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Impact of 'SWAR' an Augmented Mobile Application to Enhance Functional Communication for Children with Autism-A Case Study

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Abstract: **Trending in communication through the availability and accessibility of mobile applications has become a routine of the day. The interesting part of mobile applications is most of them are available free of cost, provided an individual has a smart phone with internet connectivity to download and access it irrespective of the operating system suitable to procure which best suits to their mobile phone. Most of the applications used for social communications are for mainstream population. Research has proven, persons with autism are gadget friendly learners, but amongst ASD (Autism Spectrum Disorder) the individuals with low functioning abilities possess profuse challenges in communication and found to be non-verbal, SWAR is an augmented mobile Application which is tailor made for persons with autism who have limitations in verbal communication. A case study method was used to analyze the features of SWAR. The sample consisted of two participants with autism who were taught through SWAR for enhancing functional communication. The results show that there was an improvement in functional communication. The implications of findings are further discussed.**

Keywords: **SWAR; Augmented Mobile Application; Functional Communication; Children with Autism.**

1. INTRODUCTION

Persons with autism can experience limitations in their intellectual functions, social behavior and sensory area, adaptive behaviour and in the language they use verbal and non verbal, in both semantic and pragmatic aspects. Autism is a spectrum condition, which means that, while all people with autism share certain difficulties, their condition will affect them in different ways. Amongst the spectrum of children having autism those with low functioning abilities possess profuse challenges in communication and found to be non-verbal. In today's world mobiles are playing an instrumental role in social communication, most of the mobile communication applications are designed to the mainstream population. The use of mobile devices for persons with Autism offers the possibility of using applications that help the user to communicate in different environments and places. These devices also allow families, educators and professionals to intervene in the educational process. Their portability also enables users to perform learning activities anytime, anywhere. In addition, the connectivity between mobile devices is very useful in performing communication and learning activities in a group setting, helping the integration of the user in their social environment, Rodriguez-Fortiz..M.J, Fernandez-Lopez A and Rodriguez M.L. 2011.

About 25%-30% of children with Autism Spectrum Disorders (ASD) could be considered to non-verbal Autism. Some have ability to speak, but lack the ability to use language in a meaningful way, others cannot use spoken language, but are able to communicate with written or typed language, sign language, picture cards, or digital communication devices. C-DAC Centre for Development of Advanced Computing Bangalore in collaboration with National Institute for the Mentally Handicapped NIMH Hyderabad, has designed an application for persons with Autism who are non-verbal. This application is named as 'SWAR', means voice. This application is designed for persons with Autism who are non verbal to alternately communicate using mobile.

2. DESIGN & COMPONENTS OF 'SWAR-APP'

SWAR –Speak for me, is a mobile based communicator application for children with Autism spectrum disorders (ASD). In this App, a child can tap on the image present on the screen which will speak out the desired need, action or feeling the child is intending to communicate. It adapts the methodology of Picture Exchange Communication System (PECS), it basically converts the typed text to speech and the user can communicate with it.

3. TECHNOLOGIES USED IN SWAR APPLICATION

SWAR-speak for me, is based on latest technology with Android operating system 4.0.4., text to speech and PECS.

TABLE 1: TECHNOLOGIES USED IN SWAR APP

Operating System	Android 4.0
Feature	Text to speech, when the child taps on the icon it speaks.
Teaching Method for Autism	Picture Exchange Communication System(PECS).
Special feature	Take picture of any object and insert into gallery, enter text for augmented communication.

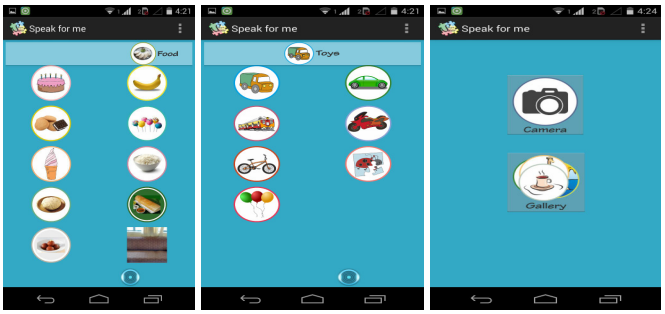

FIG. 1: SCREENSHOTS OF SWAR APPLICATION

4. METHODOLOGY

1. RESEARCH DESIGN: Case study method was used in the present to enhance functional communication using SWAR speak for me application.
2. SAMPLE: To study the effectiveness, two participants with Autism who are nonverbal, are taken from a special school. The participants were diagnosed as having Autism with communication problems on ISAA (Indian Scale for Assessment of Autism). Purposive sampling technique was used. Two participants attending special education therapy class in 1:1(teacher student ratio) for 40 minutes at special school were taken for the study.

   The researcher identified MDPS (Madras Development Programming Scale) a Criterion Referenced Tool to assess the communication needs of the participants. The Receptive Language and Expressive Language abilities in MDPS were assessed among 5 children (children ASD who are non verbal) attending special education therapy class, 2 participants were selected among the 5 as these children had greater communication challenges comparatively than others.

TABLE 1: SAMPLE CHARACTERISTICS

Case 1 Name and Age Diagnosis Communication Level	*Shourya; Age 4years Autism Low Functioning Non-verbal uses gestures
Case 2 Name and Age Diagnosis Communication Level	*Pranav; Age 5years Autism Low Functioning Non-verbal uses gestures

(Names changed in order to maintain anonymity)*

3. TOOLS AND CHECKLIST USED

- ISAA (Indian Scale for Assessment of Autism – standardized tool).
- MDPS (Madras Development Programming Scale popular special education checklist in India)
- Assessment checklist for Functional communication (developed by the researcher for conducting the experiment). This checklist contains 15 target words for the selected participants chosen for the study. This checklist has been give for 5 experts (2 Special educators; 2 Speech Therapists; and Psychologist) in the field of disability rehabilitation working for children with Autism.

4. TRAINING SETTING AND SESSIONS: The intervention program was conducted for 20 sessions for 2 participants in 1:1 ratio. The duration of each session was 30 minutes. A pre-test and post test was taken before and after intervention sessions. Daily the special educator and the parent in school and sometimes in home trained the participants to use the mobile app 'SWAR-speak for me' to communicate their needs.

5. MATERIAL USED: SWAR - speak for me a free application for non-verbal children with Autism designed by CDAC (Centre for Development of Advanced Computing Bangalore) in collaboration with NIMH(National Institute for the Mentally handicapped Hyderabad)was used.

Smart phone's Galaxy S4, Android 4.2.2 (Jelly bean), camera 13 Mega pixel and Samsung Galaxy star with Android OS, v 4.1 (Jelly bean) 2.0 MP camera features were used in for training.

6. PROCEDURE: The instruction was given in clinical therapy session at Sudharshan Special School and the family members implemented the intervention in home. The researcher demonstrated the usage of the application to the special educators and parents of the participants. The investigator explained the coding system to the special educators to be entered in Functional Communication Checklist for monitoring the progress of the participants in communication. The special educator demonstrated and explained in simple steps to start the application, how to tap the icons in SWAR, later the participants were explained how to go to the categories and communicate their needs. Several repetitions with systematic practice training were given over 20 sessions.

7. DATA COLLECTION: The keys for scoring are for the functional communication checklist. Each item is scored by the Special Educator for every 5th session across 20 sessions of training, by observing the child's progress level. A pretest and a post test were taken before and after the intervention sessions. The raw scores and the pre and post test mean scores

in functional communication of the two participants are tabulated in the table and graphically represented to show the progress and the improvement in expressing their communication needs.

Key for scoring

Independent-4; Verbal Prompt - 3; Gestural Prompt – 2 Modeling- 1; Dependent -0

TABLE2: MEAN SCORES OF FUNCTIONAL COMMUNICATION AMONG 2 PARTICIPANTS THROUGH SWAR-SPEAK FOR ME APP

Case	**Pre-test**	S5	S10	S15	S20	**Post-test**
1	**17**	26	29	32	37	**41**
2	**19**	26	28	36	41	**44**

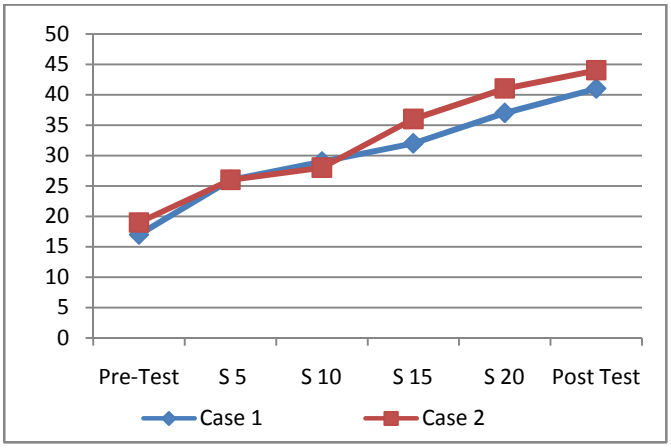

FIG. 2: GRAPHICAL REPRESENTATION OF PARTICIPANTS IMPROVEMENT IN FUNCTIONAL COMMUNICATION AFTER USING SWAR-SPEAK FOR ME APP

5. RESULTS AND DISCUSSIONS

Table 2 and Figure 2 depict progress in functional communication among 2 participants with autism who are nonverbal, before using the SWAR application the special educator, instructors and the parents used the conventional method of teaching through exchanging cards PECS (Picture Exchange Communication System). The same method was used in the SWAR application; this reduced the tedious task of preparing the flashcards and picture cards for special educator and instructors. Case 1(Shourya) was having a pretest mean score of 17 before intervention with the training in his functional communication. Through training in SWAR application Master Shourya is able to communicate his needs he was asking for biscuits, roti, toys of his choice thus reaching to 41mean score in the post test. Case 2(Pranav) was having a pretest mean score of 19 before intervention with the training in his functional communication. Through training in SWAR application Master Pranav is able to communicate his needs he was able to tell colours red and blue, asks for toys, tells animals like Elephant, Giraffe etc., of his choice thus reaching to 44 mean score in the post test. Bothe the participants are able to select the icons and press the icons which they would want. This involved rigorous training for the participants sometimes during the intervention the participants did not press the correct icon, as the training progressed the more number of the correct responses were taken into consideration to record the progress. The SWAR application has a special feature which makes it distinct from other application. It has camera option with which we can take the picture of any object and upload it in to the gallery. Next we can enhance by entering words and sentences so that speech is augmented this gives the learner and the instructor to have wider choice of learning.

6. CONCLUSIONS AND FUTURE IMPLICATIONS

This application is applicable to Android Operating System Smart Pones only. Similarly Mobile Applications for other Operating Systems i.e. windows, blackberry and apple phones which are popularly used by the mobile users can adopt the scientific teaching methods for children with Autism and other special needs for designing applications. In the present study only 2 participants for a shorter duration were taken due to the time constraints, in near future it can be used on a large sample for longer duration. The application needs training and awareness among special educators, instructors and parents, though the application is free of cost it demands internet connectivity to download and a smart phone with Android OS, which the economically backward parents may not afford it, more so the operation techniques involved in using the application along with smart phone may not be conversant for some of the parents having children with Autism. Various other Educational Mobile applications to teach social skills, behavioural aspects, personal skills, academic skills, sensory skills and recreational skills in special education for children with Autism and other special needs can be designed in future. This is the preliminary step in the direction of educating children with Low Functioning Abilities Among Autism Spectrum Disorder (ASD), hopefully technology could be put to better use

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REFERENCES

[1] Mary Randolph, "Autism: A Systems Biology Disease", First IEEE International Conference on Healthcare Informatics, Imaging and Systems Biology, San Jose CA, July 2011, pp. 359-366, doi:[10.1109/HISB.2011.13].

[2] Myers S.M.; Johnson C.P., " Management of children with autism spectrum disorders", Pediatrics, November 2007, Vol. 120(5), pp. 1162-1182, doi:[10.1542/peds.2007-2362].

[3] Helena Song Sook Yee, "Mobile technology for children with Autism Spectrum Disorder: Major trends and issues", 2012 IEEE Symposium on E-Learning, E-Management and E-Services, Kuala Lumpur, October 2012, pp.1-5, doi:[10.1109/IS3e.2012.6414954].

[4] Accessibility Adaptability Model for the Disabled (Annie Joyce V., K.Senthil Kumar, and B.S.Bindhumadhava) WORLDCOMP 2010, Las Vegas, USA.

[5] Helena Song Sook Yee, "Mobile technology for children with Autism Spectrum Disorder: Major trends and issues", 2012 IEEE Symposium on E-Learning, E-Management and E-Services, Kuala Lumpur, October 2012, pp.1-5, doi:[10.1109/IS3e.2012.6414954].http://en.wikipedia.org/wiki/JSON.

[6] Barrera, R.D., Lobato -Barrera, D., & Sulzer- Azaroff, B. (1980).A simultaneous treatment comparison of three expressive language training programs with a mute autistic child. Journal of Autism and Developmental Disabilities, 10, 21-37

[7] Reynhout, G., & Carter, M. (2006). Social Stories for children with disabilities. Journal of Autism and Developmental Disorders, 36, 445-469.

[8] Vullamparthi A.J, Mallaya, D.D, Chandrasekhar, S, & Nelaturu, S.C.B .Assistive Learning for Children with Autism using Augmented Reality" The 5th IEEE International Conference on Technology for Education, 2013, Indian Institute of Technology, Kharagpur, India.

[9] Mncil, G.R, Haydon, T. & Whitby., P (2009) "Differentiated Effects of Paper and Computer-Assisted social stories on Inappropriate Behavior in Children with Autism.". Focus on Autism and other Developmental Disabilities. 24(4), 205-215.

[10] Rao, S. M., & Gagie, B. (2006). Learning through seeing and doing: Visual supports for children with autism. *TEACHING Exceptional Children*, *38*(6).

[11] Mobile Communication and Learning Applications for Autistic People (2011), Autism spectrum Disorders-From Genes to Environment M.JA, Fernández-López, and M.L. Rodríguez, book edited by Tim Williams, SBN 978-953-307-558-7.CITIC-UGR. University of Granada., Spain.