Rehabilitation of post-stroke communication impairments

Reabilitação de déficits comunicativos pós-acidente vascular cerebral

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ABSTRACT

Discursive, lexical-semantic, pragmatic-inferential and/or prosodic communication processing may be impaired following a cerebrovascular accident. These deficits require intervention methods and programmes for effective communication rehabilitation. Within this context, the aim of this systematic review was to identify and describe methods used for neuropsychological rehabilitation of the communication of adults after a stroke, more specifically, systematic intervention approaches for each communication processing. Abstracts published in the last ten years were selected in PubMed, using keywords related to rehabilitation, stroke and communication. For the communication topic, we also used specific keywords related to the four communication processing components. Initially, 914 abstracts were found; after exclusion of the repeated studies, 460 were analyzed. Full texts were examined if the abstract evidenced that the study was empirical, included at least one post-stroke patient, focused in communication rehabilitation, presented pre- and post-intervention assessments, and if it was published in English, French or Portuguese within the last ten years. Only four empirical studies accomplished such criteria, being conducted mainly with aphasic or aprosodic patients. These findings might be considered surprising and alarming, since there is a lack of systematic studies about rehabilitation of communication components. It is important to highlight the need to search for a detailed description of intervention procedures with specific goals, allowing studies to be replicated and also contributing for monitoring the effects of treatment. Communicative processing intervention programmes should be developed based on theoretical approaches, and studies with this focus should be conducted and published, in order to verify therapeutic effects.

Keywords: Communication disorders; Language therapy; Rehabilitation of speech and language disorders; Language therapy; Neuropsychology; Stroke

INTRODUCTION

The communicative sequels derived from unilateral hemispheric stroke (cerebrovascular accident – CVA) have been increasingly explored. The function of the right hemisphere (RH) for communication has been studied and evidenced since the 50's, once damages on the RH may affect the prosodic, semantic (non-literal), discursive and pragmatic skills, as well as functional aspects of language. However, there is a historical gap, of about one hundred years, when one compares early studies about language and disorders due to stroke in the left hemisphere (LH), in relation to the participation of the RH in these aspects[1,2]. Thus, despite hemispheric specifications, there is bright evidence of the interhemispheric cooperation[3-5].

In this paper, the term language refers to more structural linguistic aspects, and the term communication to more functional aspects[6]. Left brain damage (LBD) may cause alterations in phonological, morphological, denotative semantic, and syntactic aspects. Alterations in these aspects constitute the aphasic clinical pictures, in a most traditional definition[7,8].

After right brain damage (RBD), the discourse, lexical-semantic, pragmatic and/or prosodic communicative processes may be impaired. It is estimated that these communicative difficulties may be present in 50% to 78% of adults with RBD[2,9,10]. These clinical manifestations, that may be followed by cognitive and emotional deficits, need rehabilitation in order to minimize their biopsychosocial impact[11,12].

However, investigations regarding post-stroke intervention are mostly focused on non-linguistic deficits, such as motor and memory skills. Among the researches that promote rehabilita-

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tion for disorders of the verbal function, there is particular attention to studies of programs for language impairments caused by LHD, increasing the consistent knowledge about aphasia, including specific methods of assessment and intervention[13,14].

There are several studies reinforcing cognitive interventions for brain damage patients[15-19]. However, oriented rehabilitation stills based on the evaluation and the understanding of the neuropsychological deficits of a patient is still an issue to be discussed[15,20], especially due to its variety of tasks and techniques, and, hence, to its wide diversity of reported results[21]. Studies on post-stroke patients have emphasized non-linguistic cognitive impairments, investigating and suggesting intervention programs for attention-perceptual impairments, such as in the hemineglect syndrome[22], aiming at better quality of life[23].

Nevertheless, with regards to communicative impairments, rehabilitation proposals usually focus on one communicative processing ability, and the results are usually subjectively described, besides being assessed through specific tasks directly related to the treatment, without verifying generalization for the context of functional communication[24]. In addition, there are intervention studies about prosodic processing in post-RBD patients, while, on the other hand, there is little evidence available about discourse and pragmatic deficits[25].

As for lexical semantics impairments, the existent programs and approaches, in general, prioritize the treatment of anomie related to LBD[26], especially for classic aphasia. As an example of anomie rehabilitation, a treatment with aphasic adults was conducted based on phonemes[27]. Patients presented improvements on naming and word retrieval with phonological criteria, besides generalizing these abilities to the discourse.

To date, there is no systematic review regarding specifically rehabilitation methods for each communicative processing in patients with cerebrovascular lesion. There are general reviews about interventions for different cognitive functions[16], and non-systematic reviews about rehabilitation methods for communicative processing[11].

Thus, there is still an important gap regarding procedures and methods for communication rehabilitation in neuropsychological and speech-language pathology clinical settings. These methods and procedures must be well detailed and specifically developed for each possibly affected communicative processing ability, in light of the knowledge regarding hemispheric specializations and interhemispheric cooperation. In this context, the aim of this systemic review was to identify and describe methods used on neuropsychological rehabilitation of communication in post-stroke adults, more precisely, intervention approaches for each communicative processing (discourse, lexical-semantic, pragmatic, and prosodic).

LITERATURE REVIEW

The database from PubMed was searched in January and February 2011, looking for article abstracts regarding rehabilitation of discourse, lexical-semantic, pragmatic and/or prosodic communicative processing in adults with cerebrovascular lesion. Abstracts published in indexed journals in the last ten years were analyzed for this systematic review.

Keywords related to each construct researched were used: rehabilitation, communication and stroke. For the rehabilitation construct, the following terms were used: "rehabilitation", "readaptation", "reeducation", "training", "intervention", "treatment" and "therapy". For the stroke construct, the terms were: "stroke", "cerebrovascular disease" and "cerebrovascular accident". For the communication construct, the following terms were used: "communication" and "linguistic". Regarding this last construct, the search also used specific terms for each of the four communicative processing abilities: discursive skills ("discourse", "narrative", "conversation" and "conversational"); pragmatic skills ("pragmatic", "inference", "speech acts" and "metaphor"); lexical-semantic aspects ("lexical", "lexicon", "semantic" and "verbal fluency"); and prosodic components ("prosody", "intonation" and "emotion"). The search strategy for this systematic review associated a keywords from each construct: "rehabilitation" AND "stroke" AND "communication" OR "discourse" OR "pragmatic" OR "lexical-semantic" OR "prosody".

Inclusion criteria for analysis of full texts were: to be an empirical study, to have at least one post-stroke adult subject, to research rehabilitation of communication, to present intervention for at least one of the four communicative processing abilities, to include pre- and post-treatment assessments, to be written in English, French or Portuguese, and to have been published in the last ten years. The selected abstracts were analyzed observing the inclusion criteria, and whenever information were not clear enough, they were judged by two independent judges, with consensus from a third judge. Thus, we excluded repeated papers, literature review manuscripts, articles regarding other treatment approaches, such as motor and occupational intervention, psychotherapy, and music therapy, as well as studies focused on other cognitive functions, such as attention and memory. The detailed flow for analysis and selection of abstracts and full texts regarding rehabilitation of communicative processing abilities is detailed in Figure 1.

Full texts were analyzed and classified according to the type of study (case report and group study), the purpose, the communicative processing ability predominantly focused (discursive, pragmatic, prosodic, lexical-semantic, or mixed), the sample characterization regarding size, socio-demographic factors (e.g. age), type of stroke (LH or RH), and symptomatology (aphasia, aprosodia). Finally, the studies were characterized according to the methodological intervention approach, stages and aspects assessed, as well as the main findings.

DISCUSSION

Initially, the search retrieved 914 papers published between 2001 and 2011 (Figure 1). From these, 454 papers were repeated, totalizing 460 different papers. When the inclusion criteria were applied, 450 abstracts were excluded because they were focused on assessment and rehabilitation of general aspects of stroke, dementias, and others. Therefore, after narrowing the search, ten studies focused on rehabilitation of post-stroke communication were selected for analysis.

After that, four empirical studies were also excluded, because their abstracts did not identify the type of intervention proposed nor which communicative-linguistic process-

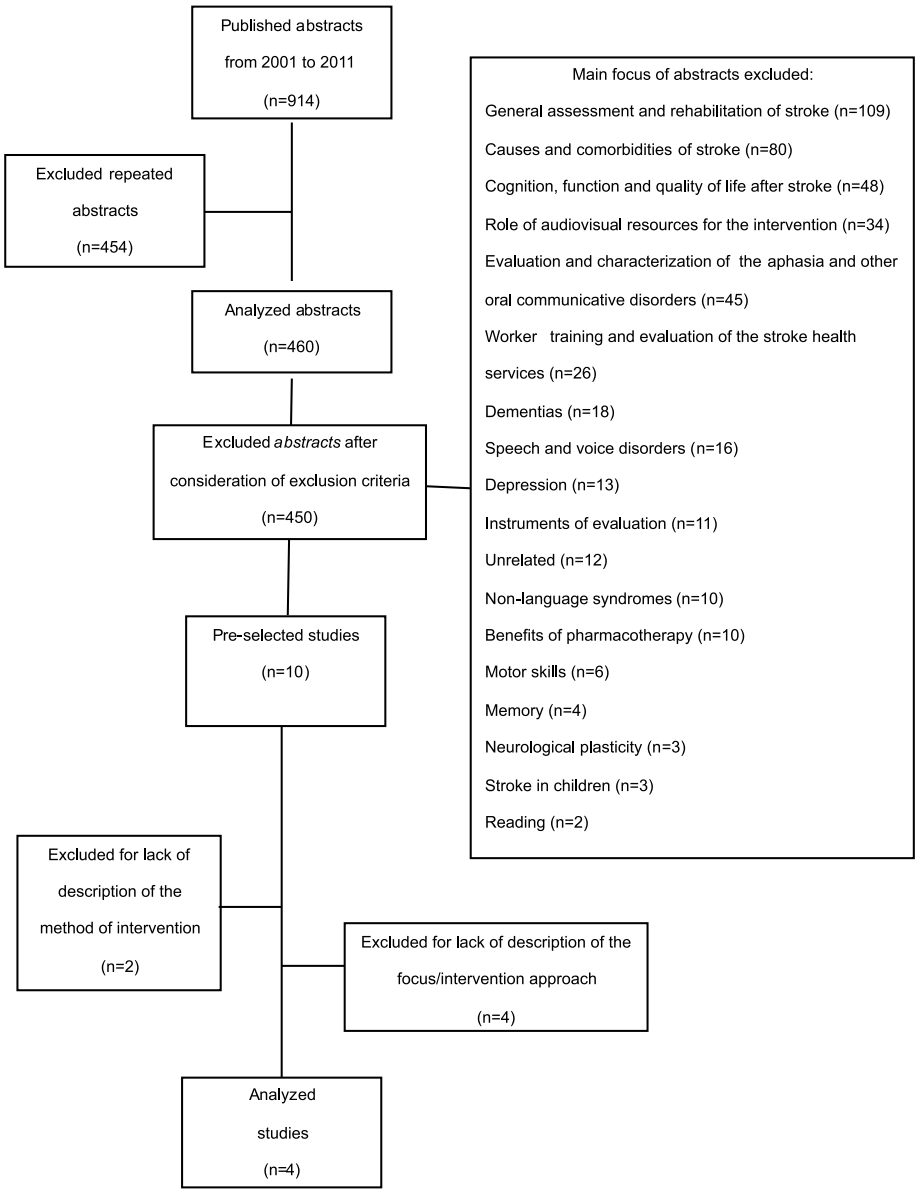

Figure 1. Analysis and selection of abstracts and complete studies on rehabilitation of communicative processing

ing or components were specifically examined, even though rehabilitation was clearly related to communicative aspects. Two more studies were excluded because they emphasized performance or functional communication measures pre- and post-intervention, without describing methodological aspects of the intervention per se and which functional linguistic components were targeted at the treatment. Thus, only four empirical studies regarding rehabilitation of post-stroke communication in adults were found Chart 1.

Among the full texts included and analyzed, the main purpose was to promote rehabilitation of one or more communicative processing abilities. Authors were mostly interested in validating or exploring the therapeutic effect of at least one employed approach. In this sense, it is emphasized the importance to use methods and techniques that present more evidence of therapeutic efficacy or effect in therapy[28].

The rehabilitation of communication processing abilities was intensively conducted, observing that patients participated in intervention from two[29] to five times a week[30]. With regards to the continuity of treatment, all studies mention using homework to train communicative abilities. The computer was an auxiliary tool in this training[29-31].

For intervention in lexical-semantic communicative processing[31], the semantic approach was developed focused on word, sentence and text interpretation, involving semantic decision activities and written stimuli. On the other hand, the phonological approach focused on phonemic production. Patients improved on the functional communication assessment. Complementary, the authors observed that the performance of patients who received semantic-based intervention presented improvement in semantic skills, and adults with phonological deficits improved their phonological skills, corresponding to the specific approaches conducted to each group[31].

The linguistic-cognitive approach aims to reestablish the linguistic levels affected (semantic, phonological, and/or syntactic) and uses cognitive strategies, while the commu-

Chart 1. Characterization of studies

Communicative processing	Study	Purpose	Sample	Methodological intervention approach	Evaluation		Results
					Moments	Aspects	
Lexical-semantic and pragmatic communication processing	Jong-Hagelstein et al.[29]	Compare the efficacy of cognitive-linguistic in comparison to communication treatment to improve the communication of aphasic adults.	75 adults aged 18-75 years post-LBD, with aphasia	GC: 37 adults treated with cognitive-linguistic treatment EG: 38 adults treated of the communicative treatment	1) baseline 2) preintervention 3) post intervention	- language - semantic - phonology	The cognitive-linguistic treatment (CG) had the greatest influence on performance improvement in semantic and phonological tasks that the communicative approach (EG).
Conversational discursive communication processing	Manheim, Halper & Cherney[30]	To evaluate the changes as the communication difficulties of adult patients with aphasia after intervention in conversational skills with a computer-based script intervention.	20 adults aged 26-78 years post-LBD, with chronic aphasia	Training of communication skills in consecutive phases with the use of a computer-based script .	1) baseline 2) preintervention 3) post intervention 4) *follow-up*	- communication difficulties - mobility	There were communication difficulties decrease and improving communication on the basis of evaluation and self-report.
Emotional prosody communication processing	Leon et al.[35]	To investigate the effects of the cognitive-linguistic and imitative paradigm to expressive aprosodia.	Three adults post-LBD, with aprosodia	Design ABAC intervention A: evaluation B: imitative paradigm C: cognitive-linguistic paradigm.	1) preintervention 2) post intervention	- emotional communication	The imitative approach showed greater effect on the prosodic emotional performance to patients 1 and 2, while the cognitive-linguistic, for participant 3. Did not occur generalization to the untreated emotions.
Lexical-semantic communication processing	Doesborgh et al.[31]	To investigate the effects of semantic treatment on verbal communication compared to the phonological.	55 adults aged 20-85 years, pos-LBD with lexical-semantics deficits.	EG: semantic treatment CG: phonological treatment	1) preintervention 2) post intervention	- language - semantic - phonology	Improvements of communication were observed that after semantic processing, after semantic treatment, EG improved semantic performance, while CG improved phonological performance.

Note: CG = control group; EG = experimental group; LBD = left brain damage; RBD = right brain damage

nicative approach aims to optimize communication by using compensatory strategies and residual linguistic competences. The authors compared the results from these interventions in two groups of aphasic adults[29]. Both patients who received linguistic-cognitive treatment and the ones who received the communicative treatment presented improvements in assessments, with no significant difference, not confirming the hypothesis of better communication performance with the training of cognitive strategies. A possible explanation is that both approaches focus on the use of language for communication, leading communicative intervention to indirectly use cognitive aspects. The relation between language and other cognitive processes in communicative processing still needs to be further explored, even on assessment context[32].

Regarding intervention at the discursive level, authors[30] have developed tasks with conversational contexts in computer programs to practice linguistics skills. The tasks started in the sentence level to achieve the discursive level, more complex, the conversational discourse. Hence, there was a hierarchy of difficulties and complexity levels of stimuli, as well as a decrease of auxiliary clues with the progress of training (such as visualizing the word written). The technique of deleting clues is widely used in rehabilitation, and its effect is increasingly proved in mnemonic intervention programs[33,34]. The patients improved on the formal assessment of language and indicated less difficulty in self-reported communication after rehabilitation.

Another identified comparative method was presented in the study of rehabilitation of prosodic processing[35]. The effects of two paradigms of expressive aprosodia treatment were compared (imitation versus linguistic-cognitive approach), with ABAC design, where A was the assessment stage (two sessions), B an intervention approach, and C another intervention stage. The length of each intervention was 20 sessions. Aprosodia treatment presented modest but substantial effects for the three adults with RH stroke, suggesting that aprosodia

may be reduced by behavioral treatments. In this study, it was also characterized by detailed presenting the rehabilitation approach used. Of all communication processing abilities that may affect post-stroke patients, especially after RBD, disprosodies seem to be more examined and more systematically detailed in literature[36].

One of the purposes of this systematic review was to find among studies about communication rehabilitation in post-stroke adults a description of the procedure for the development of communicative skills. However, only in one study[35] – the one describing rehabilitation for emotional prosody difficulties – approaches were thoroughly described. The detailed description of the procedures of an intervention program is crucial to repeating the method[37]. Hence, replication of other studies is compromised.

The attention of conducting assessments in different moments of intervention, especially having a base line, is quite important to obtain evidence of treatment effects, since there is a reference standard[15]. The four studies included in this review presented experimental design with at least one reference assessment and one evaluation at the end of intervention[29]. However, only one study performed follow-up assessment[30]. Follow-up application is essential to test the duration of the therapeutic effect and its generalization for daily cognitive and communicative demand.

Moreover, to have a control group helps to dissociate the effect of spontaneous recover, which may occur after any neurological involvement. The ideal method would be to have a control group of non-treated patients, an experimental group to receive the studied intervention, and a control group under other intervention approach[16,28]. However, there are objectionable ethic aspects in submitting patients who need intervention to a waiting period when the advisable measure is to start intervention as soon as possible; it is not recommended to deprive the patient from this possibility highlighted in literature. Concerning this question, to perform intervention study on chronic patients[26,30] is also a possibility.

The communication intervention was performed in clinical and home environment, in one of the studies[29]. The authors did not observe that the place was an intervenient variable. It is noted that the usual environment of the patient is interesting for rehabilitation, favoring the daily use of language. In addition, rehabilitation was accomplished individually in all four studies analyzed, but the effect was analyzed in groups of treated cases.

FINAL COMMENTS

In searching for investigations that present rehabilitation methods of communicative processing abilities in post-stroke adult patients, it was evident the lack of studies of this nature. However, in systematic reviews of interventions in other cognitive deficits, such as working memory, this fact is repeated. Yet, regarding intervention effectiveness, besides the few publications, there is the obstacle of variety in method application. These adaptations, which are essential to clinical practice, hinder the investigation of methods of language and communication rehabilitation. In general, transferring from clinical practice and routine of communicative rehabilitation to a rigorous research of the issue is a constant challenge for clinical researchers.

Other challenges in investigating neuropathological rehabilitation of patients with traumatic brain injury may be highlighted, especially the heterogeneity of clinical samples, the learning effect between pre- and post-intervention using the same neuropsychological instruments, and the replication of clinical practice with minimum control of variables, among others. In the study about communication rehabilitation, besides the various techniques that are not detailed, the investigation of achieved results deserves attention. It is essential to conduct evaluations before and after intervention, including follow-ups to verify the maintenance of the performance reached after treatment. However, the instruments and tests used on pre- and post-intervention assessments are varied, not allowing comparison of the studies.

The assessment area of communicative processing deficits post-RBD evolved a lot in the past few years, but the investigation about these aspects did not evolve in the same way. This panorama may be related to more recent studies about these skills.

It is worth mentioning that proposals for rehabilitation of communicative processing are extremely relevant for clinical practice, although fewer. Possibly, rehabilitation programs conducted in clinical settings are not yet systematized in literature, and it is necessary that this knowledge is scientifically reported. Moreover, intervention on communicative processing has been more frequently described in cases of dementia and traumatic brain injury than post-stroke.

Thus, in face of the restrict number of studies that present systematic intervention approach for communicative impairments, we can consider the findings from the present study surprising and even alarming. The relevance of systematic studies regarding methods and their efficiency for rehabilitation of communicative disorders is unquestionable, and the conduction of researches of rehabilitation of communicative processing abilities, with the conception of treatment theoretically and clinically based, without restricting to the etiological aspects of deficits, are also essential to accomplish. The deep knowledge of the characteristics of communicative deficits and of the aspects that may contribute to their manifestation should be considered in the planning. Still, it is important that the developed rehabilitation proposal is detailed described so that studies can be replicated, also contributing for the verification of treatment effects. We suggest that intervention proposals for communicative processing in post-stroke adult patients are outlined, and case and group studies of rehabilitation under this approach are conducted and published, in order to verify the therapeutic effects.

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RESUMO

Os processamentos comunicativos discursivo, léxico-semântico, pragmático-inferencial e/ou prosódico podem apresentar-se deficitários após um acidente vascular cerebral. Esses prejuízos demandam métodos e programas de intervenção para uma reabilitação efetiva da comunicação. Neste contexto, o objetivo desta revisão sistemática foi identificar e descrever métodos utilizados para reabilitação neuropsicológica da comunicação de adultos acometidos por lesão cerebrovascular, mais especificamente, abordagens sistematizadas de intervenção para cada um dos processamentos comunicativos. Foram avaliados resumos publicados nos últimos dez anos na base de dados PubMed, utilizando palavras-chave relacionadas aos construtos reabilitação, acidente vascular cerebral (AVC) e comunicação. Para o construto comunicação foram utilizadas, ainda, palavras específicas dos quatro processamentos comunicativos. Inicialmente, foram encontrados 914 *abstracts*, dos quais, após exclusão dos repetidos, 460 foram analisados. Os critérios de inclusão de *abstracts* para análise de seus textos completos foram ser estudo empírico, ter a participação de pelo menos um indivíduo adulto pós-AVC, tratar de reabilitação da comunicação, apresentar intervenção para pelo menos um dos quatro processamentos comunicativos, ter avaliação pré e pós-tratamento, estar escrito em inglês, francês ou português, e ter sido publicado nos últimos dez anos. Apenas quatro artigos empíricos cumpriram tais critérios, sendo conduzidos predominantemente com adultos afásicos ou com aprosódia. Assim, tais achados podem ser considerados surpreendentes e alarmantes frente à escassez de estudos sistemáticos de reabilitação de componentes comunicativos. Ressalta-se a necessidade de descrição detalhada de procedimentos de intervenção com objetivos específicos para que estudos possam ser replicados, contribuindo também para a verificação do efeito do tratamento. Sugere-se que propostas de intervenção dos processamentos comunicativos sejam delineadas com bases teóricas e que sejam conduzidos e publicados estudos com este enfoque para verificação de efeito terapêutico.

Descritores: Transtornos da comunicação; Terapia da linguagem; Reabilitação dos transtornos da fala e da linguagem; Neuropsicologia; Acidente cerebral vascular

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