Review Article

Study on Language Rehabilitation for Aphasia

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Abstract

Objective: The aim is to update our clinical recommendations for evidence-based language rehabilitation of people with aphasia, based on a systematic review of the literature from 1999 to 2015.
Data Sources: Articles referred to in this systematic review of the Medline and PubMed published in English language literatures were from 1998 to 2015. The terms used in the literature searches were aphasia and evidenced-based.
Study Selection: The task force initially identified citations for 51 published articles. Of the 51 articles, 44 studies were selected after further detailed review. Six articles, which were not written in English, and one study related to laryngectomy rehabilitation interventions, were excluded from the study. This study referred to all the important and English literature in full.
Results: Aphasia is the linguistic disability, which usually results from injuries to the dominant hemisphere of the brain. The rehabilitation of aphasia is until in the process of being debated and researched. Evidence-based medicine (EBM), EBM based on the clinical evidence, promotes the practice of combining the clinicians' first-hand experience and the existing objective and scientific evidence encouraging making decisions based on both empirical evidence and the scientific evidence. Currently, EBM is being gradually implemented in the clinical practice as the aim of the development of modern medicine.
Conclusions: At present, the research for the aphasia rehabilitation mainly focuses on the cognitive language rehabilitation and the intensive treatment and the precise treatment, etc. There is now sufficient information to support evidence-based protocols and implement empirically-supported treatments for linguistic disability after traumatic brain injury and stroke, which can be used to develop linguistic rehabilitation guidelines for patients with aphasia.

Key words: Aphasia; Evidence-based; Rehabilitation; Stroke

Introduction

Aphasic syndromes usually result from injuries to the dominant hemisphere of the brain. Aphasia affects up to 38% of stroke survivors.[1] Aphasia causes major limitations in social participation and quality of life and can be associated with unemployable and social isolation. A range of patient-related (gender, handedness, age, education, socioeconomic status, and intelligence) and stroke-related indices (initial severity, lesion site, and lesion size) were identified as potentially influential factors in poststroke aphasia recovery. Initial severity of aphasia emerged as the most predictive factor of long-term aphasia recovery. Other influential factors of poststroke language recovery includs lesion site and size, appear most critical to poststroke aphasia the recovery.[2] Aphasia severity, communication and activity limitations, emotional distress, other medical problems, and social factors affect health-related quality of life in patients with aphasia.[3] Among a complex interaction of a multitude of variables, clinicians and language therapist are faced with the arduous challenge of predicting aphasia recovery patterns and subsequently, long-term outcomes in these individuals.

At present, globally, organizations of medicine and researches are actively exploring and researching aphasia. Japan in 2004, Australian in 2010 and New Zealand in 2010, respectively, drew up the Clinical Guidelines for Stroke Management in this century.[1] In Germany, to address the increasing complexity and continuously changing needs and demands in the health-care system, the researchers

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identified the need to strengthen knowledge translation, evidence-based practice, and the conduct of clinical trials in the field of allied health professions. On August 6, 2015, the first symposium of linguistic disability and the science of the brain was held in Beijing, China. It was organized by the Beijing Language and Culture University. On October 8, 2015, the 9th Asia Pacific Conference of Speech, Language and Hearing was held in Guangzhou, China.

Evidence-based medicine (EBM), based on the clinical evidence, encourages the practice of combining the clinicians' first-hand experience and the existing objective and scientific evidence to make decisions based on both empirical evidence and the scientific evidence in treating patients. Evidence-based practice has become established as a way of linking clinical practice with research evidence. Currently, EBM is being gradually implemented in the clinical practice as the aim of the development of modern medicine. The most robust evidence is usually considered to be that from randomized controlled trials, and from systematic reviews of these trials. However, in the clinical studies, most reviews have focused on drug and surgical interventions, and few reviews have been produced in the field of rehabilitation.

Speech pathologists identified a current knowledge-practice gap in their management of aphasia in hospital settings. Speech pathologists place significant emphasis on the research evidence; however, their engagement with the research is limited, in part because it is perceived to lack clinical utility. A sense of professional dissonance arises from the conflict between a desire to provide best practice and the perceived barriers to implementing evidence-based recommendations clinically, resulting in evidence-based practice becoming a disempowering concept for some.[4] This may be due to the unique difficulties posed by reviews in this area.

This article examined key evidence in the study of people with aphasia poststroke, provided discussion on how this evidence impacts rehabilitation at a clinical level; and explored strategies that should improve the way which is addressed internationally. The findings presented in this review offer clinicians and language therapist an evidenced-based medical framework to assist in mechanism research, rehabilitative treatment, prediction of aphasia recovery patterns, and subsequent long-term functional communication outcomes. We aimed to establish an scientific and effective clinical recommendations for evidence-based linguistic rehabilitation of the patients with aphasia.

Rehabilitation Mechanism

Functional neuroimaging with word generation task has been used in neurolinguistic research on normal subjects and on patients with brain damage. Remote effect of the focal lesion and functional redistribution or reorganization can be found in aphasic patients.[5] Recently, there has been evidence from neuroimaging studies on lexical-semantic processing. There is evidence that semantic priming effects can be found both in fluent and nonfluent aphasias, and that these effects are related to an extensive network which includes the temporal lobe, the prefrontal cortex, the left frontal gyrus, the left temporal gyrus and the cingulated cortex.[6]

Improvement of nonfluent aphasia patients' speech production by voice cues is related to the direct extraction of phonological encoding. Phonological encoding induced by voice cues inhibits the grapheme-phoneme route.[7] The difference in nonfluent aphasia patients' speech production of related and unrelated words by familiar voice cues indicates that familiar voice cues can only improve the extraction of preserved phonological encoding, but cannot promote the process and expression of phonological encoding through the grapheme-phoneme route. On the contrary, the former may exert inhibition on the grapheme-phoneme route.

The analysis of patients with the semantic subtype of primary progressive aphasia, which is associated with marked temporopolar atrophy, revealed much more pronounced impairments of naming and matching. It confirms the critical role of the temporal pole and inferior frontal gyrus in transmodal linking and verbalization of objects.[8]

Mechanisms of language recovery after brain injury to the dominant hemisphere seem to be relatively stereotyped. The study indicates that more specifically it leads to the inhibition of the nondominant hemisphere when brain lesions affect the dominant hemisphere. The nondominant hemisphere also plays an important role during recovery from aphasia. Nowadays, plasticity mechanisms reopen the critical period of language development, large-scale randomized controlled trials that evaluate well-defined interventions in patients with aphasia are needed for stimulation of neuroplasticity mechanisms that enhance the role of the nondominant hemisphere for language recovery.[9]

Rehabilitation Assessment

The assessment Validity is determined by the performance validity tests, measuring whether an examinee is providing an accurate measure of their actual level of ability, and the symptom validity tests, measuring whether an examinee is providing an accurate report of their actual symptom experience. A core neuropsychological battery is described that includes tests with established construct and criterion validity, and assessment validity, for comprehensive evidence-based evaluation.[10]

An approach to quantify treatment outcomes using effect sizes, providing clinical outcome data that are potentially useful for clinicians and researchers.[11] One study[12] suggested possible directions for professionals to develop evidence-based clinical narrative analysis tailored to the functional assessment needs of their clients across a variety of service settings. However, quality of life and social participation were not evaluated as outcomes. The purpose of this study is to offer an evidence-based framework for

guiding assessments of the personal narratives of adults with aphasia, within a managed care model of service delivery.

Rehabilitation Treatment

The mandate for evidence-based practice has prompted careful consideration of the weight of the scientific evidence regarding the therapeutic value of various clinical treatments. The effect of rehabilitation is to be judged in terms of the assessment of functions and abilities. The treatment methods and training skills for the rehabilitation of aphasia need to be decided under the guideline of the research results both domestically and internationally focusing on functional impairment, disability, and social handicap.

Beeson and Robey[11] performed a meta-analytic review of aphasia treatments after stroke, another initial review concluded that there was strong evidence for the effectiveness of treatments for language. Based on 5 additional years of research (i.e., 1998–2002), an article noted that continuing evidence supported the effectiveness of language treatments for aphasia after stroke.[13]

As full recovery is not achievable in chronic aphasia, treatment must focus on improved compensatory approaches and on supporting the clients' coping strategies. There was no evidence suggesting that one type of training was superior to the others. Speech therapy-led training for communication and self-efficacy and the integration of communication partners may have a positive impact on these client-centred outcomes. This article described specifically the treatment methods for the rehabilitation of aphasia as follows.

Rehabilitation of language and cognition

Language is one significant component of cognition. Linguistic function and all other cognitive functions are closely related, interrelated, and mutually stimulating. A study confirmed the relationship between language and cognition and the two factors coordinate to function depending on the parts of the structure. The study showed that there exists a close relationship among linguistic functions and cognitive orientation, spatial perception, visual perception, and thinking operation in a clinical study of Chinese patients with poststroke aphasia.[14] There are areas in the brain responsible for language and cognition; language and cognition that share the base: the brains are closely related. Poststroke aphasia is mostly accompanied by cognitive deficits. There has been a long debate among scholars surrounding the relationship between language and cognition.[15] The worldwide study of aphasia is actively exploring the function of language from the cognitive point of view.

The increase in the clinical application of cognitive rehabilitation has been accompanied by a rapidly expanding literature detailing an ever-increasing set of candidate treatments. With so much recent research activity, it is not surprising that numerous reviews found too much conflict in the literature to either support or refute the effectiveness of aphasia treatments. However, only one meta-analytic study has been published that examined the effectiveness of treatments for specific domains of linguistic of cognitive function. Cicerone and colleagues have performed the most exhaustive search of the literature to date, searching 655 articles through 1997 and additional 315 published from 1998 to 2002.[13] But Basso (2005) found clear evidence for long-term cognitive therapy as an effective strategy, which obviously surpasses other particular treatments.

The Dash and Kar's study[16] examined the subcomponents of cognitive control in bilingual aphasia. A case study approach was used to investigate whether cognitive control and language control are two separate systems and how factors related to bilingualism interact with control processes. All participants showed the predominant use of the reactive control mechanism to compensate for the limited resources system. Independent yet interactive systems for bilingual language control and general purpose cognitive control were postulated based on the experimental data derived from individuals with bilingual aphasia.[16]

Intensive therapy

Positive outcomes from intensive therapy for individuals with aphasia have been reported in the literature.[17] Intensive Comprehensive Aphasia Program (ICAP) emphasizes individualized treatment goals and evidence-based practices, with a focus on applying the principles of neuron plasticity related to repetition and intensity of treatment.[18] The method requirements include people with aphasia completed a residentially based ICAP.[19] On average, participants received 5 h of a day, for 4–5 days/week for 4 weeks, receiving about 80–100 h of individual, group, and computer-based treatment. One to one evidence-based cognitive-linguistically oriented aphasia therapy was supplemented with weekly socially oriented and therapeutic group activities over a 23-day treatment course.

ICAP is complex interventions through clinical research, establishing their feasibility.[19] Research into ICAP has shown that this service delivery model is efficacious, effective and has cost utility, or can be broadly implemented. However, their outcomes are necessary to guide the development of controlled clinical trials. Current ICAP research is in the early phases, the need for more rapid translation into practice is also acknowledged, and the use of hybrid models of phased research is encouraged within the ICAP research agenda.[20]

In response to the need to simultaneously address multiple domains of the International Classification of Functioning, Disability and Health in aphasia therapy and to incorporate intensive treatment consistent with principles of neuron plasticity, a potentially potent treatment option termed ICAP has been developed. ICAP has increased in number in recent years in the United States and other countries, but remains a rare service delivery option. The researches addresses the needs of individuals who want access to intensive treatment and are interested in making significant

changes to their communication skills and psychosocial well-being in a short period. These results suggest that adults of all ages with aphasia in either the acute or chronic phase of recovery can continue to show positive improvements in language ability and functional communication with intensive treatment.[17] Although there is a potential for bias with the small sample size, this pilot study gives insight into the clinician perspective of what makes working in an ICAP both worthwhile and challenging.[21]

One study[22] examined whether the amount of speech and language therapy influenced the recovery from aphasia after a single, first stroke. There may be a critical threshold of treatment intensity required to improve acute recovery after stroke, and emphasized the need for future research to address the optimal timing for starting intensive therapy after acute stroke. The second study[23] compared constraint-induced aphasia therapy with constraint-induced aphasia therapy combined with additional training in everyday communication. There was greater improvement in communication effectiveness among participants who received additional communication exercises. Although modest evidence exists for more intensive treatment and constraint-induced language therapy for individuals with stroke-induced aphasia, it should be considered preliminary. When making treatment decisions in clinical, it should be used in conjunction with clinical expertise and the client's individual values.[24]

In the future, there is a continued need to investigate the aspects of intensive language treatment (e.g., timing, dosage, efficacy, and cost-effectiveness) that contribute to therapy effectiveness. Therapy intensity should continue to be considered as a factor in the rehabilitation of language skills after left hemisphere stroke.

Precise treatment

Self-regulation of behavior is mediated by the frontal lobes and commonly disrupted after a traumatic brain injury (TBI). We conclude by providing clinicians with principles that emphasize accurate self-monitoring and explicit instruction to connect self-monitoring to strategy decisions.[25] Treatment fidelity is a measure of the reliability of the administration of an intervention in a treatment study. It is an important aspect of the validity of a research study, and it has implications for the ultimate implementation of evidence-supported interventions in typical clinical settings. Treatment fidelity is widely acknowledged as being critical to research validity and is a foundation for the implementation of evidence-based practices, but only a small percentage of aphasia treatment studies published in the past 10 years explicitly reported treatment fidelity. Recommendations for research practices include increased attention to matters of treatment fidelity in the peer review process and explicit incorporation of three levels of treatment fidelity in treatment research.[26]

Studies of therapy with people with aphasia tend to use impairment-based and functional measures of outcome. The views of participants are not formally evaluated. The language therapy which targets word retrieval can have an impact on people with aphasia's views of their communicative activity and life participation. The findings support therapists' clinical insight that is impairment-based interventions can effect change beyond scores on language tests.[27] Current health and social care practice requires intervention to be explicitly client-centred and evidence-based. Methodological quality of research on communication partner training in aphasia was highly varied. Overall, group studies employed the least rigorous methodology as compared to single subject and qualitative research. Using methodological rating scales specific to the type of study design may help improve the methodological quality of aphasia treatment studies, including those on communication partner training.[28]

The patients with nonfluent aphasic seemingly have decreased the speed of speech production and increased the error rate. There is a deficit in phonological processing of aphasic patients while their semantic processing may remain intact.[29] However, the patients with fluent aphasia is contrary. Improvement in either linguistic route may contribute to improved verbal communication patterns.[30] Semantic feature analysis was an effective intervention for improving confrontational naming for the majority of participants.[31] The effects of semantic versus phonologic treatment on verbal communication in patients with aphasia after left hemisphere stroke are different. Both groups improved on a measure of verbal communication, with no difference between groups. Treatment-specific effects were related to the type of impairment, with semantic treatment related to improved semantic processing and phonologic treatment related to improvement of phonologic processing.[30] On the language rehabilitation of aphasia, the fluent aphasia treatment should focus on semantics and the nonfluent aphasia treatment should be focused on phonology.

Others

Ineffective treatment approaches should be replaced by more promising ones and the latter should be evaluated for proper application. The data generated by such studies could substantiate evidence-based rehabilitation strategies for patients with aphasia.

Repetitive transcranial magnetic stimulation

A positive effect of repetitive transcranial magnetic stimulation (rTMS), with or without conventional rehabilitation, on poststroke aphasia compared with sham or conventional rehabilitation alone. The long-term effect of rTMS on aphasia has recovery. No adverse effect was reported. Thus, it also contributed to the plausible mechanisms of stroke recovery, recommending rTMS as a complementary treatment for poststroke aphasia.[32]

Music therapy

Nowadays, in the medical field, more and more studies prove its efficiency as complementary therapy with no known side-effects. The areas where music therapy has a positive outcome, reach from pulmonary disorders to a lot of neurological chronic diseases, including aphasia.[33]

Therapy dog

Little evidence-based research has been published within the field of communication disorders on the role of dogs as catalysts for human communication. A patient with aphasia who has treatment of a therapy dog improved the communication skills, who received intensive speech and language therapy within a rehabilitation setting. The researchers conclude that the presence of the dog does have the potential to stimulate both overt social-verbal and social-nonverbal communication.[34]

Rehabilitation Nursing

The challenge is to provide evidence-based care directed at the aphasia. Although rehabilitation stroke guidelines are available, they do not address the caregiving of nurses to patients with aphasia. Patients with poststroke aphasia have higher mortality rates and worse functional outcome than patients without aphasia. The contribution of nursing to the rehabilitation of patients with aphasia is relevant. Nurses are well aware of aphasia and the associated problems for patients with stroke because they have daily contact with them. The use of screening instruments by nurses can increase early detection of aphasia, a precondition for initiating timely speech-language therapy. Collaboration between speech-language therapists and nurses is of the utmost importance for increasing the intensity and functionality of speech-language exercises, which may enhance the quality of treatment.[35]

A National Community of Practice of over 250 speech pathologists, researchers, consumers, and policymakers developed a framework including eight areas of care in aphasia rehabilitation. This framework provided the structure for the development of a care pathway containing aphasia rehabilitation best practice statements. These statements form a crucial component of the Australian Aphasia Rehabilitation Pathway (http://www.aphasiapathway.com.au) and provide the basis for more consistent implementation of evidence-based practice in stroke rehabilitation.[36]

Rehabilitation Outcome

Designing scientific and efficient rehabilitation therapies needs to be based on the predication of the rehabilitation. In general, the patient's daily activities, the length of his hospitalization and the directions after the patient being discharged could be predicted to a degree according to the characters of the patient, the complications, the initial impairments, the initial daily activities, and social backgrounds.

The research designed to test potential moderators of treatment effectiveness will provide the evidence needed for more detailed quantitative analysis. In fact, it is the perspective afforded by this meta-analysis that placed the confounding of the significant moderators of age, course of disease, treatment domain, etiology of acquired brain injury, and recovery level into clear view. The study results found that age and gender were not significant predictors of improved outcome on measures of language ability or functional communication. However, time postonset is related to clinical improvement in functional communication as measured by the Communication Activities of Daily Living, second edition. Severity of initial aphasia is related to the outcome based on the Western Aphasia Battery-Revised, which meaning that individuals with more severe aphasia tend to show greater recovery compared to those with mild aphasia. Initial severity of aphasia also was highly correlated with changes in the Communication Activities of Daily Living, second edition scores.[17]

Clinically, aphasia improves significantly within 2 weeks of the stroke. Approximately up to 12 months, the aphasia appeared during the acute stage can improve 40%. Patients with mild aphasia recover within 2 weeks, medium, within 6 weeks, severe aphasia within 10 weeks.

There is also modest evidence for an effect of language training on global cognitive function in samples of individuals with stroke who are older and more than 1-year poststroke. The significant moderator variable regarding time postinjury (e.g., ≤1 year vs. >1 year) suggests that it is better to start patients in treatment as early as possible rather than waiting for more complete neurological recovery. Even older patients (e.g., ≥55 years old) can and do benefit from cognitive rehabilitation, particularly if the brain injury is due to stroke. Moreover, treatment effects are observed for patients <1-year postinjury but not for patients more than 1-year postinjury. Older patients tend to improve more, although this effect is confounded with the moderator variable of type of brain injury (i.e., stroke vs. TBI). Moderator variables, although statistically significant, are highly confounded.

According to the literature,[37] patients with aphasia are grouped randomly, one with treatment, the other without, the implementation of language therapy or not does not make a difference to the rehabilitation of aphasias. However, there are reports that language therapy has effects on the rehabilitation of aphasia. In addition, it is thought that language therapy is more effective than the training of listening language therapy and the training given by volunteers, comparatively speaking. However, there were also reports that there was no difference; whether it was collective training or individual training, it did not make difference either.

The moderator variable of treatment duration was not significant statistically, and hence we were not able to substantiate the influence of treatment duration. This likely was due to several limitations within the rehabilitation literature, thus precluding any conclusions regarding treatment duration and effectiveness.

We propose that it is learned in association with stages of decision-making, duty of care, documentation, goal setting, continuous therapy evaluation, clinical reasoning, professional communication with clients, ethical behavior, and evidence-based practice.[38]

Rehabilitation Practice Guideline

One goal in support of evidence-based practices in language rehabilitation is to uncover meaningful patterns in the scientific record through the synthesis of high-quality research. Findings from this study indicate several necessary steps to attain this goal. A major challenge facing researchers in the development of evidence-based practice guide-lines is to find sufficient evidence from high-quality designs to support practice recommendations.

In concert with evidence-based practice guidelines, it also describes the steps for deciding which apps to consider and how to judge their appropriateness. We recommend a process for selecting apps that involves three stages. The first step is no different than that used in traditional treatment planning. It involves assessing the client's speech and language, selecting the focus of treatment, and identifying evidence-based approaches to addressing this focus. When technology is being considered, however, it is also necessary to assess sensory, motor, and cognitive requirements of the apps and hardware being considered, as well as the client's ability to operate this technology. Finally, the clinician and language therapist must consider hardware and Internet demands of the app and whether these are accessible to the client.[39] Of all rehabilitating methods regarding the recovery of the linguistic functions. At present, the research for the aphasia rehabilitation mainly focuses on the cognitive language rehabilitation and the intensive treatment and the precise treatment, etc. On the language rehabilitation of aphasia, the fluent aphasia treatment should focus on semantics and the nonfluent aphasia treatment should be focused on phonology. This article offers best-practice guidelines for integrating apps into aphasia rehabilitation [Table 1].[40]

At present, many countries have taken the initiatives to establish clinical guidelines, such as Japan in 2004, Australian in 2010, and New Zealand in 2010 have performed Clinical Guidelines for Stroke Management, the Scottish Intercollegiate Guidelines Network 108 (2008) guideline and the Royal College of Speech and Language Therapists guideline (2005). However, the development of evidence-based treatment guidelines has relied on systematic reviews that focus on the methodological rigor of the studies. There was significant variability in methodological rigor, reporting of guideline development processes and scope of coverage of recommendations pertaining to aphasia management provided within the guidelines. Improvement is needed in the quality of methodological rigor in development and reporting within clinical guidelines, and in aphasia-specific recommendations within stroke multidisciplinary clinical guidelines.

The guidelines recommended by evidence-based treatment are scientifically proven. The rehabilitation guidelines provide clinicians with significant insights. However, treatment decisions and trainings are mostly drawn on clinical practices, and the efficacy of the treatment needs further study in terms of evidence.

Conclusions

We have systematically reviewed studies of evidence-based aphasia published from 1999 all the way through to November 2015. At present, the research for the aphasia rehabilitation mainly focuses on the cognitive language rehabilitation and the intensive treatment and the precise treatment, etc. On the language rehabilitation of aphasia, the fluent aphasia treatment should focus on semantics and the nonfluent aphasia treatment should be focused on phonology. In addition, the nondominant hemisphere also plays an important role during the recovery from aphasia. There is now sufficient information to support evidence-based protocols and implement empirically-supported treatments for linguistic disability after stroke and TBI, and to design and implement a comprehensive program of empirically-supported treatments for linguistic disability after stroke and TBI. The findings of this study can be used to develop linguistic rehabilitation guidelines for patients with aphasia. Further research is necessary to explore the feasibility of using such clinical recommendations in linguistic rehabilitation practice and to examine the experiences of patients with linguistic rehabilitation interventions directed at aphasia.

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Conflicts of interest

There are no conflicts of interest.

Table 1: Remediation of language and communication deficits

Level of recommendation	Intervention
Practice standard	Cognitive-linguistic therapies are recommended during acute and postacute rehabilitation for language deficits secondary to left hemisphere stroke. Specific interventions for functional communication deficits, including pragmatic conversational skills, are recommended for social communication skills after TBI
Practice guideline	Cognitive interventions for specific language impairments such as reading comprehension and language formulation are recommended after left hemisphere stroke or TBI. Treatment intensity should be considered a key factor in the rehabilitation of language skills after left hemisphere stroke
Practice option	Group based interventions may be considered for remediation of language deficits after left hemisphere stroke and for social-communication deficits after TBI. Computer-based interventions as an adjunct to clinician-guided treatment may be considered in the remediation of cognitive-linguistic deficits after left hemisphere stroke or TBI. Sole reliance on repeated exposure and practice on computer-based tasks without some involvement and intervention by a therapist is not recommended

TBI: Traumatic brain injury.

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