PAINBUDDY

USING VIRTUAL CHARACTERS TO IMPROVE HOME-BASED THERAPY FOR CHILDREN

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URQP Undergraduate Research Opportunities Program

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American Cancer Society®
1. Humanizing Digital Health
2. Virtual Humans/Avatars for e-Health
3. Case Study: PainBuddy
4. Project Goals
5. Methods
6. Project Challenges
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The promising era of digital health:

- Sophisticated health information systems hold tremendous potential for influencing health behaviors and promoting public health.
- However, there is a long way to go to reach that incredible potential!
Greater focus on technical design than on communicative function:

- There seems to be more interest in designing technically sophisticated health information systems than in designing e-health programs that communicate meaningfully and build influential health promoting relationships.
Until date, too many digital health information systems are:

- Boring, dispassionate, & unimaginative
- Overly complex, formal, & technical (medicalese)
- Directive/prescriptive (we know what’s best for you)
- Static (our way or the highway)
- Not much fun (have limited entertainment value)
- One-way (minimal interaction & involvement)
E-health apps are often too artificial to achieve health goals. Questions for m-health developers:

- How engaging and interactive is my health app?
- Does my app capture audience attention (exposure)?
- Does my app communicate clearly & compellingly?
- Does my app communicate humanely & sensitively?
- Does my app communicate persuasively?
- Does my app adapt well to unique individuals?
- Does my app promote IMMEDIACY?
Immediacy refers to communication that promotes:

- Physical and emotional closeness
- Interpersonal Comfort
- Engagement and caring
- Personal involvement
- Intensity and enthusiasm
- Authenticity
Verbal aspects of immediacy are designed to demonstrate:

- Familiarity (refer to person by name, experience)
- Involvement (use collective terms like “we” and “us”)
- Clarity (familiar terms, explain complex concepts)
- Interest (smooth interaction, concern, and empathy)
- Reinforcement (specific and appropriate feedback)
- Enjoyment
Nonverbal aspects of immediacy are designed to demonstrate

- Friendliness (smiling, congruence, proximity)
- Animation (movement, gestures, vocal variety)
- Involvement (eye contact, touch, direct orientation)
- Excitement (vocal intensity, expressions, design)
- Comfort (relaxed body posture, proximity, touch)
- Caring (congruent expressions, appropriate touch)
Virtual Humans/Avatars for e-Health

Virtual Agents and avatars are a promising e-health tool for enhancing immediacy.
Features that may provide virtual agents:

- Interactive (providing personal feedback)
- Adaptive (providing appropriate responses)
- Engaging (immediate & personally involving)
- Easy to use (intuitive & conversational)
- Sensitive to individual & cultural differences
- Relationally appropriate & developmental
- Learning Systems (using AI to mirror human behavior)
- Accessible (where and when needed)
Challenges that must be addressed to make virtual agents work well:

- Improve natural delivery of verbal/nonverbal cues.
- Increase repertoire of response options.
- Enhance monitoring/response to user cues.
- Improve system adaptively and relational learning.
- Make systems easy and comfortable to use.
- Provide easy access to virtual agent technology.
- Make systems exciting and fun to use.
Two compelling virtual humans exemplars:

– Sim-Sensei: Virtual Human and Multimodal Perception for Healthcare support
  https://youtu.be/ejczMs6b1Q4?list=PLC6EBD51B5445062E

– Sim-Coach: Online Virtual Agent designed to break down barriers to care in Service Members, Veterans and their Significant others. https://youtu.be/PGYUqTvE6Jo

USC Institute for Creative Technologies

The USC Institute for Creative Technologies (ICT) brings together experts in clinical psychology, cognitive science, computer vision, speech processing and artificial intelligence.
Case Study: PainBuddy

+12,000 children with cancer in the United States each year
High-risk for long-term chronic pain -> Effective therapies needed
Pain and symptom management seriously lacking at home

Cure model-based estimates (3-year periods from 1982 to 2002)

Source:
Hematological Journal, May 2013
To develop and evaluate a health app (serious game) to provide:

1) an engaging game for pain reporting.
2) a confident and smart animated buddy (3D avatar).
3) enhanced communication children-doctors.
Avatars will ask the needed questions and provide support and encouragement during the diary.

Bonus coins for completing entries will allow children to customize their avatars and environment.

Reducing stress & anxiety by adding a skills-training component.
Methods: Application structure

- Personal Info (Age, Gender...)
- Background/icon
- Avatar Options

Customization/Setting

- Direct Access
  - End
  - Break > 30min
  - On Screen Alert
  - CBT Trigger

Unlock

Alert Algorithm

- Start Survey / Twice a Day

Section A1, A2, A3

Cognitive and Behavioral Skills Training (CBT) (Age Group, Symptom, ...)

- Clock Trigger
- Interactive Animation
  - Speaking
  - Expression
  - Motion
  - Guided Imagery
  - Audio/Video
  - Instructions

Summary / Congrats

- Communicate to Doctor

Earn Coins

Interactive Animation

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Project Challenges

Android App development

Avatar development

Web front development and data management
Work in Progress: avatars and animation
## Patient List

<table>
<thead>
<tr>
<th>Patient Id</th>
<th>First Name</th>
<th>Last Name</th>
<th>Alerts</th>
<th>Alert Info</th>
<th>Patient Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>1002</td>
<td>Ariana</td>
<td>Martinez</td>
<td>0</td>
<td></td>
<td>Click to see Patient Data</td>
</tr>
<tr>
<td>1001</td>
<td>Bobby</td>
<td>Tables</td>
<td>2</td>
<td>Pain, 5 consecutive entries of Feeling of sad</td>
<td>Click to see Patient Data</td>
</tr>
<tr>
<td>1234</td>
<td>Steve</td>
<td>Stevenson</td>
<td>0</td>
<td></td>
<td>Click to see Patient Data</td>
</tr>
</tbody>
</table>

### Bobby Tables - Patient Information

#### Active Alerts

<table>
<thead>
<tr>
<th>DayNum</th>
<th>Time</th>
<th>Message</th>
<th>Dismiss</th>
<th>More Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>am</td>
<td>Pain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>pm</td>
<td>3 consecutive entries of Tired</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
References

Immediacy/Artificial Intelligence and Digital Health:


References

Adaptive, Interactive Health Information System:


– Kreps. (2012). Consumer control over and access to health information. Annals of Family Medicine, 10(5). http://www.annfammed.org/content/10/5/428.full/reply#annalsfm_el_25148


References

Pain Treatment in pediatric oncology:


Thank you!

Questions?

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