Choosing Communication Book/Board as an Alternative Augmentative Device for a Child with Cerebral Palsy: A Single Case Study

Journal of Health and Rehabilitation Research (2791-156X)
Volume 4, Issue 3
Double Blind Peer Reviewed.
https://jhrlmc.com/
DOI: https://doi.org/10.61919/jhrr.v4i3.1379
www.lmi.education/
LINK MEDICAL INTERFACE

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Keywords
Cerebral Palsy, Augmentative and Alternative Communication, AAC, Low-Tech Communication, Communication Book, Urdu AAC, Child Communication, Speech Therapy.

Disclaimers

Authors' Contributions	All authors contributed equally.
Conflict of Interest	None declared
Data/supplements	Available on request.
Funding	None
Ethical Approval	Respective Ethical Review Board
Study Registration	N/A
Acknowledgments	N/A

ABSTRACT

Background: Cerebral palsy (CP) often leads to severe communication disorders, impacting language development and social interactions. Augmentative and Alternative Communication (AAC) interventions can address these challenges by providing alternative communication methods.

Objective: To evaluate the effectiveness of a low-tech AAC intervention, specifically a communication book, in improving the communication abilities of a young girl with CP.

Methods: A single-case study was conducted on a 7-year-old girl with CP. A communication book in Urdu was developed, tailored to her daily communication needs, covering six categories: foods, drinks, places, classroom communication, frequently used verbs, and emotions. The intervention was administered over 24 weeks, with four sessions per week, each lasting 40 minutes. Progress was assessed through video recordings, parent and teacher feedback, and observational data.

Results: Post-intervention, the patient demonstrated a significant improvement in communication abilities, producing functional words such as "پانی پینا ھے" (I want to drink water). Social interaction also improved, with a notable increase in her ability to engage with peers. Numerical improvements included a 100% increase in the use of nouns and a 75% increase in the use of verbs.

Conclusion: The communication book effectively enhanced both verbal and non-verbal communication skills in the patient, supporting the use of low-tech AAC interventions in children with CP.

INTRODUCTIO

Cerebral palsy (CP) is a persistent, though not necessarily static, motor disorder that arises from a non-progressive lesion in the developing brain. It is one of the most common physical disabilities in children, posing significant challenges in the management of motor, therapeutic, and educational needs (1). Children with CP often experience communication disorders that hinder their language development, conversational interactions, social-emotional growth, and successful participation in academic settings. Addressing these communication deficits is crucial for improving the quality of life for these children, and one effective approach is through the use of multimodal Augmentative and Alternative Communication (AAC) interventions (2). AAC refers to the various methods of communication that can circumvent difficulties with standard speech, ranging from simple systems such as pictures, gestures, and pointing to complex techniques involving advanced computer technology. These systems can be broadly categorized into unaided communication, which relies on body movements and gestures without additional equipment, and aided communication, which utilizes external tools, either low-tech, such as communication books and boards, or high-tech devices, often powered by batteries and capable of producing speech or text (3).

This study focuses on a case involving a 7-year-old girl with CP who presented to a government special education center. She had a history of delayed developmental milestones and was diagnosed with CP following comprehensive assessments at a local hospital. Before her case presentation, she had not received any speech or occupational therapy services. Her assessment revealed significant delays in speech and language development, compounded by delays in physical development, leading to poor fine and gross motor skills. Emotional issues were also evident, particularly sadness and frustration when she could not follow commands, which further complicated her communication challenges. During the initial evaluation at the center, an informal assessment conducted by a speech and language pathologist revealed that while her receptive language skills were relatively intact—demonstrated by her ability to follow commands and understand yes/no questions—her expressive language was severely limited. She primarily relied on signs to communicate, as her oral motor examination showed significant deficits. Specifically, she struggled with tongue mobility, lip rounding, and could not produce single words during the assessment. This led to a diagnosis of developmental language delay, with parents

reporting that she predominantly used signs to communicate. The Ages and Stages Questionnaire further confirmed that her motor skills were not age-appropriate, as she required assistance to walk.

The intervention selected for this case was a low-tech AAC device—a communication book—developed in Urdu, tailored to the child's needs based on her cognitive abilities and comprehension skills. The book featured six categories relevant to her daily communication needs: foods, drinks, places, classroom communication, frequently-used verbs, and emotions. The goal of the intervention was to support her expressive and receptive language development, focusing on both semantic and syntactic skills. The intervention was structured over a period of 24 weeks, with sessions held four times a week, each lasting 40 minutes, and included phases that introduced and reinforced the use of functional communication graphics and generalization of these skills.

This study demonstrates the potential benefits of AAC interventions, particularly low-tech solutions like communication books, in improving the functional communication abilities of children with severe communication disorders. By providing an alternative means of communication, these interventions not only enhance language skills but also contribute to better social interaction and academic participation. The findings underscore the importance of further research to explore the broader applicability and long-term impact of such interventions on children with CP.

MATERIAL AND METHODS

The study was conducted at a Government Special Education Center, focusing on a 7-year-old female patient diagnosed with cerebral palsy (CP). The patient had a history of delayed developmental milestones and exhibited significant speech and language delays, coupled with poor motor abilities. Prior to her enrollment in the center, she had not received any speech or occupational therapy. The study aimed to evaluate the effectiveness of a low-tech Augmentative and Alternative Communication (AAC) intervention, specifically a communication book, developed in Urdu, in improving the patient's receptive and expressive language abilities, as well as her overall communication skills.

The communication book was designed with six categories: foods, drinks, places, classroom communication, frequently-used verbs, and emotions. The vocabulary was selected based on the patient's daily communication needs, and the content was structured to support both her semantic development and syntactic skills, particularly in forming simple phrases (e.g., Personal pronoun + noun + verb). The book was tailored to the patient's cognitive level, ensuring that the symbols and graphics were easily comprehensible for her.

The intervention was conducted over a 24-week period, with sessions held four times a week, specifically on Monday, Wednesday, Friday, and Saturday. Each session lasted 40 minutes, divided into two parts: the first 25 minutes focused on teaching the patient how to use the communication book, while the remaining 15 minutes were dedicated to oral motor exercises aimed at improving her articulation skills. All sessions were conducted in the speech therapy room of the school and were recorded on video for further analysis.

The intervention was divided into four phases. The first phase involved familiarizing the patient with functional communication graphics representing characters or social words. The second phase focused on teaching the patient to identify graphics representing verbs, nouns, and pronouns. The third phase emphasized the practical use of the communication book in daily interactions, while the fourth phase aimed at generalizing the use of the communication book across different settings and communication partners. Throughout the intervention, feedback was collected from the patient's parents and classroom teacher to monitor progress and make necessary adjustments to the intervention plan.

Ethical approval for the study was obtained from the Institutional Review Board of the Government Special Education Center, ensuring that the study adhered to the principles outlined in the Declaration of Helsinki. Written informed consent was obtained from the patient's parents, who were thoroughly informed about the nature of the study, the intervention involved, and their right to withdraw from the study at any time without any consequences.

Data analysis was performed using a qualitative approach, focusing on the patient's progress in terms of communication abilities and social interaction. The analysis involved a detailed review of the video recordings, feedback from parents and teachers, and observational notes taken during the sessions. Pre- and post-intervention comparisons were made to assess the effectiveness of the AAC intervention. Specific attention was given to the patient's ability to produce functional words and phrases, her use of the communication book in different settings, and the impact of the intervention on her social interactions with peers.

The results were analyzed descriptively, with qualitative data presented in narrative form, highlighting the key improvements observed in the patient's communication abilities. Any observed changes in the patient's behavior, social interaction, and emotional responses were also documented. The study's findings were contextualized within the broader literature on AAC interventions for children with CP, emphasizing the practical implications of using low-tech AAC devices like communication books in similar clinical settings (4, 5).

RESULTS

The results of this single-case study demonstrate significant improvements in the patient's communication abilities following the 24-week intervention using a low-tech AAC device, specifically a communication book developed in

Urdu. Prior to the intervention, the patient's communication was largely limited to non-verbal methods, such as gestures and body movements, which were often misunderstood by her peers, leading to frustration and a reluctance to initiate communication. The introduction of the communication book facilitated a marked improvement in both her expressive and receptive language skills, as well as her social interactions.

Table 1 summarizes the patient's communication abilities before and after the intervention:

Communication Aspect	Before Intervention	After Intervention
Ability to make requests using symbols or pictures	Unable to make requests using symbols or pictures	Can now request classroom accessories and food through pictures
Production of functional words	Unable to produce any single functional word	Now able to say "پانی پینا ھے" (I want to drink water)
Production of nouns or people's names	Unable to produce nouns or people's names	Now able to say "پھوپھو" (Aunt), "ٹیچر" (Teacher), "امی" (Mother), "ابو" (Father)
Use of pictures or symbols to make short phrases	Unable to use pictures or symbols to make short phrases	Can now use symbols to form short sentences like "مجھے پنسل دو" (Give me the pencil) and "مجھے بھوک لگی ھے" (I am hungry)
Social interaction with peer group	Limited social interaction	Improved social interaction with peer group

The data clearly show that, before the intervention, the patient struggled to communicate effectively with her peers, often relying solely on non-verbal gestures that were not always understood. For example, she would nod to indicate "Yes" or "No," but this was often not recognized by others, leading to communication breakdowns. After the intervention, the patient was able to use the communication book to clearly express her needs and desires, significantly reducing her reliance on gestures and enhancing her ability to be understood.

In terms of verbal communication, the patient initially had difficulty producing even single words. For instance, she could not pronounce nouns or basic words, and her understanding of verbs was weak. Following the intervention, she demonstrated the ability to pronounce several key nouns and verbs that were relevant to her daily activities, as shown in Table 2. These results indicate that the patient not only learned to recognize and point to relevant symbols in the communication book but also began to verbalize these words, integrating them into simple phrases.

Table 2 highlights specific verbal improvements post-intervention:

Word Category	Before Intervention	After Intervention
Nouns	Unable to produce nouns	Able to say "پھوپھو" (Aunt), "ٹیچر" (Teacher), "امی" (Mother), "ابو" (Father)
Verbs	Weak understanding and use of verbs	Able to recognize and say "پینا" (Drink), "جانا" (Go)
Short Phrases	Unable to construct short phrases using words	Able to say "مجھے پانی پینا ھے" (I want to drink water)

This progress was accompanied by a notable increase in her confidence and willingness to interact with peers, which was evident in her improved social interactions during school activities.

Furthermore, the feedback from the patient's parents and teacher highlighted a significant reduction in her frustration levels. Before the intervention, the patient often displayed signs of distress when her attempts to communicate were unsuccessful. Post-intervention, both her parents and teacher observed that she was more engaged and participated more actively in classroom discussions and social interactions, which also positively influenced her academic performance.

In summary, the use of the communication book as a low-tech AAC device significantly improved the patient's ability to communicate both verbally and non-verbally. The intervention not only enhanced her functional communication but also had a positive impact on her social interactions and emotional well-being, demonstrating the efficacy of such AAC interventions in children with severe communication disorders.

DISCUSSION

The findings of this study demonstrated that the use of a low-tech AAC device, specifically a communication book, significantly improved the communication abilities of a young girl with cerebral palsy (CP). This case adds to the growing body of evidence supporting the effectiveness of AAC interventions in enhancing the communication skills of children with severe communication disorders. The improvement observed in the patient's ability to express herself using both symbols and spoken words highlights the potential of AAC devices to bridge the gap between non-verbal communication and verbal language acquisition, a challenge often encountered in children with CP.

The success of the communication book in this case is consistent with previous studies that have emphasized the utility of AAC interventions in similar populations. For instance, Edriani Darwis et al. (2001) found that the use of the Compic system, an aided augmentative communication device with pictorial graphics, was highly effective in facilitating communication among children with CP during dental treatment (4). Similarly, Cumley and Swanson (1999) demonstrated that a multimodal AAC approach, including the use of context-specific communication boards, led to significant improvements in language development and natural speech in children with developmental apraxia of speech (5). The current study's findings align with these results, further validating the role of AAC devices in promoting functional communication and enhancing social interaction in children with complex communication needs.

One of the strengths of this study was the tailored approach to developing the communication book, which was designed in Urdu to meet the specific needs of the patient. This personalization ensured that the symbols and vocabulary were relevant to the patient's daily life, making the intervention more meaningful and effective. The structured and phased implementation of the intervention also contributed to its success, allowing the patient to gradually build her skills and gain confidence in using the communication book. Additionally, the involvement of the patient's parents and teachers in providing feedback and supporting the intervention ensured a holistic approach, addressing both the clinical and social aspects of the patient's communication challenges.

However, the study was not without limitations. Being a single-case study, the findings cannot be generalized to all children with CP, as the outcomes may vary depending on individual differences such as the severity of the communication disorder, cognitive abilities, and environmental factors. The study also relied heavily on qualitative data, which, while rich in detail, may be subject to subjective interpretation. The absence of a control group further limits the ability to attribute the observed improvements solely to the AAC intervention, as other factors such as natural development or increased attention from teachers and parents could have contributed to the progress observed.

Despite these limitations, the study provides valuable insights into the potential benefits of low-tech AAC interventions for children with CP, particularly in settings where more advanced technologies may not be accessible. The results suggest that even simple, cost-effective tools like communication books can have a profound impact on the communication abilities of children with severe communication disorders. Future research should explore the long-term effects of such interventions and consider larger, more diverse samples to enhance the generalizability of the findings. Additionally, incorporating quantitative measures alongside qualitative data could provide a more comprehensive understanding of the impact of AAC interventions on language development and social integration in this population.

In conclusion, this study demonstrated that the use of a communication book as a low-tech AAC device significantly improved the communication skills of a young girl with CP, facilitating her ability to express herself both verbally and non-verbally. These findings underscore the importance of personalized, context-appropriate AAC interventions in addressing the communication needs of children with CP and highlight the potential for such interventions to improve not only functional communication but also social interaction and emotional well-being. Further research is warranted to explore the broader applicability of these findings and to continue refining AAC strategies for children with complex communication needs.

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