
PACT analysis for an AAC app on the iPad

People

It is difficult to pinpoint psychological differences or physical differences for children on the spectrum since there is no one-way to diagnose autism spectrum disorder (ASD). In addition, there are multitudes of aspects that may fall onto ASD along with other mental health disorders that may overlap with ASD, so narrowing down how one neurodivergent child may behave and react is hard enough, let alone a group. Therefore, it is important for our app to not be limiting or too general. An example of how this can be done is by personalizing the contents of our app to the users, such as having words with images that are relatable to the child, having vocabularies appropriate to the child's language development, or having commonly used words be easily accessible and editable (<https://www.cdc.gov/ncbddd/autism/signs.html>).

The primary audience for our app is heterogeneous since the children can fall into various spectrums. The children will most probably have different: (1) levels of social communication and social interaction challenges; (2) repetitive behavior and restrictive behavior; (3) over- or under-sensitivity to light, sound, taste or touch; (4) highly focused interests or hobbies; (5) levels of anxiety; (6) levels of meltdowns and shutdowns (<https://www.autism.org.uk/advice-and-guidance/what-is-autism>). The secondary audiences for our app are the parent(s)/guardian(s) and the speech therapist(s) of the child.

Physical Differences

It is important to be aware that the child might be over- or under-sensitive to light, sound, and touch. For example, a child who is over-sensitive to sound might find background music in a café too loud or distracting, and as a result, the child can experience anxiety or even physical pain, so covering their ears would be a way to avoid the overwhelming experience (<https://www.autism.org.uk/advice-and-guidance/what-is-autism>). An example of a child who is over-sensitive to touch might find water pressure from the average shower head to be too strong, and changing to a rainfall shower head can reduce the feeling and provide a more comfortable experience showering (<https://autismsociety.org/resources/communication/>). An example of a child who is under-sensitive to light might like brighter colors (sensory-seeking), while a child who is over-sensitive to light might be uncomfortable with bright colors, and may squint their eyes as a result of avoiding the sensory experience (<https://raisingchildren.net.au/autism/behaviour/understanding-behaviour/sensory->

[sensitivities-asd](#)). Hence, our app should be able to accommodate differences in sensitivity of at least 3 senses: sight, touch, and sound. There can be system preferences or settings that allow the child to engage in sensory seeking or sensory avoidance, and make sure that our app can provide a comfortable experience for the child. An example could be to give the child various options when choosing an image to be associated with the word, or a simple light mode or dark mode setting. However, providing too many settings may be overwhelming for our target audiences. We will need to provide a customizable experience intuitively, while keeping our app user friendly.

Since our primary audience is a child on the spectrum, we will need to ask ourselves how their physicality may affect our design. The screen size may be big for their hands and fingers, and how that may or may not change our approach in the design can be a question before concluding the direction of the design.

Cognitive Abilities

Our app will focus on being the child's communication tool, and each child's stage of development will be different. We will need to ensure that our app is able to dynamically adapt to their current needs and level, such as updating the words and images associated with it as the child grows and learns at their own pace. In addition, children on the spectrum may have anxiety, meltdowns and shutdowns when facing change or when everything becomes too overwhelming for them, so in order to understand them better, our app will need to implement an "emotion check" feature to help clarify what they are feeling, and have model descriptive words to help accurately identify the sensory issues that the child may be having (<https://autismsociety.org/resources/communication/>). We will also need to ensure that our app has the ability for Text-to-Speech (TTS), so that they are able to communicate with another as they are nonverbal, or when situations cause them to become nonverbal. Children on the spectrum may view situations and experiences differently due to their unique sensory experiences and understandings of the world, we will need to explore how our app can adapt to their contextual understandings. Visual schedules help children on the spectrum to have expected routines, as to not disrupt and overwhelm them with unexpected activities. We can also consider incorporating an in-app visual schedule/routines for the child using our app.

Cultural Differences

It is important to be aware of different cultures around us, since it could affect the app's spoken language, spelling, dialects, date formats, measuring systems, etc.

However, our app focuses on US standards and US English, but could integrate other languages and their cultures in the future.

Activity

In terms of activities, we will need to draw our attention into the regularity of the activities, the complexity of activities for our goals and objectives using the app. A feature used daily, and a feature used yearly will have a different emphasis on the design approach due to how accessible it might need to be. A feature that might be unintuitive in an initial user experience, might need guides, instructions, or feedback to be used properly. We need to consider if the activities are simple or complex, and if so, how can we make it user-friendly that is simple but complex? There are frankly many characteristics of activities that need to be considered.

Temporal Aspects

How often will a feature be used? Would it be daily, weekly, monthly, or even yearly? We will need to consider what would be high, medium, and low frequency activities when using our app.

Since the system is focused on daily communication, frequently used buttons are designed to be accessible and commonly used words/expressions are consistently easy to access (<https://www.liberator.co.uk/resources/important-aac-device-features/>). Additionally, children on the spectrum may find it hard to express themselves through facial expressions, so an “emotion check” feature can be a daily activity. An example of a medium frequency activity might be having to update the child’s vocabulary whenever they are ready to move onto more complex wordings; while an example of a low frequency activity might be configuring the app for the first time or resetting to factory settings.

Cooperation

The child uses our app as a communication tool for people that can range from their family members, therapists, or friends. Family members and therapists may also manage the settings of our app for the child, but there is also a possibility of another unauthorized person that can accidentally or purposefully make changes to the app, so we can consider having a locking feature that prevents that from happening. We also note that some users may practice their language alone or post video recordings on social networking sites using their AAC devices by themselves (<https://www.youtube.com/watch?v=z3YQ9F4SFAQ>). In the form of an emergency, there should be a way for our app to communicate emergency contact information, provide medical information, have the ability to make emergency calls, etc.

Complexity & Nature of Content

Due to the nature of content in our app, the complexity of the app varies technologically, and usage wise. Since our primary audience is children on the spectrum, we need to make sure that our app is engaging and fun for them. We will also need to explore what makes an AAC device fun for the child. Furthermore, it is important that the app is simple, but it gets the job done. For example, setting up new images and vocabularies should be straightforward. Potentially generating a complete sentence just by grouping up a selection of words by the child. These activities should have an immediate or almost immediate response time to keep our app feeling seamless and engaging

(<https://www.liberator.co.uk/resources/important-aac-device-features/>).

Additionally, we need to allow for a backup plan for when a mistake might occur. An example could be for if the child may have pressed a wrong button, returning to the homepage or undo-ing the mistake should be easy.

Context

We should closely examine activities in accordance with context, since activities must happen in a context.

Physical Environment

There may be instances where the child might use our app in a place with low or no internet connectivity. This means our app needs to have a local storage available so that our contents may be accessed in different locations regardless of internet connectivity. We will need to do research on sensors and beacons so that an indoor positioning system (IPS) may be integrated to bring about changes to context awareness when the child enters different areas of the house, such as the kitchen or the living room.

Social Context

For the child's family members or therapist to make changes, our app will have an "editor" mode for authorized users. To support them from making proper changes to the app, we will need to provide them instructions inside the app. There may also be situations where loud sound is not permitted, so we can have a feature that is similar to Do Not Disturb, but for low volume instead of muting since our app is the child's "voice".

Organization Context

We will need to make sure that our app complies with the [AAC Policy Laws](#).

Technologies

The main platform is iPadOS. There needs to be extension research to be done in order to incorporate appropriate APIs. Texts and images will generally be the main input source, so we will need to make sure that our app has an input keyboard and a way to upload custom images either directly through the camera or image files. This essentially will become the dictionary that the child can refer to and communicate using word associated images. Additionally, our app aims to be the “voice” for the child for most situations if not all, so our app may need to allow the child to input alphabetical letters, or use predefined images as buttons for speech synthesis or TTS. To make the sound emitting from the iPad more relevant to the child, we will need to explore differences between synthesized speech and digitized speech so we can set-up multiple voices that resonate with the child. To make our app contextually relevant in the house, beacons or sensors can be set up in certain areas such as the living room, kitchen, bathroom, and bedroom. These sensors serve to help our IPS to update the contents of our app to appropriately reflect the conversations that usually occur in the area without being too fixated on the topic, since other conversations can occur as well.