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The Speech Therapy Methods for Global Aphasia: A Narrative Review

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Review Article

Abstract

Introduction: Global aphasia due to extensive lesions in cortical, subcortical, and white matter of the left hemisphere is a severe acquired language disorder which disrupts all aspects of aural and written language. In the global aphasia, individual's interaction and his social community is generally affected and he needs ongoing rehabilitation, especially speech therapy. The purpose of this study was to investigate the common speech therapy methods for global aphasia and dissuss them based on exsiting evidence to introduce the most effective treatment.

Materials and Methods: An electronic search in Web of Science, PubMed, Scopus, Medline, SID, Google Scholar, Ovid, and Magiran databases for reviewing the common speech therapy methods was performed to obtain relevant articles published from 1980 to 2020. The keywords used included "Global aphasia", "Treatment methods", "Intervention", "Speech therapy", "Communication", and "Therapy".

Results: Among 19 related articles, 9 speech therapy methods have been reviewed to improve communication, expression, and comperhensive language in global aphasia. The results showed that some of them were effective and some were ineffective.

Conclusion: The review suggests that alternative nonverbal, augmentative, and complementary communication methods in the people with global aphasia will produce better results and techniques such as remnant books, the Melodic Intonation Therapy (MIT), and SIPARI methods have been more effective than other methods

Keywords: Commnication; Global aphasia; Language therapy; Speech therapy

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Introduction

Global aphasia is the most severe and common clinical type of language disorder that results in severe acquired communication deficits in all areas of language, and these patients have impaired aural perception and emotional tone, expressive language, and severe receptive deficits (1-6). Individuals affected by this complication have severe disorders in all language modalities (7-9). According to the classification system by Goodglass and Kaplan, speech for people with global aphasia is usually limited to expressing clichéd, obscure words and words that have already remained in their minds. These patients have difficulty even expressing simple words and have difficulty reading skills (8). Except understanding simple concepts and easy content, the auditory comprehension in these individuals suffers a great weakness. These patients seldom use gestures or drawings spontaneously (9). In addition to speech and language skills, they have limitations in other communication skills such as initiation and use of body and face gestures and tone of voice, but these problems are inferior to those of speech and language (10-12).

Patients with global aphasia need communication and language tools to communicate with others (12). Most treatments for global aphasia include verbal therapy or complementary-alternative communication techniques such as the use of communication boards, a glossary, and a notebook (13). In general, their therapeutic output is of lower quality than that of other types of aphasia, and some communication problems remain even after the intervention (14).

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Given the high prevalence of global aphasia and the extent of damage in language modalities and patients' need for communication, effective speech therapy intervention is very important (1,6). So far, several methods have been designed for patients with global aphasia with different perspectives (6-10,12-17,19-21). The preparation and collection of these interventions is the first step towards describing and examining the problems and obstacles to the progress of these patients. The best method is to perform an intervention that is cost-effective and accessible in any place and time and for any language, which helps the patient the most to communicate and use the remaining abilities (10). In this regard, it is very important to review and compare effective and efficient treatment methods.

Given that so far no study has been conducted to collect and describe speech therapy methods in individuals with global aphasia, the present study tried to enhance the awareness and easier access of researchers, therapists, nurses, caregivers, and anyone involved in some way in the assessment and treatment of people with global aphasia by collecting various therapeutic interventions and examining them in more detail. Therefore, understanding the existing treatment methods with increasing insight can be applied in clinical and research areas for patients with aphasia. In the present study, in addition to reviewing common speech therapy methods in subjects with global aphasia, the strengths and weaknesses of each were clearly stated in order to select the best, most cost-effective, and most efficient treatment method appropriate to the patient's condition. The questions that arose after reviewing the studies and treatment methods included what characteristics should a treatment method have in order to be effective? In other words, in today's world, where early treatment and increasing the quality of life (QOL) of patients are among the most important indicators of intervention, what is the best, most efficient, and most cost-effective treatment method given the patient and family conditions?

Materials and Methods

The aim of this study is to collect and review the common methods of speech therapy in subjects with global aphasia, details, conditions, and application of the method, the length of the method and finally, the extent of their effectiveness. The search process was implemented in two general steps. First, in order to get an inclusive list of speech therapy methods for individuals with global aphasia, an extensive search from 1980 to 2020 was performed in the Medline, Scopus, PubMed, and Web of Science databases using the Global Aphasia keyword with at least one of the words "Language Therapy, Communication, Speech Therapy, Intervention, Treatment Method". In addition, a search was made in the Scientific Information Database (SID) and Magiran using the keywords "Speech Therapy, Communication, and Global Aphasia" in order to check which of the methods had been performed and reported in our country. If the above keywords were used in the title, abstract, or keywords, the articles would enter the study. The inclusion criteria included studies published in both English and Persian. Thus, a list of speech therapy methods in people with global aphasia was extracted. In the second stage, in order to obtain more complete information about the speech therapy methods, using the name of the treatment method with at least one of the words "Accuracy, Efficacy, Reliability", the above databases were referred again and the studies containing these words in the title, abstract, or keywords, entered the review. Finally, the effective therapies on language and communication in patients with global aphasia were included in the study. To prevent bias, the articles were extracted by two independent researchers and if the articles were not included, the reason was mentioned. In cases where there was disagreement between the two researchers, the article was reviewed by a third person.

Results

Following studies and searches in various databases, out of a total of 25 research and review articles, 19 ones that met the inclusion criteria, were selected. Accordingly, 9 methods of speech therapy in this field as well as their detailed information were extracted in the next steps. The search for this information included the name of the treatment method, designer, patients' language, year of publication, related studies, and their positive and negative results. Despite sending a request to the corresponding author or editor of the publishing journal for access to the full text of some of the studies, they were removed from the review due to lack of response. It should be noted that some of these methods were old and their introduction dated back to several decades ago; while these methods are not only still important in the treatment of patients with global aphasia, but the basis of many therapeutic tasks in patients is also derived from these old methods. Since the objective of this study was to collect all existing methods and its approach did not consider only new or widely used methods, these methods were also discussed in the present study and their necessity, importance, and use were explained in the relevant section (Table 1).

Table 1. Speech therapy methods in global aphasia

Name of the treatment method	Name of the designer	Type of method
Visual action	Helm-Estabrooks et al. (17)	Nonverbal
Melodic intonation therapy	Sparks and Holland (20)	Verbal
Nonverbal communication system	Johannsen-Horbach et al. (6)	Nonverbal
Drawing	Ward-Lonergan and Nicholas (13)	Nonverbal
Computerized language intervention system	McCall et al. (21)	Nonverbal
Picture books	Ho et al. (9)	Verbal
Hand and arm gestures	Rose (١٢)	Nonverbal
Music therapy	Jungblut et al. (22)	Verbal
Special therapies	Alexander and Loverso (7)	Verbal

Visual Action Therapy (VAT): This nonverbal treatment was developed by Helm-Estabrooks et al. in English. The VAT method enables subjects with global aphasia to present symbolic movements for mental stimuli which are not visually illustrated, which is performed in three steps (17). At each stage, a score of 1, 0.5, or 0 is given for completely correct answers, corrected answers, and incorrect answers, respectively (2). All instructions are presented non-verbally (2,15).

In a study, eight 37- to 70-year-old men with global aphasia, with right hemiplegia, were evaluated using the VAT method 12 to 14 weeks after the onset of the disease. Prior to initiation, all patients used standard speech therapy techniques. The method was performed in 30-minute sessions with an average of 5 sessions per week and the patients completed the treatment program in 4 to 14 weeks (15).

In another study, the VAT method was implemented on two adult men, 66 (A) and 81 (B) years old. Both had normal intelligence and were right-handed and had suffered from global aphasia following a cerebrovascular accident (CVA) in the left hemisphere, 12 and 16 months, respectively. The patients went through 30 sessions of treatment each for 55 minutes and the interval between sessions was 1-3 days (2). Finally, the positive effects of treatment were reported in most stages for patient A and in half of the stages for patient B, however the generalization to untreated cases was very weak (2).

Melodic Intonation Therapy (MIT): This method was first developed by Sparks and Holland in 1976 in English to establish verbal communication in patients with global aphasia with limited verbal output (20). The MIT method is specifically for speech improvement, but some experts have reported its successful use in reducing nonfluency and pronunciation errors. However, it is not effective for patients with aural perception impairments (5,6,16,17). In a study, a physiological model to justify this method and its success was attributed to the superiority of the right hemisphere for processing music and melodic speech (18).

To understand the MIT method, one must first distinguish between the tone of a sentence or propositional phrases and the tone of the voice, which, unlike singing, has a more limited range of musical notes (16,18). In other words, a range of 3-4 notes is required for sufficient variety in patterns (17). Each stage of speech consists of 12 sentences or short phrases related to the needs and background of the patient. First, with the therapist training, the patient produces a number of melodic sentences and phrases as the unit length increases. During the treatment, dependence on the therapist and reliance on the melody decreases (2,3,17,18). To progress through the stages, the patient must score 90% based on the average of 10 consecutive points, and at the end of treatment, the patient is able to produce a melodic speech in his sentences (18).

A review of recent research has been very promising and shows that despite the advantages and limitations, the MIT method has been successful for patients with more verbal intensity (3,16-18).

Nonverbal Communication System: Bilsymbols (NVC): This visual symbolization method was designed by Johannsen-Horbach et al. in German and consists of visual, imaginary, or exhibitive lines (6). When using the NVC system, understandability of the method is very important for aphasia-free communication partners (4,18). In this regard, in addition to very complete lexical content, the method has some syntactic and grammatical structures and is suitable and easily understood to meet the needs of the patient (17). It is also effective for patients with paralysis of the right half of their body (6).

Lane and Samples, treated four patients with aphasia as a group, three of whom had global aphasia, using the Bilsymbols symbolic system, with several positive results. These subjects underwent routine aphasia treatment for at least six months and 2 sessions per week, all of whom had moderate intelligence quotients (IQs) (6). The NVC method was then performed for each patient for at least two months and 2 sessions per week. The unexpected finding of the study was the correct expression of the

word with its symbol, which was observed in 3 patients (4,6).

Drawing: This is one of the complementary-alternative communication methods for patients with global aphasia, developed by Ward-Lonergan and Nicholas (13).

In the treatment proposed by Lyon and Sims, strategies were developed to enhance drawing skills in patients with global aphasia (14). Given their study, 5 patients underwent the Promoting Aphasics' Communication Effectiveness (PACE) drawing treatment program within three months. In this program, interesting visual backgrounds were provided to the patients to draw graphic drawings of them, with positive results reported in the study (14,15).

The results of a case study were performed on a person with global aphasia who was poor at drawing before the injury. A 61-year-old right-handed man who developed aphasia after a left hemisphere injury was examined. His speech in singing, repetition, or oral reading was indistinguishable, and he was unable to communicate through writing or gestures, could not write his name, and had impaired muscle movements and inability to perform physical activities. He had gone through common treatment methods and due to the lack of proper effect, drawing therapy was used (13). Despite some problems in the spontaneous start of drawing, an important point after treatment was that in the presence of a small stimulus such as a pen and paper, the patient was able to draw a picture to communicate (15).

Computerized language intervention system: This system is a diagnostic and therapeutic tool developed by McCall et al. in English (21). In this method, a person with global aphasia constructs and writes various phrases and sentences based on abstract rules and grammar of language by manipulating symbols related to nouns and verbs (3,22). This method is used to improve the semantic aspects and perceptual skills, but so far this hypothesis has not been confirmed that it may increase the improvement of speech in patients with global aphasia (21, 22).

Remnant and pictographic books method: This method was designed by Ho et al. in English as a complementary-alternative communication method to improve communication in people with global aphasia (9). Picture/touch books contain shapes, diagrams, and objects, and are designed to be completely personal in terms of vocabulary and content, and include tickets to a recent sporting event, holiday photos, information about religion, and personal interests (3,9,18). Remnant books are similar to recovered-memory therapy (RMT) and differs from Scrap.

Arm and Hand Gestures: This procedure was performed by Rose in English (12). Sometimes people with global aphasia spontaneously convey communication concepts using gestures (18). According to neuropsychological studies, the use of motor skills and gestures in many people with aphasia changes after brain injury, but their damage in understanding and expressing movements is less than language skills. Therefore, gestures are effective in improving communication and speech production (5). In other words, in this treatment, gestures are replaced by damaged speech and are used to facilitate the function of verbal communication (12).

In this regard, the study by Kurland et al. used the Amer-Ind gestures, which was the method of communication between Native Americans and Indian Americans (18). Their study was performed on 6 people and was accompanied by good results and all patients were able to produce words using gestures (18). In another study of people with phonology and coding problems and semantic deficits, all participants had significant improvements in naming images (3,12).

Specific music therapy: This treatment method was designed by Jungblut et al. (22) based on the knowledge that in most patients with aphasia, even if speech output is limited or speech clarity is low, the patient is able to sing some familiar songs (23). According to investigations on parallel processing between speech and music, music can be used to treat patients with global aphasia (24,28).

One of the methods of music therapy for aphasia is SIPARI, the main components of which are singing, intonation, prosody, atmung, rhythm, and improvisation (23,24). The first stage, mental preparation and internal singing is an important educational element and expands the concept of melody. The atmung exercises then enhance the vital processes for prosody and prepare the individual for prosody (24,25). Rhythmic exercises expand the phonological capabilities of the left hemisphere, and improvisation helps to improve patient communication (18,19,21). Finally, therapy helps to establish spontaneous verbal and non-verbal communication and improve basic comprehension and expression skills (26-28).

Music therapy was performed in 2000 on a 57-year-old man with global aphasia due to cerebral hemorrhage, alexia, agraphia, and hemiparesis (23). He did not get an acceptable result after regular speech therapy, so 3 years after the stroke, the SIPARI method was started on him. After 20 months of treatment and follow-up, the patient showed improvement in spontaneous speech, repetition, and naming, and in the

last assessment of clinical progress, his speech and social relations performance and self-confidence increased (24,25).

Specific treatments: These treatments were introduced by Alexander and Loverso in English, which included the results of a two-year scientific experience of using speech therapy for 22 patients in the age range of 40-75 years old with global aphasia (7). According to their study, all participating patients had left hemisphere infarction and aphasia, and were right-handed and their mother tongue was English (7). Initial assessments were performed for 2-5 weeks after the stroke and treatment was performed in accordance with the therapist's decision and based on the individual's needs for 4-10 weeks and 6 days a week in the form of individual, group, and family education sessions. At the end of the treatment period and based on the Western Aphasia Battery (WAB) criteria, global aphasia was detectable in all patients and none of them were able to speak clearly (3,7,18).

There are other case methods, including Performance Assessment of Contributions and Effectiveness (PACE) traditional speech therapy, used to improve communication in individuals with global aphasia (7,25-27). Additionally, there are special therapies that are used to improve defects in lexical content (27-29). Some complementary methods are also applied in conjunction with speech therapy, such as transcranial magnetic stimulation (TMS), which is involved in improving naming (3,26).

Discussion

The present study was conducted aiming to collect and compare common methods of speech therapy in patients with global aphasia and to address the features, advantages, and limitations of the methods and the results of relevant studies; nevertheless, some of this information was not available in some methods. This review study can be helpful in providing readers with a comprehensive view of speech therapy intervention methods such as assignments used, target community, treatment areas, implementation method or progress benchmark, etc., and can be a good source for getting knowledge on the most widely used and important treatment methods and their justification.

An undeniable fact is that the prognosis of patients with global aphasia is very poor due to the extent of the injury and the involvement of multiple cognitive, speech, and language skills (1,6). These patients may show improvements, but most of the aphasic features remain and are detectable in them (7). However, in evaluating and selecting treatment and determining the prognosis, it should be noted that patients with aphasia perform much better in real life than in clinical and laboratory settings, and there is a chance of cure for most patients (3,7). To choose the type of intervention, indicators such as treatment duration, cost, availability, results, and effects of treatment on the person's QOL should be considered (8).

Traditional rehabilitation therapies, despite being expensive and time consuming, are not effective in improving functional communication in these patients (3,7,10). Thus, therapists and researchers alike place great emphasis on the use of interventions related to complementary-alternative communication systems and family training (9,24-26). Studies on the functional abilities of patients with aphasia have shown that treatment based on nonverbal communication skills is the most promising and best treatment, which is confirmed by a review of studies in recent years (21,23,25-27).

In patients improved by the VAT method, despite improving the aural and reading capabilities and performing pantomime in uneducated subjects, no improvement was observed in speech language skills (2,17) and there was a relative generalization of the trained steps (2). Moreover, they did not use this method to initiate communication (3,17,18).

The MIT method, with its emphasis on grammar improvement, provides a relative improvement in oral expression (19), and its best volunteers are patients who have better aural comprehension than oral expression (20). This method is useful for patients with limited verbal output, but it cannot be said with certainty that patients with severe global aphasia who are disabled in all areas of communication will be treated with this method (3,18-20).

The results of the SIPARI method reported significant improvements in spontaneous speech, indicating the successful generalization of the treatment to semantic and syntactic levels in everyday communication (30). In this way, rhythmic patterns improve cognition and improve the ability to name and repeat (26,27). Despite the favorable results, more research is required to ensure the effectiveness of this method.

Complementary-alternative communication systems used for patients with global aphasia include spontaneous communication methods such as gestures and pantomime, and automatic communication methods such as drawing, graphic symbols, speech production gestures, and computerized systems (2,6,9,12-18,21). Most therapists tried to educate patients to be able to recall

specific movements from marking systems, but failed to have significant effects on everyday communication (3,5,18). The study of pantomime exercise indicated that the ability to communicate is improved using movements (12). Using this method, those around the patient also reported that after training, the individuals appeared more confident in social interactions and their ability to use spontaneous movements increased (5,12).

Despite improved mental health and speech clarity using the Bilsymbols method (6), other studies suggested that this method may not be appropriate for all patients (15); Because even in normal people, it is difficult to understand the abstract message relative to the objective one, and people with global aphasia have additional problems in understanding the meanings of abstract codes (1). Furthermore, for individuals with severe hearing impairment, symbolic-semantic information was more difficult to understand and express, and they did not have the cognitive ability to use symbols without the support of communication partners (1,9).

The results of the computerized methods showed that by manipulating the symbolic signs related to nouns and verbs, the patient could express and write different sentences and phrases based on syntactic abstract rules (21,30,31), but so far, there has been no more accurate evaluation confirming the hypothesis that this method has been able to improve expression in patients with global aphasia (3,21,22). The findings showed that various types of communication symbols with picture/touch and visual books improve the relationships between patients and their communication partners successfully (21). Patients who used these books had better and more communication and were more successful in conveying their messages, and according to the patients and communication partners, using this method was enjoyable and promising (9).

A review of studies published in recent years shows that in addition to choosing the proper treatment method, other indicators also affect the individual's recovery and treatment success, including the choice of appropriate, objective, high-frequency words and words that are processed in the right hemisphere (10,32-35). Another important factor was the intensity of the treatment sessions. Studies show that the effectiveness of intensive and daily sessions is higher than regular sessions such as 2 days a week (16).

Limitations

In the present study, only articles published in both English and Persian were reviewed and the ones in other languages were not reviewed. On the other hand, not all of these methods with different studies have been performed in all languages and cultures, and therefore their advantages and limitations cannot be generalized.

In the extensive search conducted, there were few studies comparing the outcome of treatment with at least two different methods, and no study was found that systematically discussed the scientific quality of articles published on the applications of different treatment methods. However, these methods make it possible to conduct research on different patients with almost similar conditions and to make a relative comparison of the treatment method for each given language.

Recommendations

So far, limited studies have been conducted on therapeutic interventions on patients with global aphasia and their effects. Additionally, due to the severity of defects and diversity of abilities and problems in patients with global aphasia, it is recommended to conduct more extensive research to treat these patients in different languages and on more samples, and speech therapists are recommended to use clinical methods with more confidence and design new effective therapies.

Conclusion

Review of various interventions suggests that non-verbal methods are probably more effective and among the alternative communication methods, picture/touch books are more enjoyable for patients and they can take them to different places with themselves and on the other hand, these methods do not need special training for communication partners and are cost-effective. Besides, the MIT and SIPARI methods in patients with healthy aural perception can bring the patient to the spontaneous speech level. In addition, learning these methods is much easier and makes patients feel more satisfied.

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Authors' Contribution

Fatemeh Fekar-Gharamaleki: Study design and ideation, study financial, support, executive, and scientific services, providing study equipment and samples, data collection, analysis and interpretation of results, specialized statistics services, manuscript

preparation, specialized evaluation of the manuscript in terms of scientific concepts, approval of the final manuscript to be sent to the journal office, responsibility for maintaining the integrity of the study process from the beginning to publication, and responding to the referees' comments; Shima Zarei: study financial, support, executive, and scientific services, providing study equipment and samples, data collection, analysis and interpretation of results, specialized statistics services, manuscript preparation; Azar Mehri: study financial, support, executive, and scientific services, manuscript preparation.

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Conflict of Interest

The authors declare no conflict of interest. Fekar-Gharamaleki and Shima Zarei conducted basic studies related to this project. Fekar-Gharamaleki has been working as a faculty member at Tabriz University of Medical Sciences since 2016. Shima Zarei has a bachelor's degree from Tabriz University of Medical Sciences. Dr. Azar Mehri is an assistant professor at Tehran University of Medical Sciences, Tehran, Iran.

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