. Soo AE, Shelby RA, Miller LS, Balmadrid MH, Johnson KS, Wren AA et al. Predictors of pain experienced by women during percutaneous imaging-guided breast biopsies. Journal of the American College of Radiology. 2014; 11(7):709-716.
15. American Pain Society 2011 Annual Report. http://americanpainsociety.org/uploads/about/2011-annual-report.pdf. Access Date: October 2016.
16. Valdovinos NC, Reddin C, Bernard C, Shafer B, Tanabe P. The use of topical anesthesia during intravenous catheter insertion in adults: a comparison of pain scores using LMX-4 versus placebo. Journal of Emergency Nursing. 2009; 35:299-304.
17. Çelik N, Khorshid L. The use of ShotBlocker for reducing the pain and anxiety associated with intramuscular injection: a randomized, placebo controlled study. Holist Nurs Pract. 2015; 29:261-271.
18. Mohammadi SS, Pajand AG, Shoeibi G. Efficacy of the valsalva maneuver on needle projection pain and hemodynamic responses during spinal puncture. International Journal of Medical Sciences. 2011;8(2):156-160.
19. Yilmaz DK, Dikmen Y, Köktürk F, Dedeoğlu Y. The effect of air-lock technique on pain at the site of intramuscular injection. Saudi Med J. 2016; 37(3):304-308.
20. Sürücü O, Başar M.E. Kültürel mirası korumada bir farkındalık aracı olarak sanal gerçeklik. Artium. 2016; 4(1):13-26.
21. Chirico A, Lucidi F, Laurentıis M, Milanese C, Napoli A, Giardona A. Virtual reality in health system: beyond entertainment. a mini-review on the efficacy of vr during cancer treatment. Journal of Cellular Physiology. 2016; 231:275-287.
22. Demirer V, Erbaş Ç. Mobil artırılmış gerçeklik uygulamalarının incelenmesi ve eğitimsel açıdan değerlendirilmesi. Mersin Üniversitesi Eğitim Fakültesi Dergisi.2015; 11(3):802-813.
23. Schroeder D, Korsakov F, Jolton J, Keefe JF, Haley A, Keefe FD. Creating widely accessible spatial interfaces mobile vr for managing persistent pain. IEEE Computer Graphics and Applications. 2013; 3:82-89.
24. Buchwald P, Rostanski M, Maczka K. Virtual reality and mobile devices in 3d objects designing and prototyping. Available at: http://www.ptzp.org.pl/files/konferencje/kzz/artyk_pdf_2015/T2/t2_0645.pdf. 2016.
25. Bayraktar E, Kaleli F. Sanal gerçeklik uygulama alanları. Akademik Bilişim. 2007; 2:1-6.
26. Li A, Montano Z, Chen VJ, Gold JI. Virtual reality and pain management: current trends and future directions. Pain Management. 2011; 1(2):147-157.
27. Hoffman HG, Patterson DR, Carrougher CJ. Use of virtual reality for adjunctive treatment of adult burn pain during physical therapy. Clin Journal Pain. 2000; 16:244-250.
28. Guo C, Denk H, Yang J. Effect of virtual realty distraction on pain with hand injury undergoing dressing change. Journal of Clinical Nursing. 2014; 24:115–120.
29. Wiederhold B, Gao K, Kong L, Wiederhold D. Mobile devices as adjunctive pain management tools. Cyberpsychology, Behavıor, And Socıal Networkıng. 2014; 17(6):385-389.
30. Biermeier A, Sjoberg I, Dale CK, Eshelman D, Guzzetta E. Effects of distraction on pain, fear, and distress during venous port access and venipuncture in children and adolescents with cancer. Journal of Pediatric Oncology Nursing. 2007; 24(1):8-19.
31. Oyama H, Ohsuga M, Tatsuno Y, Katsumata N. Evaluation of the psycho-oncological effectiveness of the bedside wellness system. Cyberpsychol Behavior. 1999; 2:81-84.
32. Wint S.S, Eshelman D, Steele J, Guzzetta EC. Effect of discraction using virtual reality glasses during lumbar punctures in adolescents with cancer. Oncology Nursing Forum.2002;29(1):8-15.
33. Gold J, Reger G, Rizzo A, Buckwalter G, Kim S, Joseph M. Virtual reality in outpatient phlebotomy: evaluating pediatric pain distraction during blood draw. The Journal of Pain. 2005;6(3):57-63.

How to cite this article: Karaman D. Virtual reality and pain management. Int J Health Sci Res. 2016; 6(12):288-291.

****