Use of Virtual World Technology for Health Behavior Change

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Health Behavior Change and Virtual Technology

VALUE

• Able to modify “time”
• Able to interact in real time
• User can access the community or health care professional from anywhere regardless of ability or resources beyond a computer and internet access.
• Can experience virtual (vicarious) effects of behaviors on future health without actual increased risk to health
• Can participate in support communities
• Allows for anonymity and interactivity
Overview of Research


Used immersive virtual environment to virtually simulate sugar sweetened beverage (SSB) consumption and weight gain. Outcome measure was actual SSB consumption and intention to consume comparing tailored vs untailored messaging. Results indicated that using IVEs to depict the negative future consequences of SSB consumption was effective in reducing soft drink consumption 1 week following experimental treatments but no immediate effects of the IVE on intention to consume SSB’s.


Explored the Use of Second Life, IMVU, there.com, & Kaneva for social support. 162 different groups. Found they were particularly valuable for “niche communities” (rare health conditions or unique approaches to conditions).
Research overview cont’d


Examined the role of self-presence in SL on offline health, appearance, and well-being (N=279). Results showed that virtual world users who reported higher levels of self-presence were more likely to report that they had begun exercising and dieting because of their experiences with their avatar.

4. Johnston, JD, Massey, AP, DeVaneaux, CA. (2012) Innovation in weight loss programs: A 3-dimensional virtual-world approach. Explored the effectiveness of a 12 wk SL weight loss program relative to weight loss and behavior change. (N=54, overweight) Face to Face vs. SL groups. Weight, BMI, health behaviors (ie,self-efficacy, physical activity, fruit and vegetable consumption). Both groups had significant weight loss. No difference between groups. Significant improvements across all of the variables for the virtual-world group.
What is Second Life?

http://www.secondlife.com
Online virtual world (Developed in 2003)

Inhabited by millions of residents from around the world with an estimated 1 million regular monthly users.

Web 2.0 social networking technology

- Simultaneously shared space
- Fosters real time social interaction
- Gives users a sense of presence
- Self representation through the creation and use of 3-D Avatars
Communication in SL

**Multiple** Mechanisms

Text and Voice **Chat** (recorded text logs)

**Streaming** Audio and Video

Virtual libraries

Live **events**: concerts, lectures, classes

**Note cards & Objects**
Health in Second Life

Health Info Island

NLM

CDC
Created and funded by the National Library of Medicine

- Resources (Consumer library)
- Support (Path of support = approx. 120 groups)
- Research
- Virtual ability island
http://maps.secondlife.com/secondlife/Healthinfo%20Island/128/127/24
Using On-line Virtual Worlds to Encourage Healthy Lifestyle Choices Among College Students

• Purpose
  • To examine the use of Second Life for the delivery of health communication messages designed to encourage individuals to make healthy lifestyle choices regarding physical activity and nutrition.

• Primary outcomes
  • Usability
  • Participant satisfaction
  • Change in health behavior theory constructs (stage of change, motivation, self-efficacy, intention)

• Secondary outcomes
  • Body image and body ratings of self and avatar

Methodology

• 40 University students recruited through classes and flyers. No prior SL experience.

• Participants attended an orientation session where they created their Avatar and completed a pre-test assessment.

• They then attended a brief (15 min) health education intervention in Second Life.

• Participants completed a post-test survey and were asked to attend a focus group to discuss the experience (conducted in real world and SL).
Intervention Space

- Open air amphitheater
- Owned by NMC (New Media Consortium)
- Common area on Education Island
- Lecturer: Health Educator Avatar, “Ms. Howlett”
- Communication:
  - ‘Chat’ feature: type with text appearing on screen

http://maps.secondlife.com/secondlife/Teaching%206/149/161/21
Intervention

• Lecture: 15 minutes
  • Covered physical activity and nutrition
    • Recommendations and guidelines
    • Tips
    • Approximately 10 min Q & A & Discussion

• Interactive signs: allowed for a closer look

• Note cards: to keep sign information in avatar’s inventory
The Health Educator: Ms. Howlett
EMU Stage and Signs
Intervention Session
Focus Group Interviews
Results
Sample Demographic Characteristics

N=40
Gender
- Male 37.5% (n=15)
- Female 62.5% (n=25)
Race
- African-American 32.5% (n=13)
- Caucasian 57.5% (n=23)
Age
- X = 22.2 yrs, SD = 2.9
- Range 18-31 yrs
I thought about the health information I received regarding nutrition as it applies to my real life eating habits. (strongly disagree – strongly agree)
Results

- Application of information to real life – Physical Activity

<table>
<thead>
<tr>
<th>Physical Activity</th>
<th>Female N (%)</th>
<th>Male N (%)</th>
<th>Total N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Somewhat disagree</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Disagree</td>
<td>4 (16.0)</td>
<td>0 (0.0)</td>
<td>4 (10.0)</td>
</tr>
<tr>
<td>Somewhat agree</td>
<td>12 (48.0)</td>
<td>11 (73.3)</td>
<td>23 (57.5)</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>9 (36.0)</td>
<td>4 (26.7)</td>
<td>13 (32.5)</td>
</tr>
</tbody>
</table>

I thought about the health information I received regarding physical activity as it applies to my real life activity habits. (strongly disagree-strongly agree)
## Results

- **Self-Efficacy Dietary Behaviors**

  “As a result of the SL program, how confident do you feel that you can…”

<table>
<thead>
<tr>
<th>Item (moderate to completely confident)</th>
<th>Pretest n (%)</th>
<th>Post-test n (%)</th>
<th>Δ in %</th>
<th>P-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Find appropriate online resources.</td>
<td>28 (70.0)</td>
<td>32 (82.1)</td>
<td>+12.1</td>
<td>0.060</td>
</tr>
<tr>
<td>Prepare a healthy meal.</td>
<td>25 (62.5)</td>
<td>27 (69.2)</td>
<td>+6.7</td>
<td>0.000</td>
</tr>
<tr>
<td>Choose healthy foods when eating out.</td>
<td>26 (65.0)</td>
<td>24 (63.2)</td>
<td>-1.8</td>
<td>0.199</td>
</tr>
<tr>
<td>Follow a healthful diet when with others.</td>
<td>18 (45.0)</td>
<td>25 (64.1)</td>
<td>+19.1</td>
<td>0.020</td>
</tr>
</tbody>
</table>

*Pearson Chi-square  
Original 5 pt. Likert Scale from "Not at all confident" to "Completely confident" recoded into “Not Confident” and “Confident”. 
Results

• Self-Efficacy Physical Activity Behaviors

“As a result of the SL program, how confident do you feel that you can be physically active when...”

<table>
<thead>
<tr>
<th>Item (moderate to completely confident)</th>
<th>Pretest n (%)</th>
<th>Post-test n (%)</th>
<th>Δ in %</th>
<th>P-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>You don’t have anyone to exercise with</td>
<td>20 (50.0)</td>
<td>25 (64.1)</td>
<td>+14.1</td>
<td>0.000</td>
</tr>
<tr>
<td>You feel tired</td>
<td>8 (20.0)</td>
<td>14 (35.9)</td>
<td>+15.9</td>
<td>0.001</td>
</tr>
<tr>
<td>You haven’t been exercising regularly</td>
<td>17 (42.5)</td>
<td>25 (64.1)</td>
<td>+21.6</td>
<td>0.006</td>
</tr>
<tr>
<td>You can’t find an activity you enjoy</td>
<td>11 (27.5)</td>
<td>17 (43.6)</td>
<td>+16.1</td>
<td>0.000</td>
</tr>
<tr>
<td>It’s raining or snowing</td>
<td>10 (25.0)</td>
<td>13 (34.2)</td>
<td>+9.2</td>
<td>0.005</td>
</tr>
<tr>
<td>Your schedule is not consistent</td>
<td>10 (25.0)</td>
<td>16 (41.0)</td>
<td>+16.0</td>
<td>0.004</td>
</tr>
</tbody>
</table>

*Pearson Chi-square

Original 5 pt. Likert Scale from “Not at all confident” to “Completely confident” recoded into “Not Confident” and “Confident”.
### Results

**Motivation**

"On a scale from 1 to 10, how motivated are you...”

<table>
<thead>
<tr>
<th>Motivation (1-10 scale)</th>
<th>Mean Pre-test</th>
<th>Mean Post-test</th>
<th>P-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>To improve eating habits</td>
<td>X=7.07 (sd 1.8)</td>
<td>X=7.15 (sd 1.6)</td>
<td>.878</td>
</tr>
<tr>
<td>To increase physical activity</td>
<td>X=6.9 (sd 2.3)</td>
<td>X=7.3 (sd 1.8)</td>
<td>.502</td>
</tr>
</tbody>
</table>

*Paired samples 2-sided T-test
## Results

- **Intention**

<table>
<thead>
<tr>
<th>“I intend to…”</th>
<th>Pretest n (%)</th>
<th>Post-test n (%)</th>
<th>Δ in %</th>
<th>P-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>…improve my eating habits</td>
<td>36 (90)</td>
<td>37 (92.5)</td>
<td>+2.5</td>
<td>0.161</td>
</tr>
<tr>
<td>…increase my physical activity</td>
<td>36 (90)</td>
<td>35 (87.5)</td>
<td>-2.5</td>
<td>0.000</td>
</tr>
<tr>
<td>…search for health info on the internet</td>
<td>19 (47.5)</td>
<td>25 (62.5)</td>
<td>+15.0</td>
<td>0.001</td>
</tr>
</tbody>
</table>

*Pearson Chi-square.
Original 6 pt. Likert Scale from “Extremely unlikely” to “Extremely Likely” recoded into “Unlikely” and “Likely”.
Results

- Body Mass Index (based on self reported height and weight)

<table>
<thead>
<tr>
<th>BMI</th>
<th>Female N (%)</th>
<th>Male N (%)</th>
<th>Overall N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>17 (68.0)</td>
<td>6 (40.0)</td>
<td>23 (57.5)</td>
</tr>
<tr>
<td>Overweight</td>
<td>3 (12.0)</td>
<td>4 (26.7)</td>
<td>7 (17.5)</td>
</tr>
<tr>
<td>Obese</td>
<td>5 (20.0)</td>
<td>5 (33.3)</td>
<td>10 (25.0)</td>
</tr>
</tbody>
</table>
## Results

- **Body Weight Self-Rating**

<table>
<thead>
<tr>
<th>Self-rating</th>
<th>Female N (%)</th>
<th>Male N (%)</th>
<th>Overall N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Markedly underweight</td>
<td>0 (0.0)</td>
<td>1 (6.7)</td>
<td>1 (2.5)</td>
</tr>
<tr>
<td>Slightly underweight</td>
<td>1 (4.0)</td>
<td>0 (0.0)</td>
<td>1 (2.5)</td>
</tr>
<tr>
<td>Average weight</td>
<td>15 (60.0)</td>
<td>6 (40.0)</td>
<td>21 (52.5)</td>
</tr>
<tr>
<td>Slightly overweight</td>
<td>8 (32.0)</td>
<td>6 (40.0)</td>
<td>14 (35.0)</td>
</tr>
<tr>
<td>Markedly overweight</td>
<td>1 (4.0)</td>
<td>2 (13.3)</td>
<td>3 (7.5)</td>
</tr>
</tbody>
</table>
Results

• Rating of Avatar Body Weight

<table>
<thead>
<tr>
<th>Avatar rating</th>
<th>Female N (%)</th>
<th>Male N (%)</th>
<th>Overall N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Markedly underweight</td>
<td>0 (0.0)</td>
<td>1 (6.7)</td>
<td>1 (2.5)</td>
</tr>
<tr>
<td>Slightly underweight</td>
<td>7 (28.0)</td>
<td>0 (0.0)</td>
<td>7 (17.5)</td>
</tr>
<tr>
<td>Average weight</td>
<td>16 (64.0)</td>
<td>11 (73.3)</td>
<td>27 (67.5)</td>
</tr>
<tr>
<td>Slightly overweight</td>
<td>2 (8.0)</td>
<td>2 (13.3)</td>
<td>4 (10.0)</td>
</tr>
<tr>
<td>Markedly overweight</td>
<td>0 (0.0)</td>
<td>1 (6.7)</td>
<td>1 (2.5)</td>
</tr>
</tbody>
</table>
Results

- Avatar appearance compared to real life appearance

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Female N (%)</th>
<th>Male N (%)</th>
<th>Overall N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avatar is less attractive</td>
<td>6 (24.0)</td>
<td>8 (53.3)</td>
<td>14 (35.0)</td>
</tr>
<tr>
<td>Avatar is equally attractive</td>
<td>14 (56.0)</td>
<td>6 (40.0)</td>
<td>20 (50.0)</td>
</tr>
<tr>
<td>Avatar is more attractive</td>
<td>5 (20.0)</td>
<td>1 (6.7)</td>
<td>6 (15.0)</td>
</tr>
</tbody>
</table>
Focus Group Key Themes

Information was **useful** and informative

Intervention was **creative**

Health Educator was **professional, credible**, and looked **physically fit**

Appreciated **anonymity** of the format
- Encourages more people to ask questions
- Ensures confidentiality

Intervention encouraged them to **think about their own behaviors**
Conclusions

• Participants were **receptive** to receiving health information in SL.
• Prefer a more traditional intervention method with a credible source.
• Future projects should include how experiences change with **long term participation** in SL.
• **Potential** for the delivery of effective health communication messages promoting healthy behavior change using 3-D virtual world technology.
Application

http://maps.secondlife.com/secondlife/Ohio%20University/192/177/27
Future Work

Continued monitoring and evaluation of health outcomes and how users create and participate in virtual worlds is needed.

Actual need vs. perception (stage etc.)

Issues surrounding the use of avatars (self identity i.e. body image, message processing etc.)
References & additional studies of interest:


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