EVALUATION OF PLAYFULNESS FOLLOWING ENGAGEMENT IN VIRTUAL REALITY

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Perspectives on Play

- As occupation (Reilly, 1974; Vanderberg & Kielhofner, 1982)
- Internal locus of control (Rubin et al, 1983)
- Theories of purpose of play, role in development, role on self-esteem, context of play (Parham & Primeau, 1997)
Playfulness

1. Intrinsic motivation
2. Internal control
3. Freedom to suspend reality
4. Framing
Intrinsic motivation

- Refers to some aspect of the activity itself, rather than to an external reward, that provides the impetus for the individual’s involvement in the activity.
Suggests the individual is largely “in charge” of his actions and at least some aspects of the activity’s outcome.
Freedom to suspend reality

- Means that the individual chooses how close to objective reality the transaction will be
Framing

- Refers to the ability to give and receive social cues to maintain the play frame
Hypothesis

VR play is fun and engaging
- Increased motivation
- Increased self control
- Increased satisfaction
- Playfulness
Research questions

1. What is the level of playfulness among children with cerebral palsy engaged in virtual play?
2. How does playfulness change according to different contexts?
3. What are the features of the VR games and their relation to different levels of playfulness?
Participants

- 13 eight to twelve year olds (mean age = 10 yrs, 5 mo.)
- 7 male, 6 female
- 7 wheelchair users
- able to reach with at least one arm
Procedures

- 8 one-hour sessions
- Children sat in demarcated area in front of large TV screen
- Television was interfaced with VR system
- Children could see themselves on the TV
Procedures (cont.)

- Each session started with the application "Birds and Balls"
- Other games were played throughout the session
VR system

- Mandela Gesture Xtreme VR system
- tracking device
- user moves and interacts with virtual environment
Instrument

- Test of Playfulnessness (Bundy, 1997)
- 24 items
- scored on 4-point extent scale, intensity scale, and skill scale
- a rating of 3 indicates a good or high rating and a rating of 0 indicates a low or poor rating
Modifications to instrument

- Four of the items were non-applicable to the context of VR
- 1. Appears safe
- 2. Actively modifies complexity and/or demands of the activity
- 3. Plays interactively with others
- 4. Enters a group already engaged
Subscales

- The items were grouped into 4 subscales (factors) according to Bundy
  - 5 items = motivation subscale
  - 7 items = internal control subscale
  - 5 items = suspension of reality subscale
  - 3 items = framing subscale
Data analysis

- 8 VR sessions videotaped
- 3 sessions were randomly selected and 3 trials (applications) were scored
- total of 117 trials analysed
Results

- The number of times an application was played varied depending on what the child chose to play.

Table 1. Frequency of VR environments played by participants

<table>
<thead>
<tr>
<th>VR Environment</th>
<th>Times Played</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birds and balls</td>
<td>23</td>
<td>12</td>
</tr>
<tr>
<td>City (flying space ship)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Island sound (musical instruments)</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Paint</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Snowboarding</td>
<td>16</td>
<td>11</td>
</tr>
<tr>
<td>Soccer</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>Speedroller (driving car)</td>
<td>11</td>
<td>8</td>
</tr>
<tr>
<td>Trip (shape maker)</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Volleyball</td>
<td>19</td>
<td>11</td>
</tr>
<tr>
<td>Shark (swimming game)</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Drums</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Gravball (ball game into hoops)</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>
Results

- Overall means and SD were calculated for each of the 4 subscales

Table 2. Means and standard deviations for subscale scores (N = 13).

<table>
<thead>
<tr>
<th>EXTENT</th>
<th>INTENSITY</th>
<th>SKILL</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>C</td>
<td>S</td>
</tr>
<tr>
<td>1.86</td>
<td>1.59</td>
<td>0.12</td>
</tr>
<tr>
<td>0.77</td>
<td>1.05</td>
<td>0.41</td>
</tr>
</tbody>
</table>

Key: M = motivation, C = control, S = suspension, F = framing
Results

- Motivation score ranged from 1.50-2.25
- Control score from 1.00-1.88
- Suspension score from 0-.26
- Framing score from 1.33-1.78

Table 3. Means and standard deviations for playfulness ratings across VR environments

<table>
<thead>
<tr>
<th>VR GAME</th>
<th>M</th>
<th>C</th>
<th>S</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paint</td>
<td>2.06</td>
<td>1.79</td>
<td>0.11</td>
<td>1.62</td>
</tr>
<tr>
<td>Soccer</td>
<td>1.79</td>
<td>1.33</td>
<td>0.06</td>
<td>1.41</td>
</tr>
<tr>
<td>Shark</td>
<td>1.77</td>
<td>1.46</td>
<td>0.10</td>
<td>1.48</td>
</tr>
<tr>
<td>Drums</td>
<td>1.50</td>
<td>1.00</td>
<td>0.0</td>
<td>1.50</td>
</tr>
<tr>
<td>Volleyball</td>
<td>1.91</td>
<td>1.73</td>
<td>0.15</td>
<td>1.53</td>
</tr>
<tr>
<td>Birds &amp; Balls</td>
<td>1.67</td>
<td>1.37</td>
<td>0.09</td>
<td>1.48</td>
</tr>
<tr>
<td>Trip</td>
<td>2.25</td>
<td>1.70</td>
<td>0.26</td>
<td>1.42</td>
</tr>
<tr>
<td>Snowboarding</td>
<td>1.94</td>
<td>1.58</td>
<td>0.10</td>
<td>1.61</td>
</tr>
<tr>
<td>City</td>
<td>1.83</td>
<td>1.78</td>
<td>0.0</td>
<td>1.78</td>
</tr>
<tr>
<td>Speedroller</td>
<td>1.81</td>
<td>1.88</td>
<td>0.09</td>
<td>1.63</td>
</tr>
<tr>
<td>Gravball</td>
<td>1.50</td>
<td>1.50</td>
<td>0.07</td>
<td>1.72</td>
</tr>
<tr>
<td>Island Sounds</td>
<td>2.13</td>
<td>1.67</td>
<td>0.50</td>
<td>1.33</td>
</tr>
</tbody>
</table>

Key: M = Motivation, C = Internal Control, S = Suspension from Reality, F = Framing
Results

- The motivation subscale mean was the highest for both extent and intensity ratings
- The internal control subscale mean was the highest for skill ratings
- Three VR environments yielded extant ratings of 2 or “much of the time” (Trip, Paint, Island Sounds)
Results

- All behaviours were demonstrated 10% 10 90% of the time for all ratings except for suspension of reality.
- Seven other games ranged in ratings from 1.33 to 1.88 reflecting the behaviour was demonstrated some of the time.
Discussion

- Children did exhibit playfulness according to the elements of motivation, internal control, and framing that conceptualise the construct of playfulness in the TOP
Motivation - Participants appeared to actively engaged
they persisted and repeated their actions to succeed
they were exuberant, laughing and shouting
they were concentrating hard therefore did not manifest joy
Discussion

- Internal control - Participants engaged in challenging behaviours
- they shared the task requirements and played well with a partner
- they let their desires known for changes to the game
Discussion

- Suspension of reality - hard to rate this element
- Participants did not pretend except for a few comments “I am a pilot”
- They did make jokes and teased staff
Discussion

- Framing - Participants were skilled at showing they were able to give and respond to other’s cues
- The opportunity to give and receive facial and body cues was restricted due to the nature of VR
Discussion

- The games of Trip, Island sounds, Paint encouraged participants to remain engaged.
- There was an element of creativity with each of these.
- Entexturent seen here.
Discussion

- Drums and gravball produced the lowest ratings
- they were frustrating because of a reaction delay to user’s movements and the unpredictability of the game
- They felt not in control of these games
The other seven games produced similar levels of playfulness.

Volleyball, snowboarding were two-player games which resulted in playing with others and assuming leadership roles.

Also, element of pretend here.
TOP was useful in measuring playfulness in children who engage in VR play

Knowing which environments are conducive to playfulness is helpful

Designing new environments with elements to enhance M, C, S, F is a recommendation for future R & D