"ISPEAK"- AUGMENTATIVE AND ALTERNATIVE COMMUNICATION FOR CHILDREN WITH COMMUNICATION DISORDERS.

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ABSTRACT

Background and Objectives : *Augmentative and Alternative Communication (AAC) includes all forms of communication (other than speech) that are used to express thoughts, needs and ideas. People with severe speech or language difficulties rely on AAC to supplement existing speech. This increases social interaction, school performance, and feeling of self esteem. Studies in the past have mentioned greater results in the usage of AAC. This study focused on the development of a prototype AAC "ISpeak" which is cost efficient and can be easily maintained.*

Method : *This device was administered on forty children with various communication disorders and whose language age ranges from two to four years. The materials like controller board, voice board, wires, push buttons, mica sheets, coloured naturalistic pictures and speaker were used to device ISpeak. It was used to assess the accessibility and easy usage of the device.*

Results : *Five domains such as water proof, durability, proximity, power supply, stimuli were tested and positive results on all five domains were obtained.*

Key words *: Augmentative and Alternative Communication, Communication disorders, ISpeak.*

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INTRODUCTION

"Alternative and Augmentative Communication (AAC) is defined as an area of clinical practice that attempts to compensate (either temporarily or permanently) for the impairment and disability patterns of individuals with severe expressive communication disorders".[1] AAC system can be broadly divided into two types: aided and unaided communication systems. The unaided communication systems are those which rely on the user's body to convey messages like gestures, body language, and/or sign language. The aided communication systems are classified as low tech AAC devices, which range from papers to picture cards. They are often less intimidating for the listener and are lighter in weight to be carried anywhere. The lack of speech output proves to be a big restriction for some users of low tech device. High tech AAC devices, ranges from communication boards to devices that produce voice output, programmed to produce different spoken languages. There are high chances of breakdown or damage of these devices. A variety of AAC devices are available in the market, that is both high and low tech. One such device is "Avaz" which is a high tech AAC, available in India. An individual has complex communication need and are limited in using their vocabulary in a range of settings, it is essential to utilize a well thought-out system, which is tailor-made for the individual's needs and environments.[1] Currently limited materials are available which could be tailor made for individual child's need.

Children with Cerebral Palsy, Mental Subnormality, Down's Syndrome, Autism Spectrum Disorder, Childhood Apraxia and other childhood communication disorders are beneficial with the use of an AAC device.[2] 68% children with communication disorders are benefitted from the use of AAC in United States. It was also observed that over 11% of children enrolled in special education require AAC.[1] Children with Autism Spectrum Disorder have shown impact on communication using AAC applications. Also, it is important to carefully design the AAC depending on various communication needs. The accessibility of these applications by social and economically backward regions is limited.[3] Though the current scenario of our country is marching towards technological developments in this field, language and social behaviour of children with communication disorders will be enhanced through the usage and training of AAC.[4] Thus, there is a need to develop an AAC system which is cost efficient and easily procurable by all sects of the society. The aim of this study is to develop a high tech AAC device which is cost efficient and has low maintenance.

MATERIALS AND METHODS

Material development

The material was developed based on reviewing various literature search and different models of AAC available in the current market/scenario in India. There are different categories of AAC, from low tech to high tech devices. This study focussed on development of a prototype AAC which was tailor-made for an individual child's communication needs. The ISpeak was constructed using electrical materials such as wires, integrated circuits, a voice board and a controller board. The device was developed using coloured pictures of basic lexical

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categories and verbs in the form of stickers of 2B size. These materials were procured and assembled with the help of an electronic professional. A total of six pictures were uniformly arranged on the AAC board. The board was fixed with eight push buttons for each stimuli present. Each button corresponded to the respective stimulus linked to the voice output. There were a total of sixty two speech stimuli which was recorded using a female voice. The board has a microphone that can record any new vocal stimulus for further modification in vocal output. Also, a speaker was mounted on the device for vocal output. The power supply for the device was provided through an adapter. The sharp edges of mica sheets were covered with colourful tapes to avoid injuries while using the AAC board (Fig.1).

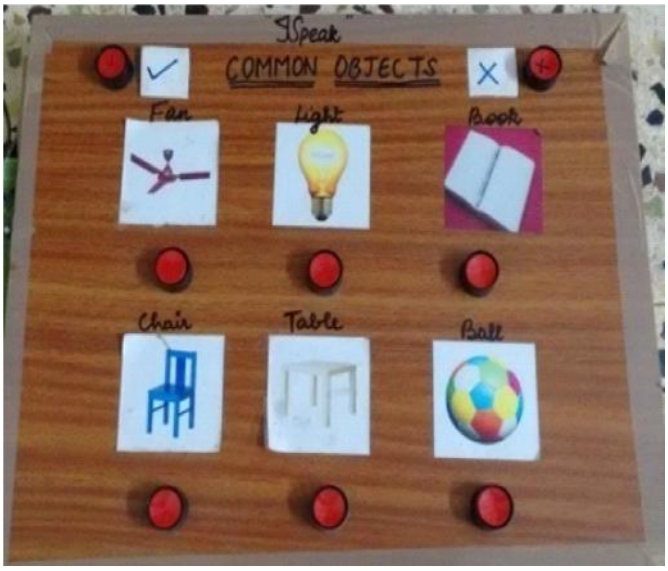

Fig.1: Assembled *ISpeak*

A pilot study was done on five children between the age range of 6 - 7 years with the language age of 2 - 3 years (Mean age: 2years, 5months) from an early intervention centre. Prior permission from the school head was obtained. Parents were explained about the study and informed consents were obtained. All these children had language delay with no problems in locomotion. All children had Tamil as their native language (Table 1).

Each child was allotted three sessions of training. On the first session language evaluation for each child was done using Assessment of Language Development (ALD).[5] AAC protocol was administered on each child for the following skills: sensory skills, communication skills, physical abilities and positioning. Based on this evaluation, the pictures were selected and were tailor made for every child. In the second and third sessions, the children were trained individually to operate the device. Since these children were already using a low tech AAC, it was easy for them to adapt with the procedure. They were trained to press the appropriate push button when asked for the target object. The following domains like

Table 1: Participant details of pilot study

S.No	Participants	Chronological age/ sex	Language age	Provisional diagnosis
1	Child 1	6/M	2;2	Intellectual Disability
2	Child 2	6;3/F	2;6	Autism Spectrum Disorder
3	Child 3	6; 7/M	2;4	Pervasive Developmental Disorder
4	Child4	6;5/M	2;2	Attention Deficit Hyperactive Disorder
5	Child 5	6;9/F	2;9	Intellectual Disability

easy usage, proximity of pressing the buttons, portability, weight of the device, short circuiting, waterproof, power consumption, were tested and the results were noted. Most of the domains showed positive results. Few modifications such as decreasing the size of the board, placing an inbuilt speaker were added in the device.

PROCEDURE

Participants

Thirty five children with language delay (10 children with Autism Spectrum Disorder, 10 children with Intellectual Disability, 10 children with Down's Syndrome, and five children with Cerebral Palsy) were included in the study. These children were selected between the age range of 6 and 7 years with the language age ranging from 2 to 4 years from an early intervention centre. Prior permission from the school in charge was obtained. Parents were explained about the study and informed consents were obtained. All children had Tamil as their native language (Table 2).

Table 2: Participant details

Sl.No.	Disorders	No. of participants
1	MRELD* with Autism Spectrum Disorder	10
2	MRELD with Intellectual Disability	10
3	MRELD with Down's Syndrome	10
4	MRELD with Cerebral Palsy	5

***MRELD: Mixed Receptive and Expressive Language**

Assessment

The AAC administration was done in the same manner as that of pilot study. All the sessions were video recorded using Samsung SRD - 1670 DC. The parent and the clinician were present during the assessment. Each session lasted for 45 minutes. The assessment was carried out on comprehension of common objects. Children were trained to comprehend the stimuli and how to use the device for eliciting a response. After this training session, the stimulus was presented to the children and they pressed the respective buttons. Domains like water proof, durability, proximity, stimuli and power supply were tested and the results were noted.

Analysis

All the sessions were video recorded and were individually analysed. Descriptive statistical analysis was used and the results were noted for each domain for different communication disorders.

RESULTS

Domain specific observations

On observation for waterproofing, 88% of children had no issues. None of the children had any problem with short circuiting. Under the domain, durability of the material, 93% of the children had good response. None of them had any issues in the power supply to the device. In proximity of pressing the buttons, 85% of them showed good responses. All of them perceived the stimuli appropriately, since coloured naturalistic images were used.

Disorder specific observations

Three children with Intellectual Disability had drooling on the device, which was wiped off easily with the tissue. Four children with Autism Spectrum Disorder pushed the AAC board down the table three times and the device remained sturdy. Two children with Cerebral Palsy showed excellent proximity of pressing the buttons since the buttons had boundaries and the click sound when pressed gave an auditory feedback for accuracy.

Maintenance of the device: the device can be easily maintained by replacing the buttons when they are damaged by procuring the buttons available in the market. In case if the circuit in the device breaks, it can be fixed by an electrical or electronic person. The stimuli can be pasted on the device when they are detached. New vocal stimuli can be added at any point of the time by the caretaker.

DISCUSSION

This study focused on developing a prototype AAC ISpeak. The results revealed that this device was easily adaptable by children of different communication disorders. Since coloured and naturalistic pictures were used, children were interested to participate in the session. Children were able to perceive coloured images quicker than black and white images when arranged before them.[5].

I Speak produces speech output which provided a positive reinforcement for these children. It also has an added feature of recording a new voice, based on the child's need. It was observed that when there is a speech output in a device, there is a reduced demand for motoric activities. Hence, it results in reduced stress level on all systems and increased speech production.[6]

The device had buttons of same colour and the proximity of reaching the switches showed good results. The buttons also provided a tactile feedback for all children due to boundaries in the switches. The size of the switch shouldn't be too large or too small. The user should feel the touch of the switch, the pressing sound provides accuracy for user and colour of switch should be same throughout the device.[7]

Some of the issues related to ISpeak are that, it requires continuous power supply and the portability of the device which hindered the usage of device in different environment. The children needed caregiver's assistance to switch on the device. These can be modified in future research. Thus, it can be used as an effective clinical tool for treating children with communication disorders.

CONCLUSION

The high tech AAC ISpeak can be used as an intervention tool for various communication disorders. It is useful in assessment and intervention of children with non verbal communication. A longitudinal study on a large population with different communication disorders will provide the efficacy of usage and success in the intervention.

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