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## Reduction in Behavior Problems with Increase in Communication Skills Through Augmentative and Alternative Communication among Special Needs Children

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### Abstract

Cerebral Palsy is one of the most prevalent physical handicaps in children. Sensory-motor problems such as communication and cognitive impairment are major symptoms of cerebral palsy. In Pakistan, lack of interventions for cerebral palsy children exists due to low health budget. Consequently, CP children are facing difficulty in having the treatment. The present study aims to implement an augmentative and alternative communication (AAC) approach among nonverbal children with cerebral palsy living in Pakistan. Past research evidence has revealed the co-morbidity of communication problems with behavioral issues among cerebral palsy children. Keeping in view, the present study also aims to examine the behavioral issues of nonverbal children with cerebral palsy. For the said purpose, a pilot study employed the interventional research design (pre and post assessment) which was conducted in Pakistan. 10 nonverbal cerebral palsy children were selected from three different special needs centers by using non-probability sampling technique. Repeated measures, pre and post assessment t-test analysis was conducted to assess the impact of augmentative and alternative communication (AAC) intervention on the communication skills and behavioral problems of the participants. The results showed that AAC intervention has significantly improved the communication skills ( $t = -11.09$ ,  $P < .001$ ) and reduced the behavioral problems ( $t = 2.55$ ,  $P < .005$ ) of the participants which were nonverbal children with cerebral palsy. Thematic analysis on the open-ended questions from Pragmatic profile reported that participants have started to enjoy indoor and outdoor activities. After the intervention, significant improvement in communication has been observed in participants when they present needs/desire. Thus, this study recommends that implementation of AAC on cerebral palsy population would be effective in improving communication skills and reducing their behavioral problems.

**Keywords:** Augmentative and Alternative Intervention, Communication Skills, Behavioral Problems, Cerebral Palsy

## Introduction

Children with Cerebral Palsy (CP) experience difficulties in utilizing full sign language as an effective form of communication depending on the severity of their motor disability, but they can utilize a range of approximation signals in addition to other modes of communication. Symbols are representations of language in the form of graphics or objects. Pictures and photos are two examples of symbols used by children with CP, with orthography being the most advanced visual symbol system (Clarke et. al., 2008). Augmentative and alternative communication (AAC) incorporates a range of approaches and technologies to meet the requirements of persons with speech and communication difficulties. Manual signs, communication boards, speech-generating devices, and other electronic and non-electronic aids are among these items. Manual signs and symbols are also a type of AAC. An AAC device can assist a child with communication difficulties in articulating fundamental desires and requirements, as well as communicating with both familiar and new people. A person who is conversant with a technology is more equipped and more assured when interacting with an AAC participant. Therapy providers, parents, teachers, and other peers should think about training the programmers when engaging with people who use AAC systems (Mackenzie, 1984). In early history, speech and language services for children with cerebral palsy were extremely limited. Routine visits for physical therapy and occupational therapy were experienced by children with cerebral palsy. In the beginning of early first year of life, children often undergo medical or surgical procedures (Cooper, 2001). Parents and professionals prioritized medical procedures over communication intervention. Marshall and Goldbart (2008) found that in UK parents stress on communication more than other issues their children were facing. Pennington and Noble (2010) interviewed parents of pre-school and found that instead of making communication a priority, they preferred to wait and see if communication developed without intervention. Conversely, other parents saw that in addition to physical skills, communication also needs to be a top priority. AAC addresses the expressive, supportive, and alternative language groups.

Those children who belong to expressive language group category lack understandable speech. These children face a significant gap between their capacity to absorb language and their capacity to express themselves. Throughout their lives, these children are likely to employ AAC methods and tools as part of their overall communication repertoire.

Children in supportive language group, on the other hand, may receive AAC assistance in the near term to preserve and develop the communication skills, with the assumption that speech intelligibility will improve with intervention and maturity. Children in this category may, only utilize AAC devices in certain interactional circumstances when their use of speech is ineffective.

Finally, the alternative language group of children those experiencing substantial problems both in expressive and receptive language (e.g., cerebral palsy children), these children specifically encounter difficulties. They face difficulties in expressing themselves in a conventional way. AAC methods and tools are designed to help them communicate as effectively as possible throughout their lives (Clarke et. al., 2008).

Present study addresses Clark's theory of language use (1996) for the study of conversations between the augmented speakers and the addressees. It emphasizes on how common ground that is shared meaning, is achieved, under the real time constraints the processes of grounding utterances and how the grounding process affects the media

characteristics of devices. An analysis of grounding which is a joint action, will be applied to the Voice Output Communication Aid (VOCA) and word-board, directed conversations to demonstrate the participants conversation patterns around particular media restrictions and resolve the problems related to communication. The author of the article states in a single descriptive framework this device-mediated model of communication performance or some diversity of it has the capacity to merge many individual findings of the research (Geytenbeek et. al., 2011). Ruler (2018) explained that mediated model of communication helps various participants in an activity through which they gradually build a set of word definitions, object references, and actions that identify their membership in that group. Common ground provides a logical foundation for communication via language that fosters efficient sense making in an almost imperceptible way (Monk, 2013). In the present study Clark theory of common ground and related evidence from the existing literature assist to build theoretical framework of present study as this study will examine the use of device-mediated model of communication to enhance the communication in non-verbal cerebral children.

The present research also focuses on the behavior problems faced by the nonverbal children with cerebral palsy. As these children cannot convey themselves verbally therefore, they face behavior problems. To curb these behavior problems augmentative and alternative communication mode is given to these children so that they can communicate themselves. Therefore, bringing Skinners operant theory (1948) into the play. According to the Skinners operant theory a behavior could be reinforced or diminished with reinforcements or rewards and punishments respectively. The principles of learning were first explained by the Thorndike (1932). In the mid of 19 century Skinner worked on his learning fundamentals theory and stated that all the human behavior is the result of the operant conditioning. Skinner's research of verbal behavior was studied for its applications in context of teaching communication skills to children with disabilities. (Carnett et. al., 2019). The AAC mode of communication which would prove to be a positive reinforcement for the nonverbal children with cerebral palsy who had no mode of communication to be able to communicate. It would consequently prove to enhance the communication skills of the nonverbal children with cerebral palsy. This enhancement in the communication skills of the children would help in diminishing the behavioral problems. Due to their inability to convey their needs verbally to their caregivers these nonverbal children exhibit aggression in form of hitting, biting, throwing things and yelling.

Augmentative and alternative communication (AAC) is considered best for the individuals who have disability in communication as it can bring effective results. However, the positive results are not easier to achieve as there may be difference in language models, communication opportunities, and desired intervention outcomes in the intervention process. According to ASHA (2004), the main purpose of augmentative and alternative communication (AAC) is to facilitate individuals with means of communication so they can actively participate in life's events.

Argumentative and alternative communication is a mode which helps people with speech disability. For children with cerebral palsy, establishment of AAC mode is very important to develop and support a child's communication skills (Bondy et. al., 1994; Clarke et. al., 2012). AAC can be both aided and unaided communication such as picture exchange communication system, topic supplementation and gestures. Unaided communication comprises of facial expressions, hand movements, sign language and body positioning (Bondy et. al., 1994).

Aided communication or high technology AAC systems require external or additional assistance outside of the speaker's body. It includes electronic devices that allow to store or retrieve information when needed. Over the years AAC devices have been used to treat mental disabilities that affect speech and studies have recommended this method for mentally disabled people. By identifying an AAC method which would be most effective to an individual with mental disabilities, their social interactions can be enhanced (Goodman, 1997)

Some studies explored listener attitudes towards individual who use AAC strategies which involved speakers with dysarthria due to cerebral palsy and traumatic brain injury.

McNaughton and Light (2013) observed the benefits of tablet in many people like increasing social acceptance, increasing awareness of AAC technology, and functioning at higher level. Roche et al (2014) aimed to increase speech production with two boys who had a neurodevelopment disorder. The researchers noticed that the boys began to utter single words relevant to their request. This was the first study in the field of AAC to withdraw effective results in increase in natural speech in participants using SGD. Grove, O'Sullivan, and Rodda (1979) conducted a study to determine whether total method (combination of speech, lip reading and manual signing) was more effective than oral methods (speech and lip reading). They found that by using the participants' preferred method, both methods are equally effective. Each of these studies showed that AAC as an effective method for individual with mental disorders.

Researchers explain that introducing AAC to children with cerebral palsy is challenging but necessary to optimize communication skills (Millar et. al., 2009). Introducing AAC in young children is important as it does not seem to change the development of speech at an early age (Jeffery et. al., 2009). The use of AAC and high technology has risen over the last three decades due to the social acceptability and affordability of these devices (Schlosser et. al., 2008). In Pakistan, being a developing country resources and treatment access for the children with special needs is limited. Therefore, this study aimed to examine the impact of AAC intervention on the communication skills and behavioral issues of non-verbal children with cerebral palsy. This study will help to introduce implementation of AAC approach within our community for the enhancement of communication skills and reduction in behavioral problems of children with cerebral palsy.

Keeping in view the evidence from existing literature, the present study was aimed to implement the AAC intervention among cerebral palsy children living in Pakistan. The study had examined the impact of AAC intervention on communication and behavioral problem of CP children. It was hypothesized that AAC intervention will improve the communication and reduce the behavioral problems of participants.

### **Methodology**

The present pilot study was interventional research with Repeated Measure Pre and Post Assessment research design. Pre and post assessment design was used on the single group of participants, as the study aimed to explore the impact of AAC intervention on the communication skills and behavioral problems of nonverbal children with cerebral palsy. Informed consent, confidentiality, debriefing research ethics were considered during research.

## Sample

The sample of the study was selected from the cerebral palsy population of Rawalpindi and Islamabad. Rawalpindi is the fourth largest city of Pakistan and Islamabad is the Capital of the country. A non-probability convenience sampling technique was used. The sample for the present pilot study consisted of 10 participants (6 boys and 4 girls) with the mean age was 8 years. The intervention was given to participants (10 CP children) while the responses on questionnaire were recorded from parents (mothers).

The sample size for the pilot study was calculated using G-power software (Faul et. al., 2007) Based on the 95% confidence interval along normally distributed data (Mean = 0, Standard Deviation = 1) the calculated sample size was 10 participants. This sample size ensured the 80% power of the study. The criteria for choosing the participants are cerebral palsy children from 5 to 10 years of age were included in the study. Cerebral palsy children who were never exposed to any speech therapy and AAC were included in the study. Cerebral palsy children above 10 years of age were not included in the study. Children with other disorders and cerebral palsy children who have developed speech were not included in the study. The children who were exposed to speech therapy and AAC before were not included in the study.

## Research Instruments

Two instruments and one intervention were used in the present study.

The strength and difficulty questionnaire measure the emotional symptoms, conduct problems, hyperactivity, peer relationship problems and pro-social behaviours of children. SDQ has five subscales i.e., emotional symptoms scale, conduct problem scale, hyperactivity scale, peer problem scale and pro-social scale. Item scoring is based on likert scale ranging from 0 to 2. High score on the scale represents the prevalence of high behavioural issues among children.

The pragmatics profile for the people who use AAC instrument was used to collect information about a child's communication skills. Profile consists of close and open-ended questions. This profile focused more on child's communication level in context of everyday life. The Profile was based on the pragmatic approach to understanding language which emphasises on how communication is achieved, how language is used to communicate a variety of intentions, the related needs of the listener, and how children participate in conversation and discourse.

The intervention of the study is a tablet of 9 inches where a communication application is installed. The application has got icons on which the real time pictures of the needs of the children could be mounted. The pictures are the ones which are the objects which the children use in the real life. Like the picture of the glass, plate, spoon etc. Behind the picture you can record the voice stating out the sentence like, 'I want water' for the glass icon.

Pictures on which the children were given training were:

Glass for I want water

Plate with the child's favorite food for I am hungry.

Toilet seat for I want to go to the washroom.

Picture of the child raising the hands high above for carry me.

Picture of the child's favorite cartoon for I want to watch the cartoon (name of that cartoon)

Picture of the mother for where is mama?

Participants were given training on the intervention for eight weeks. They had attended the training sessions three days a week. Their parents were also trained to help them use the device. The devices were every child's personal device. They took it home along with them. At home parents made/helped them use it. Parents were guided to make them use it when they want to convey the things which are mentioned on the device.

### Procedure

After preparation of the study protocol, sample size was calculated, and locale was identified. Further, baseline data (pre-assessment) was collected, and intervention was given. After completion of the intervention, post assessment was conducted.

Cerebral palsy (CP) children were given training for 8 weeks and they were exposed to the training intervention for three days a week. The AAC device was the child's own personal device. Therefore, the child was made to take it at home so that they could use it actively at home to interact with their communicative partner.

### Results

The internal consistency for the Strength and Difficulty questionnaire (SDQ) and the pragmatics profile for the people who use AAC, were calculated through alpha reliability coefficient. The results from the analysis are displayed in table 1. The results show that the overall reliability of all scales was good. The reliability of strength and difficulty questionnaire was found to be highly reliable. The internal consistency of the pragmatics profile was found to be moderately good as has been shown in table 1.

Table 1

*Alpha Reliability, Mean, Standard Deviation, Range, value for the SDQ and AAC at Pre-assessment (n = 10)*

Scales	Items	N	M	SD	A	Range	
						Actual	Potential
SDQ	36	10	46.80	8.29	.84	0 - 108	36 – 102
AAC	44	10	43.30	4.87	.78	1 – 88	15- 84

M=mean, SD=standard deviation, SD =Strength & Difficult Questionnaire, AAC= Pragmatic Profile

Paired sample t-test was computed to estimate the mean scores of pre and post assessment (T1 & T2). It was explored through the analysis that participants score on SDQ at time of post assessment T2 were significantly decreased ( $t = 2.6$ ,  $p < 0.01$ ) as compared to pre-assessment T1. Comparison between AAC scores at pre and post assessment showed that scores were increased from  $M = 43.30$  ( $SD = 1.63$ ) at pre-assessment T1 to post assessment T2  $M = 65.10$  ( $SD = 5.28$ ). The difference between scores was also statistically significant ( $t = 11.19$ ,  $p < .01$ ). Keeping the results in view we can conclude that AAC intervention effectively reduces the behavioural problems and improve the communication skills among the nonverbal children with cerebral palsy. The results from the paired sample t-test are displayed in Table 2.

Table 2

*Within group differences estimated from Paired Sample t-test (n = 10)*

Scales	Time 1		Time 2		T	sig	Df
	M	SD	M	SD			
<b>SDQ</b>	46.80	8.29	42.50	6.51	2.55	.005	9
<b>AAC</b>	43.30	1.63	65.10	5.28	11.19	.000	9

M=mean, SD=Standard Deviation, df=Degree of Freedom, \*\*\*  $p < .001$ , SDQ = Strength and Difficulty Questionnaire, AAC= Pragmatic Profile

### Thematic Analysis

The thematic analysis was conducted on the data obtained from open-ended questions of pragmatic profile. These questions were responded by the mothers of participants. Six steps procedures of thematic analysis (i.e., familiarizing yourself with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report) were followed. Following themes were generated.

Enjoying outdoor Activities, use of vocabulary while presenting need/desire, happy and pleasant mood, reduce screaming.

Majority of mothers have reported that their children enjoy going outside of home and showed interest in outdoor activities. Like going to the park, engaging with people etc. participants also started to use vocabulary when they need or want something. for example, "want water", "water", "give me" etc. most of the mothers have reported that significant change in participants mood have been observed while they are at home. Participants became happy and scream less after the intervention.

### Discussion

The results from the paired sample t-test revealed the statistically significant mean differences between pre and post assessment. Our study showed that participants have improved their level of communication after they have received the AAC intervention. A statistically significant ( $t = 11.19$ ,  $P < .001$ ) means difference between pre and post assessment finding of our study have proposed that AAC is an effective and applicable intervention for improvement in communication skills among cerebral palsy children. Our study results are consistent with the previous research findings. Research has conducted a case study of 6 years old girl suffering from spastic-athetoid cerebral palsy (Gossens, 2009). A case study has revealed that augmentative and alternative communication intervention was found to be effective in the development of symbolic communication and functional speech as well. Research conducted in the past has stated that AAC approach is a multidisciplinary perspective which effectively improves the communication, motor, sensory and learning perspectives of the children with cerebral palsy (Clarke et. al., 2012)

Along with the communication, our pilot study also aims to investigate the behavioral problems of participants before and after they receive intervention. Results from the paired sample t-test stated that participants have reported statistically significant ( $t = 2.55$ ,  $P < .05$ ) improvement that is reduction in the behavioral problems at pre and post assessment. These findings proposed that AAC intervention would be effective in reducing the behavioral problems among children with cerebral palsy. In consistent with our study results, a meta-analysis has revealed that AAC intervention is useful in reducing the challenging behaviors. They have analyzed 54 studies and concluded that AAC intervention is effective for eliminating the challenging behaviors and teaching new functional behaviors (Snell, 2013).

Writing about the challenging behaviors, past literature has stated that augmentative and alternative communication devices help children to communicate their needs and desires through functional behaviors (Lund et. al., 2016). Ultimately, it reduces and eliminates the challenging and maladaptive behaviors. Results from the thematic analysis supported our statistical analyses. Participants have improved communication skills and started to use in daily life. Their mood and screaming have reduced as reported by their mothers.

### Conclusion

Children with cerebral palsy experiences the difficulty in communication. Cerebral palsy is categorized as a developmental disorder with a variety of symptoms, such as motor and sensory problems, communication, and intellectual disabilities etc. They also show challenging and maladaptive behaviors. Augmentative and alternative communication intervention is an effective and applicable way to improve the symbolic and functional communication among the nonverbal children with cerebral palsy in Pakistan. The results of our pilot study have shown the statistically significant mean differences in participants communication skills and behavioral problems at pre and post assessment. These findings have concluded that AAC intervention helps in improving the communication skills in cerebral palsy children. The intervention is also useful in reducing the behavioral problems among these children. Participants' high satisfaction from the intervention assures the applicability of AAC approach within Pakistani community.

### Recommendations

The findings of our pilot study suggested that AAC intervention is effective and applicable for the nonverbal children with cerebral palsy in Pakistani community. Therefore, it is suggested that further research should be conducted on large sample size. Random and large sample size would help to generalize the results on the broader level in the community. Future research should include the young children and adolescents' sample that will help to see the effectiveness of intervention on each age category. To investigate the long-term impact of intervention on the communications skills and behavioral problems of these children follow-up studies should be conducted.

The results of the study are very encouraging. These results should further be taken up and implemented in clinical settings and hospitals where multidisciplinary team approach is applied to help out the special needs children. These results should be implemented in planning and designing the therapeutic interventions of these nonverbal children with cerebral palsy. Such interventions where AAC devices will be used to enhance communication skills and reduce the behavioral problems would prove to be a savior for the children with special needs.

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