

VR Intervention Therapy for Emotion Related Cancer Chemotherapy Side Effects

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Abstract

Background: Anticipatory nausea and vomiting are common complications of cancer chemotherapy treatment. They are classically conditioned responses through the learning process. Anti-emetic drugs do not work; currently there is no effective medication to treat these symptoms. We have applied virtual reality intervention therapy for the treatment of anticipatory nausea and vomiting. **Method:** Phase II study was performed to determine response rates of HMD-style VR system intervention therapy to anticipatory nausea and vomiting. **Result:** 10 cancer patients who receive chemotherapy treatment at the outpatient clinic were studied. Eighty percent of these participants reported the decrease in the level of nausea and the number of vomiting. **Conclusion:** The VR intervention therapy has the potential to treat patients suffering from anticipatory nausea and vomiting.

Key words:

VR intervention therapy, Psychotherapy, Cancer, Chemotherapy side effect, HMD

1. Introduction

Approximately 10 to 20% of the cancer patients develop the anticipatory nausea and vomiting while receiving chemotherapy treatment[1]. Anticipatory nausea and vomiting occur prior to or during chemotherapy administration. Unfortunately, there are no effective drugs available to combat these symptoms[2]. Anticipatory nausea and vomiting are closely related to the psychological state of a patient, anxiety level for instance. [1,3]. Therefore, a psychological approach would be more appropriate. Patients have long been saying that thinking about their

treatment induces anxiety and sickness. Since these symptoms are said to be classically conditioned responses, behavioral intervention therapies such as relaxation, guided imagery, systematic desensitization, progressive muscle relaxation, biofeedback, or distraction, have been used for anticipatory nausea and vomiting patients [3,4,5,6,8]. However, these techniques need conscious and continuous concentration, which can be hard for the patients[7].

Virtual Reality technology has been applied to the area of mental health as an intervention therapy, and has already proven effective in treating patients with anxiety disorders, phobias, eating disorders and Post Traumatic Stress Disorder[9,10,11,12,13,14]. We conducted the research with our original virtual reality system, called Virtual Forest Walk System: Bedside Wellness System (BSW), to support the mental health of the cancer patients[15]. Results of the previous studies using the BSW showed effectiveness of the system in supporting hospitalized cancer patients mentally[16,17]. Sessions with BSW helped patients to relax, and as a result, they reported a decrease in their cancer pain and an increase in positive feelings. The research shows that VR intervention therapy(VRIT) is also effective in reducing symptom distress in children receiving cancer chemotherapy treatment[7].

Patients claim that neither listening to music nor reading books is strong enough stimuli to distract them from the chemotherapy-related negative feelings. Based on our previous experiences, we hypothesized that VRIT can provide interesting stimulus that can distract patients from negative thoughts and feelings; therefore, reducing the symptoms of anticipatory nausea and vomiting.

2. Method

2.1 System Configuration

We used the Virtual I-glasses Personal Display System

(HMD) from Virtual I.O. inc., connected with RCA jacks to a Sony GV-UX7 NYSC video cassette recorder. There are twelve movie titles which are currently on the market. The contents of which range from comedy and action, to BGV (Back Ground Video).

2.2 Study Design

Phase II study was conducted to find out if the VR intervention therapy can reduce anticipatory nausea and vomiting.

2.3 Patient Characteristics

Ten cancer patients with severe symptoms of nausea and vomiting were selected. Inclusion criteria was: male or female cancer patients who 1)receive chemotherapy treatment outpatient, 2)display symptoms of anticipatory nausea and vomiting, 3)are between the ages of 16 and 70, and 4)have no history of psychological problems.

2.4 Observation and Interview

Oral interviews were taken before and after the treatment. The main aim was to determine the change in levels of anxiety and nausea. During treatment, the experimenter observed the patient to see how he/she reacted to the therapy. After the treatment, questions were asked with regard to the patient's feelings and physical condition. In addition, an evaluation of the VR system and requests for the contents were inquired.

2.5 Procedure

One session lasted about two hours, depending on the length of the infusion. When patients arrived at the outpatient clinic, they entered a private infusion booth, which is unique to our hospital. [Figure1,2,&3] Questions regarding to the emesis are asked orally. Psychological and physical conditions are also investigated at that time. Each patient choose their preferred movie and turn on the system before infusion began. The movie continued to played throughout the chemotherapy treatment. Infusion was done using a pump incorporates an alarm to tell patients or nurses when the bottle becomes empty. The experimenter observed the frequency of vomiting, and how the patient reacted to chemotherapy with VR. When the treatment was finished, another interview was performed to determine the change in nausea levels, and to evaluate the VR system. Patients were entitled to receive VR intervention therapy as many times as they wished.

3. Result

Ten patients received VR intervention therapy. Six of them returned to receive chemotherapy with the VR. Two of them has already completed their chemotherapy treatment. Nausea and vomiting during chemotherapy improved for all patients. In particular, the frequency of

vomiting during the sessions decreased significantly. The majority of patients also reported lower anxiety levels as they focused their attention on the movie.

3.1 Case Report

Introducing the two patients who benefited most from the VR intervention therapy.

3.1.2 Seventeen year-old female patient

A seventeen year-old female with Hodgkin's disease, who receives chemotherapy treatment consisting of Doxorubicin, Bleomycin, and Vinblastine, every two weeks. This patient has been suffering from severe anxiety, nausea, and vomiting. She usually starts feeling sick when she gets to the hospital. Sometimes, she cannot go into the injection booth due to severe fear.

Her blood vessels are damaged from repeated treatment, it takes some time to insert the needle, causing her tremendous pain. This patient vomits when the needle touches her skin. Her emesis is induced and worsened by severe anxiety and tension. She continues to vomit during the treatment.

VR intervention therapy was given at her seventh chemotherapy session. Injection seemed less painful compared to previous sessions. She was very calm during treatment. The frequency of vomiting decreased significantly. Anxiety and tension level were also lowered.

At the second VR intervention therapy session, her anxiety level was low from the outset. The VR was started as soon as she arrived at the center, and the infusion began without any hesitation from her. The frequency of vomiting, and levels of anxiety and nausea were clearly lower than during the first VRIT session.

3.2 Fifty-five year-old with breast cancer

This patient had already received eight chemotherapy sessions consisting of Methotrexate and Fuoravil(5FU). Her nausea begins day before treatment and reaches its peak around the end of the treatment. She has tried reading books and listening to the music, but this was not effective. Her nausea get worse, and she becomes anxious when she enters the booth.

During the post session interview, she reported that if she had given the chance to use the VR system from the beginning of the chemotherapy course, she would have not developed the anticipatory nausea and vomiting. The VR system provided her with an interesting stimulus, so she did not think about the treatment at all.

Before infusion at the second VR session, her anxiety level was much lower than during her usual chemotherapy sessions, as she knew that she would receive the VR session. She cognitively linked the pleasant images provided by the VR to the chemotherapy treatment, resulting in a drop in anxiety level, and reduction in nausea and frequency of vomiting.

4. Discussion

Our findings indicate the effectiveness of the VRIT during the chemotherapy treatment. The reason for choosing the HMD style was to achieve increased immersiveness; an essential factor in successful intervention therapy, based on our past studies. Use of VR with HMD successfully distracted patients from outside stimuli, and negative feelings and thoughts. HMD was able to create a highly immersive VR world for the patient.

The results of the interviews indicate the importance of movie content. The movies themselves were interesting enough stimuli to alter the patient's cognitive state. The majority of patients chose a comedy or action movie because of the storyline, and very few chose BGV. It is generally easier for patients to concentrate without much effort on comedy or action.

Unlike other behavior treatment techniques, VRIT require less effort from patients to concentrate on altering their cognitive states. For example, systematic desensitization or progressive muscle relaxation require some practice, and someone to assist the patient[18,19]. Similarly, hypnosis is not suitable for everyone. People with low hypnotisability will have a hard time being hypnotized. The VRIT does not require training or any special skills on the part of the patient. Now we know that both HMD-style VR and movie content together can create a high level of immersion; the strongest distraction intervention technique we can offer.

The key to successful VR intervention therapy is the level of immersion VR technology can provide. One way to increase the immersiveness is to necessitate the active participation by users. From our previous experiment using the BSW indicated that interaction between users and the system is strongly needed for the users to feel they are immersed. Our present system provide only the passive participation of the patients. Software application which requires the active participation of the users should be developed.

Because patients with anticipatory emesis are desperate for help, there have not been any complains about the quality of the hardware, even after long hours use. However, to ease the burden of the patients, higher quality of the resolution, lighter weight HMD is preferable.

Finally, VRIT should be prescribed treatment just like the other medication. Software application should be prescribed VR medication which is personalized depend on the diagnosis of the patient. The way to personalize the contents of the VR to meet the needs of individual patient should be considered.

5. Conclusion

In conclusion, the use of VRIT can be a powerful and effective treatment for patients with anticipatory nausea and vomiting. Moreover, this therapeutic tool could

prevent anticipatory nausea and vomiting even before its development. There is urgent need for further research to confirm the efficacy of this treatment. We now have the protocol to test our hypothesis and the efficacy of the VR system.

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Figure 2. Patient in the infusion booth



Figure 3. Patient receiving infusion with I-glasses



Figure 1. Infusion Booth at outpatient center