**yCAT website provides interactive communication experience for young children: Phase 3 usability testing**

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**Introduction**

- Children with many diseases and disorders of development often have considerably intact cognition.
- Muscle weakness, atypical body structures, and neurological differences can limit participation in meaningful activities including mobility, environmental access, play, and communication.
- Communication is vital to children’s healthy development, as it allows them to express thoughts, feelings, and share information; each of these functions contribute to learning and social participation [1].
- Augmentative and alternative communication (AAC) devices are used by school-aged children with communication difficulties [2,3], but there is limited evidence on the effectiveness and availability of assistive technology devices for children five years and younger [4], particularly those with complex communication and mobility needs.

**Development of yCAT**

- A multidisciplinary team of healthcare practitioners and computer scientists collaborated with community members who have or support children who have complex communication and movement challenges.
- This group worked together to assess the need for an AAC system targeting young children age 2-5 years [5]. From this partnership, we developed yCAT – the Young Children’s Assistive Technology system.
- We have completed several phases of testing of this multi-modal product, including individual pilot cases, usability testing with typically developing children, and clinical testing with children with communication challenges who do not have physical/mobility limitations.

**The purpose of the current study was to gain qualitative information on the utility, usability, learnability, memorability, and user satisfaction with the yCAT website.**

**Methods**

We worked with four young children, ages 2-5 years old, who were attending a University-affiliated therapeutic preschool and had a documented diagnosis of expressive or mixed language delay/disorder. Results are presented as a qualitative case series. Children completed three testing sessions:

1. Children were oriented to the yCAT website on an iPad and provided demonstration and hand-over-hand assistance, which was faded as the child completed three basic communication tasks.
2. Children were reoriented to yCAT, and asked to attempt to complete the tasks independently.
3. Children were observed while engaging in free play/device use as desired, and supported as needed.

**Results**

Data were analyzed using a mixing table to compare and synthesize multiple sources of information and generate themes, which included:

- (a) factors related to child engagement
- (b) interface issues
- (c) interest in iPad device and yCAT website
- (d) carryover/learning effects
- (e) recommendations for improvement.

All children reported enjoying using an iPad and had prior experience with the device. This resulted in generally appropriate touch patterns and successful navigation, similar to [6].

The amount of assistance provided to the child users decreased with each consecutive session, and both occupational therapy researchers and caregiver supported as appropriate. Table 1 provides a brief summary of each child’s performance during the trials.

**Table 1. Summary of participant performance**

<table>
<thead>
<tr>
<th>Child</th>
<th>Summary of Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child 1</td>
<td>Engaged with yCAT effectively and appeared to make connections between adaptive communication and real life applications. enjoyed locating the icons and requesting car and train toys in the “choose play” area of the website. Most engaged when using the yCAT website paired with an Amazon Echo Plus device to turn on the light. Did not find any targeted icons upon request, but engaged and explored independently.</td>
</tr>
<tr>
<td>Child 2</td>
<td>Was initially uninterested in the yCAT website; repeatedly exited the website and tried to find YouTube videos. Exhibited improved engagement over the course of the sessions, but did not independently use yCAT to attempt communication. When using the iPad for free play, scrolled through and watched selected videos on YouTube independently.</td>
</tr>
<tr>
<td>Child 3</td>
<td>Initially disinterested in the yCAT, but gradually gained interest. Able to navigate the website and complete most tasks with verbal cuing only. Exhibited light touch which sometimes was not registered by the iPad/website.</td>
</tr>
<tr>
<td>Child 4</td>
<td>Highly engaged with the yCAT website. Able to learn procedure and complete targeted tasks independently. Was motivated and drew connections between images and actions (example: touched the “brush teeth” icon and then imitated brushing her teeth).</td>
</tr>
</tbody>
</table>

**Discussion and Conclusions**

The level of understanding and “success” with each item requested varied among participants. Researchers observed design aspects of the website that may have inhibited the children’s performance. The level of engagement with the yCAT website varied between children, but several contextual factors during each session likely led to much of this variability.

Caregivers praised many features of the website and emphasized the potential of the yCAT website for helping their child to communicate more independently. There was also positive feedback associated with the general accessibility of the yCAT website, the wide variety of included categories, and connections with smart home technologies.

**Next Steps**

We are currently studying how children without physical limitations use yCAT to communicate in the home environment, and the extent to which using yCAT in the home influences young children’s engagement in meaningful activities.

Hypotheses:

1. Children will use the yCAT app to request desired items, to answer questions, to initiate conversations, and engage in play and other occupations of development.

2. Using the yCAT app will also lead to improved social closeness with family members and decreased communication-related frustration for both the child and family members.

Our ultimate goal is to pair the app with a customized, wearable switch-access system and a range of smart home devices and sensors embedded in the user environment to enable even greater independence for young children with complex physical and communication challenges.

**References**

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**Figure 2**. A young child with expressive communication challenges uses the yCAT website on an iPad.
REFERENCES


