Up & Down Mood Tracking App

User Research Report

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**Executive Summary**

Talking and observing potential users has given much insight for the further development of our Up & Down Mood Tracking App. Our team performed interviews with individuals with intellectual disabilities, their primary caregiver, two Speech, Language, and Hearing Sciences (SLHS) professors at CU, and one doctoral student in SLHS. We also performed contextual observation on another adult with intellectual disabilities using their iPad as a method of communication. Among all these research activities, there were some common findings.

One main finding is that the ability to use technology to report mood is highly variable among the disabled community and is highly impacted by the level of cognitive disability. Individuals with speech impairment often resort to Augmentative and alternative communication (AAC) strategies, which can also vary widely across population groups. According to Dr. Pui Fong Kan from SLHS, AAC users often know what they want to say but find it challenging to communicate their ideas or have had a stroke that restricts their talking capabilities. Moreover, several kinds of AAC systems exist, ranging from paper-based tools to touch-based to eye-gaze-based systems.

In investigating how best to represent emotions to improve accessibility, we discovered that emoticons might not be the optimal approach as they could come off as 'too abstract' for those unfamiliar with them. Severely cognitively impaired users may find it challenging to map these emoticons to actual emotions. Furthermore, it would also depend on the users' spatial-visual skills. Christina Riseman from SLHS pointed out that pictures of actual humans enacting a particular emotion would be more translatable as the users would have a familiar face to associate with. Deciding on how best to organize these pictures in a grid-like format or how many pictures to use for a single emotion is still something we need to consider. Although some individuals do prefer words and providing users with this option would be advantageous.

Moreover, we learned that validating the users' choice of emotion is essential, especially when users answer yes to both the 'Happy' and 'Sad' emotions. We feel a second prompt here would clarify what the user is trying to convey. Additionally, correlating the sensors' data with the users' responses can help frame the second prompt accurately.

We also discovered that it is vital to teach users how to use the app, which we believe can be implemented through an in-app tutorial. Shirley Huang, a doctoral student at SLHS studying emotions and AAC, remarked that these tutorials are more effective when the instructions are also aimed at the caregiver. Moreover, the tutorial needs to be slow-paced and include visual illustrations or arrows pointing to the specific UI elements when explaining their functionality. Another aspect to recognize is that the application may not be adaptive to each user's needs, and cultural-linguistic differences could pose a barrier.

We examined the privacy aspects of the primary user in certain situations where the caregiver has to log emotions on their behalf. In circumstances such as these, established trust between the user and the caregiver is crucial. After brainstorming, a couple of ideas were to include authentication in the app for the caregiver (fingerprint or face-unlock) or have the caregiver upload a medical power of attorney, which is then stored on the system's servers.

Since AAC systems are largely based on trial-and-error, we have decided to include a free 30-day trial version, the benefits of which are two-fold. Users can freely use the app without having to commit to it, and it would provide us with lots of pilot data on how users use the app, which would then inform better design decisions.

Based on all our user research, we found that we must first evaluate the abilities and preferences of the user. We will do this through having users fill out a short quiz on the app asking how they prefer to convey emotions (i.e. through pictures, songs, words, etc.). Many cognitively impaired users are drawn to certain cartoon characters/certain people, we will include an option to choose popular characters such as Elmo, Paw Patrol, and Scooby Doo to help convey emotions.

Most individuals who struggle with verbal communication use communication devices, most commonly an Apple iPad. All of our interviewed users emphasized the importance of integrating our app onto existing technology used by the users. Introducing a learning curve can be too overwhelming for many individuals. We will therefore use the existing iPhone and iPad interfaces for our two app prototypes.

**Personas**

1. Eric – a 21-year-old man with intellectual disabilities. Eric uses both verbal communication and communication through use of his iPad. He loves Star Wars and sci-fi movies. He enjoys routine and can become overwhelmed when his routine falls out of place. Currently, he uses his iPad to communicate emotions that he has trouble communicating verbally but has a hard time navigating the current communication interface.

2. Tommy – a 35-year-old man with Down syndrome. Tommy communicates verbally and does not use a communication device. He enjoys playing video games and watching YouTube videos about Bigfoot. He is generally happy, but when upset, he becomes very quiet and has a hard time communicating his emotions. While he doesn’t currently use a device for communication purposes, he has a cell phone and a smart watch.

3. Annie – a 16-year-old woman with autism. Annie is a non-verbal communicator and uses an iPad to communicate. She’s also a stickler for routine and is impacted severely when her routine is not followed exactly. She tends to have meltdowns when she is overwhelmed/overstimulated or cannot communicate what she needs. Tracking her mood is important to identifying her triggers for meltdowns. Her primary caretaker, her mom, helps her with daily tasks such as navigating her iPad. Her sensory issues make it hard to wear anything extra – sensors/watches are not a feasible option for her.

**Scenarios/Task Models**

**Task Analysis – “What’s for Breakfast?” via iPad**

1. Logging into iPad
   1. Locate iPad
   2. Enter passcode
   3. Locate communication app
2. Answering “What’s for Breakfast?”
   1. Open communication app
   2. Log in
      1. Enter username
      2. Enter Password
      3. Click Submit
   3. Click “Food” Category
   4. Click “Breakfast” Category
      1. Scroll among options
      2. Locate and click “Eggs”
      3. Locate and click “Bacon”
   5. Click back to home page
   6. Locate and click “manners” Category
      1. Locate and click “Please”
   7. Caretaker says “good job! Coming right up”

User is communicating they would like bacon and eggs for breakfast. We chose to include this task analysis to demonstrate how a user already communicates via iPad.

**Task Analysis – “How are you feeling?” via iPad**

1. Logging into iPad
   1. Locate iPad
   2. Enter passcode
   3. Locate communication app
2. Answering “How are you feeling?”
   1. Open communication app
   2. Log in
      1. Enter username
      2. Enter Password
      3. Click Submit
3. Click “Emotions” Category
   1. Scroll among options (shown through pictures)
4. Locate and click “sad” option
5. Click back to home page
6. Choose “Places” option
7. Choose “Home” option

User is communicating that they are sad and would like to go home. This demonstrates how a current user communicates emotions through a communication app on an iPad. The interface is simple and not customized to the user’s preferences in any way.

**Research Instruments**

Interview Questions for Megan

*Bio: Megan is a 24-year old woman with developmental disabilities who attends an adult day program in Denver.*

1. What is your disability (can be answered by interviewee or caregiver)?

**Autism, developmental delays, bipolar disorder**

2. Do you use an iPad for communication or for any other reasons?

**Entertainment**

3. Do you use technology in your daily life often? Do you use an iPad/smart phone/smart watch or anything alike?

**iPhone and iPad for entertainment and communication with parents**

4. Would a wearable device that measures heartrate/skin response be an option for you? Do you have any sensory issues that would make you unable to wear a device?

**Maybe a bracelet, depends on how big it is**

5. Do you have difficulty communicating your emotions? If you feel sad, do you have trouble telling people you are OR explaining why?

**(Grace answering this one) I decided to answer this question for Megan because we have spent numerous days together throughout the last year and this could be possibly upset her. Communicating emotions is Megan’s strongest suit, the difficulty is being able to control them for her. She does have bipolar disorder so that plays a role in that as well, but when she is upset she always will let someone know and why and asks to talk it through. However, it does seem inconsistent at home when she talks about how upset she gets at certain situations and how she handles them. So, this app could be useful for when she is alone at home and doesn’t have staff to talk to right away.**

6. Do you have a favorite TV show or movie character? If so, what is it?

**my favorite movie of all time is twilight. Then comes icarly and starwars.**

7. Do you enjoy music/videos/emojis? Explain.

**I like Disney music and music videos, and don’t use emojis a lot**

8. Does your caregiver monitor your interaction with technology? Is iPad/TV time limited?

**No technology allowed in my room, usually use my iPad/phone for about an hour after program. Watch TV mostly after program until bed & in the morning**

Interview Questions for Grace

*Bio: Grace is a 19-year-old personal care assistant for Megan. She is also a direct care employee at the adult day program Megan attends. Grace works with adults with varying intellectual and developmental disabilities.*

1. As a direct care worker at an adult day program, do many of the attendees use technology like an iPad or smartphone? (this includes at program or home)

**We do have a ‘no’ technology rule in place to avoid having attendees play games or not be with the group or participating, unless they use it to help them with communication or ask to use to it for any reason, but the rule is not strictly enforced. But I do know many attendees use smartphones and iPads at home strictly for entertainment/social media and connecting with family.**

2. Do you think mood tracking would be helpful for attendees? We could track the good vs bad days and try to think of reasons why bad/sad moods are occurring.

**Yes, it would be helpful and we do this in our database by taking notes on every attendee every day that they attend. They each have individual goals and we give them a rating and how well they achieved their goal on that day. Then we have meetings discussing patterns/routines and try to find solutions and make goals and this has helped me make attendee’s days more meaningful.**

3. Any recommendations for explaining mood? We are designing an app that will have music/sounds/emojis/images/videos to help describe mood. We are thinking of having a feature that would show the attendee’s favorite character (i.e. Elmo) having different moods (happy, sad, angry, etc).

**I think emojis would be the best and most versatile way to describe mood. However, I think emojis should be the default setting on the app and have favorite TV show characters be an option as well. I think this because a good amount of the attendees have a smartphone at home and use emojis all the time. But for some, particularly with autism, we use their favorite characters to help them calm down in situations so that could apply to the app as well because it helps with a sense of familiarity.**

4. Is there a certain population you think would benefit most from this app? We are targeting those who are nonverbal or have trouble communicating their emotions.

**I think many many people could benefit from this app. I think those with autism, mental illness such as anxiety disorder and those who are nonverbal or have difficulty speaking would benefit the most. Those with anxiety/autism would benefit because I’ve seen it myself at work when an attendee becomes upset and doesn’t know why. This could be an outlet to help them understand. Many of them have trouble speaking about their feelings so this could be almost a “distraction” in a way of not having to verbally speak about it but still be able to express emotions in a healthy way.**

Notes from Contextual Observation of Jessica

*Bio: Jessica is a 26-year-old woman with Down syndrome and autism. She is nonverbal and uses her iPad (in some capacity) for communication purposes, while most of her communication is conveyed through body language and actions. We also had an informal interview with her parents (they gave some insight on Jessica’s abilities and behaviors that she could not communicate to us herself).*

* Jessica flaps her hands very often (a stimming behavior)
* Jessica is able to unlock her iPad and navigate the apps on it
* She struggles with understanding the meaning of the different modules on her communication app
  + Her mom (and primary caregiver) says she often chooses things on her communication app that doesn’t make sense to her
  + Jessica will sometimes choose “bacon” on her app, although she has never eaten solid food/consumed bacon
  + Her mom wonders if Jessica understands what bacon actually is and if she is trying to communicate that she interested in trying it
* Jessica uses some sign language to communicate she is thirsty, her mom responds to her verbally “OK Jessica, I will make you a drink.”
* Jessica enjoys looking at images and videos of herself and friends on her iPad
  + Her mom often finds her looking at pictures of her friends from school on her iPad
  + Her enjoyment is expressed through smiling and laughter
* Jessica cannot verbally communicate her emotions, rather she uses body language to express the emotions of happiness, sadness, and anger
  + When overwhelmed, Jessica can become self-injurious and often hits herself on the head
  + Her parents try their best to regulate these behaviors so that she doesn’t injure herself or others
* Jessica tends to throw her iPad when she becomes angry/overstimulated
  + Her parents have installed a protective case to her iPad to prevent it from breaking
  + While this behavior can be startling to outsiders, her parents see all of Jessica’s behaviors as her way of communicating
* Her parents see the utility in being able to track Jessica’s mood to see if there are certain triggers that make her upset
* Jessica likes to watch shows/videos of her favorite characters on her iPad such as Carly from iCarly and Elmo from Sesame Street

Notes from interview with Dr Pui Fong Kan

*Bio: Dr. Kan’s general research interests involve child language learning, language disorders, and bilingualism. Her current research focuses on cognitive and language processing in monolingual and bilingual children*

* Varies across different levels of cognitive disabilities.
* Some individuals can recognize emojis but some cannot.
* AAC users use a communication board that requires training. AAC users can think but cannot talk, i.e., they know what they want to say.
* Icons/pictures would be beneficial.
* Some individuals do not understand AAC at all.
* Pictures representing emotion could be graphically very relevant to them.

Notes from interview with Christina Riseman

*Bio: Christina Riseman, M.A. CCC-SLP, is a clinical faculty member who specializes in the assessment and treatment of adults with acquired neurogenic cognitive-linguistic disorders.*

* Emojis may be abstract for those who are not familiar with them.
* Severely cognitively impaired people might not be able to map their emotions.
  + They might want to see a familiar face or a human face with an exaggerated emotion.
* Pictures would be the most translatable.
* Some people do better with words. Maybe have both options.
* Consider the number of pictures that will be presented.
* Privacy
  + pre-approved caregiver.
  + If the caregiver changes, a new power of attorney doc should be uploaded.
* Validate the users' choices after they select a particular emotion.

Notes from interview with Shirley Huang

*Bio: Shirley Huang is a Ph.D. candidate in the Department of Speech, Language, & Hearing Sciences. She studies bilingual language learning in children with and without a language disorder and the development and use of culturally-linguistically appropriate tools.*

* Different types of AAC systems exist.
* Note that feeling angry is not a bad thing, nor is feeling scared.
* The population influences which representation you use for emotions.
  + Depends on their spatial-visual skills.
* Users need to be taught how to use the system. Include a tutorial in the app and consider writing instructions for the caregiver as well.
* The system may not be adapted to everyone. There could be cultural-linguistic barriers.
* Privacy
  + There has to be established trust between the user and the caregiver.
  + Authenticate the caregiver, FaceID?
* Include a free trial version of the app since AAC systems are largely trial-and-error for users.