Virtual Reality Intervention for Chemotherapy Symptoms

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This study was funded by the Oncology Nursing Foundation through an unrestricted grant from Ortho Biotech Products, L.P. and Duke University Medical Center

Purpose

The aim of this study is to explore the use of virtual reality as a distraction intervention to relieve symptom distress in 123 adults receiving chemotherapy treatments for cancer.
Problem Statement

- Treatments for cancer are intensive and difficult to endure
- Chances of survival are enhanced if patients receive all of the recommended chemotherapy treatments
- Distraction interventions provide effective relief for a variety of symptoms
- By decreasing chemotherapy related symptom distress, virtual reality has the potential to increase compliance with treatments, impact survival, and enhance quality of life

Review of Literature: Virtual Reality

- “Experience of presence in an environment by means of a communication medium”
- Most literature to date describes applications for surgery, physical therapy, education, or anxiety disorders
- Lack of consistent information regarding “Cybersickness” or side effects
- One of the first researchers nationally to explore the recreational or distraction qualities of virtual reality as a possible therapeutic intervention
Organizing Framework

Stress and Coping Model
Lazarus and Folkman (1984)
- Stress
- Appraisal
- Coping
  - Problem-focused coping
  - Emotion-focused coping
Research Questions

1) Is virtual reality an effective distraction intervention for reducing chemotherapy-related symptom distress levels in individuals with cancer?

2) Does virtual reality have a lasting effect?

Study Variables

- Explanatory Variable: Virtual Reality
- Response Variable: Symptom Distress
  (General symptom distress, fatigue & anxiety)
Background Studies

**Symptom Distress Scale: Immediately Following Chemotherapy**

![Symptom Distress Scale Chart]

**Qualitative Evaluation of Virtual Reality Intervention**

**Evaluation of Overall Experience**
- 82% indicated that this treatment was better than previous treatments
- No subjects indicated that the virtual reality experience made them feel worse
- 100% liked the virtual reality intervention
- 100% indicated that they would like to use the virtual reality again during another chemotherapy treatment
Using Virtual Reality to Help Women Cope with Breast Cancer Treatment

**Purpose**
- To determine if using virtual reality makes chemotherapy more tolerable for younger women with breast cancer

**Design**

<table>
<thead>
<tr>
<th>Chemo 1</th>
<th>Chemo 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre</td>
<td>Pre</td>
</tr>
<tr>
<td>Post</td>
<td>Post</td>
</tr>
<tr>
<td>48hr</td>
<td>48hr</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

- **O₁**: Demographic Data, SDS, SA, & Piper Fatigue Scale
- **O₂-O₆**: SDS, SA, & Piper Fatigue Scale
- **X**: Virtual Reality Distraction Intervention
- **O₂ or O₅**: Evaluation of Intervention Questionnaire
Demographics of Sample (n=20)

- Age 27-55 M = 42.6 SD=7.9
- Stage 1-3 M = 2
- Diagnosis
  - Adenocarcinoma 15 (75%)
  - Ductal Carcinoma insitu 3 (15%)
  - Metastatic 1 (5%)
- Ethnic Identification
  - Caucasian 16 (80%)
  - African American 3 (15%)
  - Other 1 (5%)

88% participation rate
### Data Analysis: Research Question 1

**Paired T-test Immediately Following Chemotherapy**

<table>
<thead>
<tr>
<th>Instrument</th>
<th>t</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptom Distress Scale</td>
<td>-1.36</td>
<td>.095*</td>
</tr>
<tr>
<td>Piper Fatigue</td>
<td>-1.82</td>
<td>.04*</td>
</tr>
<tr>
<td>State Anxiety</td>
<td>-.77</td>
<td>.23</td>
</tr>
</tbody>
</table>

*p < .10

### Data Analysis: Research Question 2

**Paired t-test 48 hours Following Chemotherapy**

<table>
<thead>
<tr>
<th>Instrument</th>
<th>t</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptom Distress Scale</td>
<td>-.90</td>
<td>.19</td>
</tr>
<tr>
<td>Piper Fatigue</td>
<td>-.466</td>
<td>.32</td>
</tr>
<tr>
<td>State Anxiety</td>
<td>-.71</td>
<td>.24</td>
</tr>
</tbody>
</table>
Effect Size

- Symptom Distress: 0.30
- Fatigue: 0.41
- Anxiety: 0.17

Perception of Time

- Actual: 70
- Perceived: 40

- t = 3.69  p < .001
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Sample

- Convenience  N=120-144
- Inclusion Criteria
  - Diagnosis of breast, colon or lung cancer
  - first diagnosis of cancer
  - age 18 years or older
  - treatment regimen that includes at least two matched cycles of intravenous chemotherapy
  - Both treatments at DCCC
  - Not receiving concurrent radiation therapy
  - ability to read and write English
  - No clinical evidence of primary or metastatic disease to the brain
  - No history of seizures
  - No history of motion sickness
  - Able to give informed consent.

Demographics of Sample
(n=123)

- Age: 32-78 (m = 53.97   SD=10.89)
- Diagnosis:
  - Breast 64 (52%)
  - Colon 19 (15.5%)
  - Lung 40 (32.5%)
- Gender:
  - Female: 77%
  - Male: 23%
- Race:
  - White 91%
  - Other: 9%
- Participation Rate: 64%
VR INTERVENTION

- Participants chose from four CD-ROM based scenarios;
  - Oceans Below ®
  - A World of Art ®
  - Titanic: Adventure Out of Time ®
  - Timelapse PC CD Game ®
- Subjects used the Virtual Reality for an average of 58 minutes (range 15-202 minutes SD 31.97)
- Participants wore i-glasses® SGVA head mounted display during their intravenous chemotherapy treatment.
**Design**

Chemo 1 Chemo 2
Pre Post 48hr Pre Post 48hr

Group 1 X
Group 2 X

O₁ O₂ O₃ O₄ O₅ O₆
O₁ Demographic Data, ASDS, SA, & Piper Fatigue Scale
O₂-O₆ ASDS, SA, & Piper Fatigue Scale
X Virtual Reality Distraction Intervention
O₂ or O₃ Evaluation of Intervention Questionnaire

**Instruments**

- Adapted Symptom Distress Scale
  (Rhodes et al., 2000)
- State-Trait Anxiety Inventory for Adults
  (Speilberger, 1983)
- The Revised Piper Fatigue Scale
  (Piper et al., 1988)
- Presence Questionnaire (PQ)
  (Witmer & Singer, 1998)
- The Immersive Tendency Questionnaire (IQT)
  (Witmer & Singer, 1998)
Data Analysis

♦ Descriptive Statistics
♦ Inferential Statistics
  ♦ sequence group equivalency
  ♦ VR-Control group differences

Results

Significance Tests: intervention vs control

• No Significant Differences any of the outcomes (Symptom Distress Scale, State Anxiety, or Piper Fatigue Scale) between the control condition and VR condition immediately following and 48 hours following chemotherapy.

• An cross over effect was noted in that individuals who received the VR intervention during the first chemotherapy treatment had significantly (p<.01) less anxiety immediately following chemotherapy as compared with the second treatment.
Perception of Time

Actual  |  Perceived

Actual: 60
Perceived: 50

$t = 4.722 \quad p < .0001$

Evaluation of Virtual Reality Intervention

Overall Experience
- 100% indicated that this treatment was better than the previous treatments
- No subjects indicated that the virtual reality experience made them feel worse
- 86% liked the virtual reality intervention
- 82% indicated that they would like to use the virtual reality again
Secondary Analysis

- Correlations between Symptom measures immediately following chemotherapy and score on Presence Questionnaire (Witmer & Singer, 1998)
  - State Anxiety  - .308**
  - Fatigue  - .296**
  - Symptom Distress  - .141

Correlation is significant at  $p < .01$
## Effect of VR on Symptoms following Chemotherapy

<table>
<thead>
<tr>
<th></th>
<th>Kids 10-17</th>
<th>Women 26-55</th>
<th>Women &gt;50</th>
<th>Adults M/F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample size</td>
<td>N=11</td>
<td>N=20</td>
<td>N=16</td>
<td>N=123</td>
</tr>
<tr>
<td>Symptom Distress</td>
<td>.06*</td>
<td>.095*</td>
<td>.63</td>
<td>.43</td>
</tr>
<tr>
<td>Anxiety</td>
<td>.11</td>
<td>.23</td>
<td>.10*</td>
<td>.14 (.01)**</td>
</tr>
<tr>
<td>Fatigue</td>
<td>------</td>
<td>.04*</td>
<td>.91</td>
<td>.52</td>
</tr>
<tr>
<td>Altered time</td>
<td>------</td>
<td>.001*</td>
<td>.001*</td>
<td>.001*</td>
</tr>
<tr>
<td>perception</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Significant outcomes  
+ Subjects who used VR during first chemotherapy treatment

## Evaluation of VR Intervention

<table>
<thead>
<tr>
<th></th>
<th>Kids 10-17</th>
<th>Women 27-55</th>
<th>Women &gt;55</th>
<th>Adults M/F</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample size</td>
<td>N=11</td>
<td>N=20</td>
<td>N=16</td>
<td>N=123</td>
<td>N=170</td>
</tr>
<tr>
<td>Better than previous Chemotherapy treatment</td>
<td>82%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>99%</td>
</tr>
<tr>
<td>Made me feel worse</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Liked using the VR</td>
<td>100%</td>
<td>95%</td>
<td>100%</td>
<td>86%</td>
<td>89%</td>
</tr>
<tr>
<td>Would use VR again during chemotherapy</td>
<td>100%</td>
<td>95%</td>
<td>100%</td>
<td>82%</td>
<td>86%</td>
</tr>
</tbody>
</table>
Results and Recommendations for Clinical Practice

- Results of these studies support the use of virtual reality with older children and adults receiving chemotherapy
- The virtual reality intervention was well received
- The virtual reality intervention did not require practice to be effective
- In some cases, symptom distress, fatigue, and anxiety levels improved when using the intervention
- Use of virtual reality significantly altered time perception
- Monitor patients using the virtual reality and discontinue if any untoward reactions (headache)
- In all studies, measures of symptom distress demonstrated that this population did not experience any signs of cybersickness

Recommendations for Research and Future Plans

- Explore the effect of repeated use of the VR distraction intervention
- Test intervention with different samples and different response variables
- Compare virtual reality to other distractors
- Explore how coping style or immersive tendency effects the use of distraction interventions
- Examine how age or gender influence outcomes following use of VR.