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Developing VICARA 2.0: Exploring the potential use of augmentative and alternative communication (AAC) apps for the parents and teachers of autistic students FREE

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Developing VICARA 2.0: Exploring the Potential Use of Augmentative and Alternative Communication (AAC) Apps for the Parents and Teachers of Autistic Students

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Abstract. AAC (Augmentative and Alternative Communication) application in mobile devices has benefits in enhancing and facilitating daily communication for autistic students with communication difficulties. VICARA (Visual Interactive Communication and Reading Aid) is designed as AAC apps with Indonesian language on mobile devices that enables the users to learn about words and objects by creating picture cards and sentences from the cards. This working paper is intended to give further insights into exploring the potential use of VICARA from four elements in user experience: attractiveness, learnability, operability and understandability aspects. Two stages of data collecting methods were conducted for this project. On the first stage, a Focus Group Discussion (FGD) involved ten participants representing parents and teachers of autistic students. The second stage was in the form of online interviews with seven participants who completed the trial and returned the feedback forms. Results indicate that the users have a good experience using VICARA although some areas need improvements, such as focusing on individual differences and implementing instructional and structured communication system for using the apps.

INTRODUCTION

The use of Augmentative and Alternative Communication (AAC) to support language development and communication skills for autistics and those who have communication difficulties has been widely researched since the 1980s, although the use of AAC techniques was introduced in the 1970s (1, 2). Lloyd et.al (1995) define AAC as "the supplementation or replacement of natural speech and/or writing using aided and/or unaided symbols" where "use of aided symbols requires a transmission device" (3). According to Carr et al. (1997) communication problems – in the context of understanding and expression – potentially leads to severe behaviour problems commonly found among persons with severe autism and mental retardation (2). Assistive communication technology can help to facilitate the needs of an Autistic person who is non-speaking or has difficulties in oral communication.

AAC interventions can give access for autistics to participate in communication and social interaction using non-verbal forms of communication (e.g. body language, gestures, sign language and speech generating devices) (4). In the recent 10 years, AAC has developed into mobile applications (apps) in popular platforms, such as Android system and iOS. Proloquo2Go is an AAC IPad-based apps that converts icons and text into synthetic speech (5), and the other apps include iCommunicate, TapToTalk and JABTalk. Herbert (2010) states that the practicality (e.g. lightweight and relatively affordable) and ease of use aspects (e.g. touchscreen and visual features) of mobile touch-screen devices make them a popular option among users with disabilities, including autistics and those who need communication and

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language aids (6). In terms of affordability, AAC apps in mobile touch-screen devices like smartphones and tablets are more affordable and easily available than AAC in the form of Speech Generating Devices (SGD) (e.g. Maestro by Dyna Vox and Vantage Lite) (7).

The American Speech-Language-Hearing Association (ASHA) states that AAC is a communication system with four primary components: symbols, aids, strategies and techniques (8). An AAC system can include various kinds of symbols, such as graphic, auditory, gestural, and textured or tactile symbols (2). Previous studies show that AAC interventions are effective to promote communication skills, social interaction skills, and academic performance, and to reduce challenging behaviours in autistic children (4). For example, autistic children can communicate their intentions by tapping to visual images, constructing structured sentences using text, images and sounds in AAC apps. However, the users in Indonesia face many challenges when adopting AAC interventions (Yang, 2015), regarding the degree of accessibility, such as technical barriers to operate, economic cost and language barriers (most AAC apps are English language-based) (9). Another aspect is the complexity and various degrees of autism spectrum condition that impose more challenge for the parents to find AAC apps suitable for their children needs (9).

This preliminary study is conducted to develop VICARA (Visual Interactive Communication and Reading Aid), a beta version of Indonesian AAC apps. VICARA is designed as a free downloadable app as a communication tool in Android-based mobile devices. It allows the users to create picture cards with text and voice outputs, or pictures from the camera or using picture archives on their devices. A text and voice output can be added to label the picture card. Once created, the picture card will be stored and archived. In the later stage, the picture card will be used for composing sentences and shared through messaging platforms (e.g. WhatsApp message application and picture message services).

For this working paper, we focus on investigating the users' experience in using VICARA by conducting a trial with the parents and teachers of autistic children. We intend to explore more deeply the specific functions and features of VICARA, particularly by addressing the users' expectations in utilizing the apps. We use a framework of the elements of usability characteristics from Zapata et al. (2015) for assessing VICARA consisted of four characteristics: attractiveness, learnability, operability and understandability (10). The attractiveness factors assess the interface, design and feature of the apps, while the learnability aspect can be assessed whether the user requires some guidance and tutorial for learning the apps, and how many hours or sessions they need to learn (10). The operability aspect includes the challenges and difficulties the users experience in using the apps. The understandability aspect refers to how users could manage the navigation levels (e.g. are the icons or text can be easily understood by the users) (10).

METHODOLOGY

Two stages of data collection were conducted, starting from January 2017 (pre-stage of developing the app) to August 2018 (the evaluation stage after the beta version is completed). In the first stage we conducted a Focus Group Discussion (FGD) in LSPR (The London School of Public Relations) Research Centre, Sudirman Park, Jakarta, to get inputs from the potential users of the apps – ten participants representing the parents and teachers of autistic students. Several guideline questions discussed in FGD included 'What kind of mobile applications can be beneficial to support children's communication skills?', 'What needs should be addressed in communication aid tools?', 'What are the users' expectations in utilizing AAC apps?', and 'What functions and features should be included in AAC apps?'

The second stage was conducted after the beta version of VICARA was launched in Google Play Store. In this stage, 19 participants were given a link to download VICARA apps and a user guide. The targeted participants were parents, guardians, and teachers or therapists who have autistic children or students with limitation or difficulties in verbal and language skills. After two weeks of trial, we sent a feedback form to be filled by the participants. We also conducted some online structured interviews to obtain more depth in participants' responses. Some aspects and elements addressed in the questions included: (1) Users' familiarity with the method of AAC and PECS (Picture Exchange Communication System); (2) Users' experience of using VICARA concerning the four elements namely attractiveness, learnability, operability, and understandability.

RESULTS AND DISCUSSIONS

Participants Expectations in Using VICARA

FGD participants raised some issues, such as the importance of creating AAC apps in Indonesian language, the critical aspects of user interface and user experience in developing AAC apps, and the possibility of using PECS

(Picture Exchange Communication System) as a basic communication system in AAC apps. The summary from the discussion is presented in Table 1.

TABLE 1. Important points to address in developing VICARA

Points	Suggestions
User experience	- User interface and user experience are important in developing the apps - Attractiveness, understandability, operability and learnability are critical
User expectations	- Creating an Indonesian language AAC apps - Implementing repetitive teaching and reward system in the apps - Using instructional communication system (e.g. PECS-based system for the apps (and including PECS pictures archives embedded in the apps)
Functions and features	- Text to speech feature is essential - Text feature (adding words to the card picture) is beneficial for supporting language learning program - Password for security
Others	- Differences in age and skills among autistic children should be considered as it will affect their learnability - Suggestion to develop apps for students with comorbid conditions (e.g. cerebral palsy with a motoric problem) - Collaborations with autism organizations, institutions, and therapy centers for conducting the trial stage - Teachers and parents are the instructors; they must learn to use the apps first then assist their children in utilizing the apps

Most of the issues discussed in FGD are related to user experiences and expectations related to the importance of additional functions and features in the apps. Additionally, an attractive visual design and the need for instructional communication systems like PECS are considered critical in developing AAC apps. The participants stated the need for an expert guidance and recommendation to teach Autistic children to use AAC apps. They also emphasized the vital role of the parents and teachers to involve in their children/students learning of using AAC.

Age and skill are important factors to consider in developing AAC apps. When a child becomes familiar with mobile devices and apps from an early age, they can adapt more easily. Meanwhile, older children face challenges when introduced to a new application and use it in daily routine because they already focus on and are consumed by their original routine. Previous studies note that AAC provision is considered the most complex "because it is characterized by the complex interaction between service user needs, the need for expert and independent assessment, user and carer training, timely reviews, and on-going, life-long maintenance and user support" (11). Another challenge for users to learn AAC lies in the diversity of using communication systems (e.g. graphic symbols, pictures) as they may have different perceptions and understanding of the symbols and pictures used in AAC (12).

In the development stage of VICARA, we implemented some main outcomes from participants in the FGD, such as designing a simple and easy-to-use interface for the apps, applying the text to speech and audio features, and an administrator setting for parents and teachers (they are required to create a username and password for running VICARA). The latter was intended to prevent the risk of losing the stored data. We also created the main features in this communication aid, namely sentence construction and sharing pictures to text through messaging platforms. For the latter stage, we plan to include an archive of free copyright PECS (Picture Exchange Communication System) image database. The sound feature was automatically embedded using Google text-to-speech data for better sound and pronunciation quality.

User Experience with VICARA

To assess the user experience with VICARA (the beta version), a feedback form and a set of questions related to the users' background and experience in using VICARA were sent to 19 participants who agreed to try the beta version.

Four participants canceled their participation due to technical difficulties in downloading and using the apps. In the end, only seven participants returned their feedback forms and gave their responses, as concluded in the table below.

TABLE 2 . User experience with VICARA

User experience	Responses
Familiarity with AAC	- Nearly all participants do not have experience using AAC; only one participant is familiar with AAC (using ProLoquo2Go)
Attractiveness	- The colour palette in the apps is attractive, but the design (layout, icons) can use some improvements - Game feature in the apps is considered fairly important - VICARA is more attractive to beginner users than advanced users - Difficulties in collating cards to create a sentence and the quality of voice feature should be improved
Learnability	- Half of the participants (parents and teachers) need training and tutorial to use the apps for their children/students - In general, participants need 30-60 minutes to learn about the basic features of the apps - The design and interface of the apps are not causing any difficulties to learn.
Operability	- Some features (creating cards, archiving and composing cards) are difficult to navigate - Sounds and text input features are important - Some participants perceive the 'send message' feature as important
Understandability	- The symbols, icons, and instruction for using the apps are easy to understand

The result shows a positive review of the app attractiveness despite some necessary improvements to the visual design. The game feature is perceived important by some, but not all participants. The strength of VICARA, according to the participants is the simplicity as a communication aid and learning tool using picture cards. The drawbacks include the low-quality sound, difficulties in composing cards, and less entertainment. The learnability aspect is viewed as fairly good as participants only need 30 to 60 minutes to learn all the features, and the apps design and interface are not proven to be obstacles. Despite that, training and tutorial are still needed particularly for utilizing VICARA as a learning tool to develop the communication skills of the children/students.

Nearly all participants do not experience difficulties in operating the apps in general, although they still face challenges in operating particular features, such as making cards, making card collection, and composing cards. Sound and text input features are perceived essential, as well as the additional feature for sending a message. The understandability aspect is viewed as fairly good; only one participant reports that the instruction is difficult to follow. All participants agree that the symbols and icons in the apps are easy to understand. We also ask the participants to provide further suggestions and their availability to involve in the next trial of the revised version of the apps. They recommend improving the interactive aspect of VICARA by adding more advanced feature, clarifying the composing/collating card feature, making the apps available in a different operating system, and keeping the apps in the simplest form. Another notable suggestion include providing a default picture cards' collection and tutorial for using the apps.

CONCLUSIONS AND RECOMMENDATIONS

There is a need for AAC apps like VICARA to facilitate the communication needs of autistic children and students in Indonesia. However, the parents and teachers still have limited knowledge of navigating the app. Ideally, AAC apps should have Indonesian language option, use an instructional communication system/command, and provide a repetitive teaching and reward system. Moreover, AAC apps should include a text-to-speech feature that supports the

children or students communication skill at home and school; therefore, the app should be incorporated into their daily activities. The role of parents and teachers is critical to assist and train their children or students for using the apps.

Based on the four elements in the user experience – attractiveness, learnability, operability and understandability elements – VICARA in beta version 2.0 is assessed fairly good. Some improvements may include additional interactive features to increase attractiveness, a video tutorial for the first-time user, and some features enhancement. Individual differences in skills, special needs conditions and age are critical aspects to be considered in developing VICARA, as well as the importance of implementing instructional and structured communication systems like PECS (Picture Exchanging Communication System).

The recommendations on future development of the apps and the next stage of research are as follows:

1. A more in-depth insight into the user experience, a standardized observation or experiment methods are essential for the next stage of the research. Involving different group with a higher level of familiarity with AAC apps is highly recommended.
2. Further research on user experience related to user interface may benefit the improvement of design and interface elements to suit the specific needs of autistic users. Some users may face different sensory problems (e.g., visual sensitivity, tactile difficulties, etc.). Tutorial video and simple guidelines are also needed for supporting users to learn the apps. In addition, a default collection of PECS-based pictures could be provided to enhance the experience of using the apps as an assistive communication tool.

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