Rehabilitation of Aphasia

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ABSTRACT

Aphasia is one of the most striking cognitive sequels of strokes and other cerebral lesions, and attempts to rehabilitate aphasic patients have been undertaken for many years. Following a brief overview of the epidemiology and the clinical characteristics of aphasia, the chapter presents the major traditional approaches to rehabilitation. They include the stimulation approach (also called classic), the behavior modification approach, Luria’s approach (functional reorganization), the pragmatic approach, as well as the neurolinguistic approach. The next section illustrates some of the current approaches to aphasia rehabilitation, specifically the syndromic approach (also called neoassociationist), the cognitive neuropsychological approach and the social approach. The chapter then provides examples of specific methods. While all intervention strategies may be classified, more or less correctly, into one or another of the above categories, it is not possible to mention the hundreds of specific interventions to be found in the literature, some of which have been described only briefly and in reference to a single case. The chapter concludes with a review of efficacy studies on aphasia therapy. Despite some opinions to the contrary, the current consensus is that sufficient experimental evidence of efficacy exists to recommend treatment of aphasia.
Introduction

The term “aphasia” refers to the more or less complete loss of the ability to use language as the result of lesions in cerebral areas generally localized in the left half of the brain; these areas are responsible for the ability to speak, understand, read, and write. Because language is complex, the term “aphasia” covers heterogeneous disorders that may have little in common. Indeed, it can be argued that the ways of being aphasic are practically infinite. Besides varying from one person to the other, aphasia is far from static in any given patient and is susceptible to changes, both spontaneously and as a result of rehabilitation.

Unfortunately, the definition of aphasia does not say much about characteristics of the loss; whether, for instance, language is impaired in all of its aspects, or whether there is a selective loss of one or more processes (such as auditory comprehension or reading); whether aphasia is a single condition, or takes several forms that may selectively impair one linguistic component (phonology, syntax, semantics), leaving the others relatively unimpaired. Even more ambiguous is the word rehabilitation, which is supposed to indicate all the different treatments intended to improve impaired function. The only thing common to all aphasia treatments is that patient and therapist try to communicate with each other. The content of the communication and what the therapist does in order to elicit a response from the patient vary from place to place and from clinician to clinician.
Following a brief overview of the epidemiology and the clinical characteristics of aphasia, this chapter will present the major traditional approaches to rehabilitation. They include the stimulation approach (also called classic), the behavior modification approach, Luria’s approach (functional reorganization), the pragmatic approach, as well as the neurolinguistic approach. The subsequent section illustrates some of the major current approaches to aphasia rehabilitation, specifically the syndromic approach (also called neoassociationist), the cognitive neuropsychological approach and the social approach. The chapter then provides examples of specific methods. While all intervention strategies may be classified, more or less correctly, into one or another of the above categories, it is not possible to mention the hundreds of specific interventions to be found in the literature, some of which have been described only briefly and in reference to a single case. The chapter concludes with a review of efficacy studies on aphasia therapy.

**Epidemiology**

No specific data on the incidence of aphasia are available but an approximate count can be inferred from the incidence of stroke. This varies from 1.8/1000 (Di Carlo et al., 2003) to 4.5/1000 (Wade et al., 1986) new cases per year; overall prevalence is 65/1000 individuals (ILSAWG, 1997). With reference to the Italian population (approximately 58 million), these figures indicate an incidence of 105,000 to 261,000 new cases per year and a prevalence of 3.8 million individuals affected by stroke. For the United States, the annual incidence is thought to be around 600,000 and the prevalence up to 4.6 million people. There is evidence suggesting that the incidence of strokes has decreased over the past 50 years (Caradang et al., 2006).

The incidence of aphasia following stroke varies from 21% in some studies (Brust et al., 1976) to 38% in others (Pedersen et al., 1995). For the Italian population, these data indicate that incidence ranges from 22,000 (21% of 1.8/1000) to 99,000 (38% of 4.5/1000) new cases of aphasia per year. Kirshner and Jacobs (2009) note that reports of incidence in the United States generally omit aphasia
caused by conditions other than stroke, but estimate that approximately 170,000 new cases per year result from stroke. Pedersen et al. (1995) compared the incidence of aphasia in acute and chronic cases (≥ six months) and found a reduction ranging from 38% in the acute phase to 18% in the chronic phase.

In addition to vascular etiology, traumatic brain injuries due to traffic accidents, war or other events also cause a substantial number of brain injuries requiring specialized rehabilitation. Other etiologies of aphasia include gunshot wounds, encephalitis, and anoxia, although they account for a smaller number of cases. If no other medical complications arise, the language of people with aphasia resulting from these causes is expected to recover to some extent. On the other hand, a number of conditions such as CNS tumors and neurodegenerative diseases (Alzheimer disease and especially primary progressive aphasia) also cause language disturbances, but because these diseases are progressive, further language decline is expected rather than recovery, and therefore the methods and goals of language treatment are quite different. For this reason, language problems due to these etiologies will not be discussed in this chapter.

**Overview of the history of aphasia therapy**

Examples of treatment for aphasia can be found, mainly in German speaking countries, after the 1st World War, but one of the first systematic studies can be attributed to the seminal work of Weisenburg and McBride (1935). Aphasia therapy became common practice only after the 2nd World War. At that time knowledge about aphasia was rather scarce and treatment was not informed by a clear-cut theory. Very different methods were put into practice but it is possible to recognize some common threads, and the best-known approaches will be very briefly mentioned. Any taxonomy one proposes, however, will be an oversimplification, and the different categories tend to overlap.
The stimulation approach, the behavior modification approach, the pragmatic approach, and the 
neurolinguistic approach have more or less succeeded one another. In contrast, Luria’s functional 
approach was developed in a different country and in a different culture. These approaches will be 
briefly discussed. The syndromic (or neo-associationist) and the cognitive approaches, still very 
popular, will be described in more detail, together with the social (or consequences-based) approach.

**Stimulation approach.** A large number of very heterogeneous interventions are generally grouped 
under this label. Followers of this school maintained that language is a complex, holistic and 
indivisible function, not represented in the brain by a number of discrete centers, but a property of the 
total brain. The two principles of the stimulation approach are the idea that aphasia is a unitary 
disorder varying in severity but not in type, and the assumption that knowledge about language is not 
lost but cannot be accessed because of cerebral damage. Deriving directly from these two principles is 
a global approach to treatment that varies only according to the severity of the disorder and that is 
based on the automatic-voluntary dissociation. The required response is facilitated and automatically 
obtained; facilitation is then progressively reduced until the response is intentional. Wepman (1951), 
Schuell (Schuell et al., 1964), and Darley (1982) are among the most important representatives of this 
school.

**Behavior modification approach.** This approach stems from the application to aphasia therapy of the 
principles of operant conditioning. In the 1960s psychologists were quite interested in learning and 
some researchers investigated whether learning in aphasic subjects followed the same rules as 
learning in normal subjects. They concluded that the majority of aphasic individuals are able to learn 
ew materials using the same strategies as normal subjects, but learning is less efficient (Tikofsky & 
programmed instruction were then put to use in aphasia therapy. The two most important techniques
used in programmed instruction are shaping and fading and they both assume that the required behavior or a similar one exists in the patient’s repertoire of responses.

*Luria’s functional approach.* This is a good example of unity of theory and practice and of a coherent therapeutic system. Luria (1963, 1970; Luria et al., 1969) distinguished functional disturbances due to the temporary loss of activity in some brain areas that can rapidly resolve by themselves and do not require treatment, from the functional disturbances resulting from the irreversible destruction of brain tissue. The damaged function can never be restored to its previous form and therapy must be directed towards the reorganization of the function by transferring it to other brain structures or functional systems. The patient must be taught to perform the damaged operation through new roundabout methods by means of a partially new neural organization.

*Pragmatic approach.* The pragmatic approach has evolved from the application of linguistic knowledge to aphasia therapy. In the stimulation approach the patient was required to use language in standardized situations, such as confrontation naming and picture description. With the appearance of pragmatics aphasia therapists broadened their view of successful responses in therapy, and began to take an interest in patients’ capacity to communicate through any channel, not only through spoken language. A number of researchers demonstrated that aphasic patients’ capacity to communicate is better preserved than their capacity to express themselves through language (Wilcox, Davis & Leonard, 1978; Kadzielawa et al., 1981; Foldi, Cicone & Gardner, 1983) and a variety of formal functional evaluations were developed (Sarno, 1969; Holland, 1980). The best-known therapeutic implementation is Promoting Aphasics’ Communicative Effectiveness (PACE) (Davis & Wilcox, 1985).

*Neurolinguistic approach.* Neurolinguistics is the branch of linguistics that analyzes the language impairments that follow brain damage in terms of the principles of language structure. The term “neurolinguistic” is neutral about the linguistic theory it refers to, but any linguistically based
approach to aphasia therapy is based on the principle that language has an internal organization that can be described by a system of rules. The neurolinguistic approach stresses the role of language in aphasia and analyzes it according to principles of theoretical linguistics.

The first linguistically based typology of aphasic impairments is probably that of Roman Jakobson (1964), although Alajouanine and his collaborators (1939, 1964) had already stressed the role of some linguistic phenomena in aphasia. Many authors have underlined the importance of linguistic theory for aphasia therapy (Hatfield, 1972; MacMahon, 1972; Hatfield & Shewell, 1983; Lesser, 1989; Miller, 1989), but linguistic analyses were not carried out in great detail until interest in aphasia expanded beyond the field of neurology to disciplines such as linguistics, speech-language pathology, and psychology.

**Present approaches**

All the previously mentioned approaches have contributed in a more or less direct way to the present situation in aphasia treatment in which it is possible to identify three very different approaches to therapy: the neoassociationist or syndromic approach, the cognitive neuropsychological or impairment-based approach, and the social or consequences-based approach.

**Neoassociationist or syndromic approach**

The neoassociationist approach (also called syndromic) derives directly from the stimulation school and similarly is highly heterogeneous. The neoassociationist school flourished in the sixties and seventies in Boston with a group of neurologists and psychologists (particularly Norman Geschwind, Harold Goodglass, Frank Benson, Edith Kaplan and others) who have had a lasting and important influence on clinical studies in aphasia. The classic aphasia syndromes (Broca, Wernicke, conduction, transcortical, anomic, global) were re-described and re-analyzed in terms of more sophisticated
linguistic analyses and anatomical knowledge.

One of the most recent detailed descriptions of the classic syndromes is that of Benson and Ardila (1996), who define a syndrome as a cluster of symptoms plus a specified brain lesion. They argue that “although limited and imperfect, the syndrome classification originally developed by the nineteenth-century continental investigators remains basically accurate, replicable, and clinically useful” (Benson & Ardila, 1996, pp. 111-112).

However, according to Albert et al. (1981) and Prins et al. (1978), only approximately 20% of chronic aphasic subjects can be reliably classified in one of the classic syndromes. Poeck, considering the problem of aphasic syndromes, argued that they are “to a large extent, artefacts produced by the vascularization of the language area” and not natural combinations of symptoms that necessarily co-occur (Poeck, 1983, p. 84). According to Schwartz, aphasia syndromes are not “real entities” because “one cannot delineate for each category an “essence” or idealized pattern which is invariant and hence shared by all members of the group” (Schwartz, 1984, p. 5).

Whatever the nature of the classic syndromes, they are still very popular among clinicians and have been the starting point for treatment for many years. A number of aphasia batteries (e.g., Boston Diagnostic Aphasia Examination (BDAE) (Goodglass & Kaplan, 1983), Revised Western Aphasia Battery (WAB) (Kertesz, 2007), Porch Index of Communicative Ability (PICA) (Porch, 1967) allow subject classification, and the syndromic diagnosis has been considered a valid theoretical basis for treatment. A person with global aphasia, for instance, has severely damaged comprehension (as well as all other verbal behaviors) and treatment of comprehension is initiated; a conduction aphasic person has disproportionately impaired repetition, and treatment for repetition is initiated; an anomic person has numerous anomias and treatment for naming disorders is initiated. The relationship between the symptom and the treatment is, however, loose, and many different treatments for the same impaired behavior have been suggested.
To illustrate, all of the following treatments for naming disorders can be grouped under the umbrella of the “syndromic” approach: semantic features analysis (Kiran & Thompson, 2003); combined presentation of the oral and written word to be named (errorless learning) or phonological and orthographic cues (errorful learning) (Fillingham et al., 2006); delayed copy and recall (CART) plus repetition or repetition only (Beeson and Egnor, 2006); semantic therapy designed to activate the semantic network and minimize errors (production was discouraged) (Davis & Harrington, 2006); and repetition combined with 4 yes/no questions about the semantics or phonology of the word (Raymer et al., 2007). It also encompasses novel approaches such as melodic intonation therapy (MIT), which aims to harness the intact musical skills of the right hemisphere to enable communication (Albert et al., 1973).

The underlying principles are not very different from those underlying the stimulation approach. The basic idea is that although language cannot be accessed, it is not lost. Hence target responses are elicited by facilitating the patient’s production by any possible means. Aphasia is no longer considered a unitary disorder, but the linguistic analysis of verbal behaviors (reading, writing, comprehension, production) is still rather imprecise.

Many clinicians consider that the difficulty of a language task is based solely on a hierarchy of linguistic units: phonemes, morphemes, words and sentences. Compared to the stimulation approach, exercises are more varied and tailored to the various syndromes; therapists are more concerned with the formal aspects of therapy (which could be a legacy of the behavior modification approach) and the question of the efficacy of rehabilitation is a central topic of research.

One limitation of this approach is that treatment addresses the superficial symptoms without trying to identify the underlying cause of the impaired behavior. As a consequence it is not possible to establish whether a particular treatment is better or worse than a different one and, even if it has been demonstrated that the treatment has been effective, it is difficult to understand why and therefore to
rationally suggest it for other subjects. Howard and Hatfield (1987) argue, “Too often…the relationship between deficit and treatment is based on some implicit idea of how treatment has its effects, which has no good justification or scientific support” (p. 106).

A “global” treatment that can be subsumed under the heading of syndromic approach that avoids this criticism is treatment based on the analysis of conversation. Conversation is the prototype of language use and the form in which we all learn our native tongue; it is the most common type of familiar discourse during which two or more participants take turns speaking and listening. A conversation is a collaborative endeavour in which participants recognize a common goal. What the participants say at any moment is determined by the common final goal, but what they communicate to each other is more than the linguistic content of the sentences themselves.

Treatment starts from an analysis of how conversation evolves between two normal interlocutors and utilizes the rules of conversation in order to build up a “normal” conversation with an aphasic individual. The aim of this treatment is to train subjects with aphasia to use their residual communicative capacity in the real world and to restore their capacity to maintain a real conversation. This type of therapy does not start from the symptoms, but from the end-point of treatment and applies linguistic knowledge about natural conversation (Basso, 2010).

*The cognitive neuropsychological or impairment-based approach*

The classic anatomo-clinical approach provided knowledge about the relationships between lesions and functions, but in spite of the accumulation of knowledge, the problem of inferring the structure of normal brain functions from behavioral dysfunctions was far from being resolved and some researchers were dissatisfied with the methodology of clinical neuropsychology. Caramazza and McCloskey, for instance, wrote, “It is not an exaggeration to say that over one hundred years of research on cognitive disorders has shed little light on the nature of normal cognitive processes and the form of their dissolution in conditions of brain damage.” (Caramazza & McCloskey, 1988, p.
In recent years, researchers began to be less interested in the localization of cognitive functions in the brain and more concerned about the nature of the cognitive mechanisms. The basic aim of cognitive neuropsychology was to provide a model of normal cognitive processing and to explain impaired performance in terms of damage to one or more components of the normal cognitive function. Cognitive neuropsychologists argued for a functional approach to the study of the mind explicitly independent of the study of the brain, and introduced the use of information-processing models, which provide a rational basis for the characterization of patterns of impaired performance in terms of damaged sub-components. They were interested in identifying the functional locus of the damage that caused the symptoms by analyzing the patient’s performance of various tasks in relation to a model of normal processing. The use of pathological data for the study of the normal cognitive system requires some assumptions, among which are the modularity and the subtraction assumption.

The modularity assumption says that a complex cognitive function consists of a series of functionally independent sub-components or modules that perform different functions and interact with other parts of the system; the subtraction assumption says that no new cognitive structure is created as a consequence of the lesion; pathological transformations of normal cognitive functions obey constraints determined by the normal structure of the system and can be inferred from the analysis of the normal structure. The relevance of these assumptions for treatment is evident. If a cognitive function (such as naming, for instance) consists of a series of independent components that can be separately damaged and no re-organization is possible, a detailed diagnosis will locate the damage and therapy will be specifically directed to that component and not to unspecified naming disorders.

It is clear that the more explicit is the reference model, the more precise can be the diagnosis based on the model. A functional diagnosis is different from a syndromic diagnosis, such as Broca aphasia or Wernicke aphasia. A syndromic diagnosis essentially involves classifying the aphasia according to
which cluster of symptoms it fits best. A number of symptoms can generally be present in a syndrome, but no particular one is necessary for the diagnosis. In other words, taking Broca aphasia as an example, the "classic" symptoms of reduced speech, speech apraxia, and agrammatism are not always present in subjects classified as having Broca aphasia.

A functional diagnosis, on the other hand, involves determining the functional damage underlying the superficial symptoms, and two subjects with the same functional damage will show the same symptoms.

A precise and correct diagnosis, however, does not dictate what to do. The contribution of cognitive neuropsychology to aphasia therapy is a “negative” contribution because the more precise the diagnosis the more constrained the therapeutic choices rationally related to the impairment. When the cause of an impaired behavior is unknown, the choice of possible interventions is very large but the opposite is true when the underlying cause is known.

The past 30 years have seen important progress in our understanding of the normal processing of single words. In addition, there is now widespread consensus on a dual-route model according to which reading and spelling can be achieved through a lexical route, which allows the correct pronunciation and spelling of stored words, and a non-lexical route, which allows conversion of sub-lexical units of phonemes or graphemes into sequences of graphemes or phonemes, respectively. Only the conversion mechanisms are dedicated to reading and spelling; the lexical routes utilize parts of the lexical–semantic system that are also used in other tasks, such as auditory comprehension and naming. The dual-route model has prompted many of the more recent papers on therapy for reading and writing disorders, and treatment is generally focused on the impaired route (e.g., Beeson et al., 2000; Luzzatti et al., 2000; Rapp & Kane, 2002; Raymer et al., 2003; Viswanathan & Kiran, 2005; Peach 2002; Sage et al., 2005; Kiran et al., 2001).

Sentence-level problems are very frequent in aphasia but in contrast to the numerous treatments for
naming disorders, sentence-level disorders have only rarely been tackled. Recently sentence level treatments have benefited from contributions from psycholinguistic studies and the cognitive neuropsychological approach. Two types of treatment are now rather common; one based on the mapping hypothesis and another one on the linguistic theory of wh-movements.

According to the mapping hypothesis, the verb’s semantic information does not only specify the core meaning of the verb, it also dictates the number of arguments involved and their role in the event. Thus the core meaning of “rob” is to deprive someone; it is a two-argument verb and the thematic roles involved are an agent (causing the deprivation) and a patient (experiencing the robbing). If an aphasic patient still understands the core meaning of “rob” but has lost information about its thematic grid he will have nothing to map onto syntax and will have problems understanding sentences such as “The thief robbed the old lady” unless he uses his knowledge of the world where it is more probable for a thief to rob an old lady than vice versa. The mapping hypothesis has given rise to many therapy programs for comprehension and production. Treatment is focused on emphasizing the centrality of the verb and its relationship to the nouns in the sentence, and attempts to link sentence structure to sentence meaning (for review see Marshall, 1995; Mitchum, Greenwald & Berndt, 2000).

The second type of treatment is based on the linguistic theory of wh-movement. According to linguistic theory non-canonical sentences have two levels of representation: the underlying or d-structure (akin to the basic Subject-Verb-Object pattern in the English language) and the s-structure. Non-canonical sentences are derived from the d-structure through application of rules which involve movement of a constituent from its original position into a new position in the s-structure (for instance, the subject in the canonical sentence “Martin is eating the fruit” moves from the front position and takes the last position in the passive sentence “the fruit is eaten by Martin”, a non-canonical sentence). One of the two major types of movement is wh-movement. To form a wh-question, wh-, which refers to a constituent that occupies a certain position in the d-structure, is
moved to the front of the sentence. When movement occurs, a trace ($t$) is left behind in the original position (“Martin”, in the previous example). Most English interrogative words start with *wh-* (*who, what, where, why, etc*), which explains the term *wh-movement*. Difficulty comprehending non-canonical sentences in English, such as passives, object relatives, and certain forms of *wh-* questions, is a widely reported characteristic of agrammatic aphasia.

Treatment involves “meta-linguistic” knowledge of verb properties and movement, and takes into account both the lexical and syntactic properties of sentences. The first steps do not differ significantly from mapping therapy, being mainly concerned with improving knowledge of the thematic role information about verbs. Then instructions concerning the movements of various sentence constituents are provided and aphasic subjects are trained to produce *wh*-movements (see Thompson et al., 2003; Thompson & Shapiro, 2007).

**The social or consequences-based approach**

Clinicians have always stressed the fact that aphasia has a significant impact on the whole life of individuals suffering from the disorder, upsetting their relationships with other family members, colleagues, and friends. Aphasic individuals suddenly find themselves deprived of their role, socially isolated, and unable to express their wishes and emotions.

Recently the idea that disabled persons have a right to an environment “without barriers” has taken root and therapy has turned to the external environment, trying to modify it to adapt it to the aphasic person. Examples of this category are the Supporting Conversation for Adults with Aphasia (Kagan, 1998; Kagan et al., 2001) and the Conversational Coaching approaches (Holland 1991; Hopper et al., 2002), which aim to teach effective strategies to the “normal” interlocutor rather than to modify the verbal behaviour of the aphasic individual.

It is impossible to delineate the boundaries of the interventions that can go under the name social or
consequences-based approach. They can run the gamut from breathing therapy to improving the ability of the person with aphasia to return to work. Some examples of the differences between the social approach, which focuses on changing the environment and the impairment-based approach, which aims to rehabilitate the aphasia itself, can be found in a recent book written by aphasia researchers and clinicians (Martin et al., 2008). Two different clinicians describe the suggested treatment for each of 5 aphasic individuals, one clinician from the point of view of the impairment-based approach and the other one from the social point of view that aims to minimize the consequences of aphasia.

The Table summarizes the various approaches to aphasia rehabilitation and their theoretical underpinnings.

<table>
<thead>
<tr>
<th>Efficacy of aphasia therapy</th>
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<tr>
<td>The first group studies on treatment efficacy, performed in the 1950s and 1960s, reported positive results, but included only rehabilitated subjects, and the possible effect of spontaneous recovery was ignored (Butfield &amp; Zangwill, 1946; Leischner &amp; Lynk, 1967; Marks et al., 1957; Sands et al., 1969; Sarno &amp; Levita, 1979). The subsequent group of studies compared treated and untreated subjects, thus taking into account spontaneous recovery, but results were equivocal because therapy was found to have a significant effect on recovery in some (Basso et al., 1975; 1979; Gloning et al., 1976; Hagen, 1973; Shewan &amp; Kertesz, 1984; Poeck et al., 1989; Mazzoni et al., 1995), but not in others (Lincoln et al., 1984; Pickersgill &amp; Lincoln, 1983; Vignolo, 1964). The effect of rehabilitation has also been studied by comparing results obtained by speech therapists and volunteers (David et al., 1982; Hartman &amp; Landau, 1987; Marshall et al., 1989; Meikle et al., 1979; Wertz et al., 1986). Treatment</td>
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was always found to be effective, but none of the studies that adopted this strategy found significantly better results for the group of subjects treated by speech therapists.

As can be seen, the results are not clear-cut: they are “positive” (rehabilitation has a significant effect on recovery) in about half of the studies that have a control group and in all studies comparing therapists and volunteers (however, without a difference between the two groups). On the other hand, no significant difference was found between treated and untreated patients in about 50% of the studies comparing these two groups.

One common element in the negative studies was brevity of treatment. Some researchers have specifically tackled the issue of amount of treatment. With different nuances, all of these studies report better recovery for subjects who received more treatment (Brindley et al. 1989; Denes et al., 1996; Hinckley & Craig, 1998; Basso & Caporali, 2001). Furthermore, Boghal et al. (2003) considered all works published between 1975 and 2002 in which recovery of a group of treated patients was compared with that of a group of non-treated patients, and they identified those that presented sufficient data for re-analysis (n=10). Significantly more therapy sessions were carried out in the “positive” studies than in the “negative” ones, thus confirming the importance of amount of treatment.

Scientific evidence in support of efficacy of aphasia therapy has come from meta-analyses and systematic reviews. Four meta-analyses (Whurr et al., 1992; Robey, 1994; 1998; Rohling et al., 2009) and two systematic reviews (Cicerone et al., 2000; Cappa et al., 2003), which were subsequently updated (Cappa et al., 2005; Cicerone et al., 2005) were conducted. All meta-analyses confirmed the effectiveness of rehabilitation. Finally, the latest Cochrane review (Kelly et al., 2010) concludes "Significant differences between the groups' scores were few but there was some indication of a consistency in the direction of results which favoured the provision of speech and language therapy (SLT)”. However, since the therapeutic interventions were extremely varied (conventional,
group treatment, computer-mediated), the number of sessions was low in 5 studies (max 48), and trained volunteers delivered the treatment in 2 studies, it is no wonder that significant differences were few. The most plausible explanation is that some treatments delivered for sufficiently long times (or sufficient intensity) are efficacious while others are not.

The American Society of Rehabilitative Medicine (Cicerone et al., 2000; 2005) and the European Federation of Neurological Societies (EFNS) (Cappa et al., 2003; 2005) independently conducted systematic reviews. Cappa et al.’s review (2003; 2005) concludes with a grade B recommendation; Cicerone et al. (2000; 2005) classify 11 studies in class I. Both reviews reach the conclusion that sufficient experimental evidence exists to recommend treatment of aphasia.

Moss and Nicholas (2006) studied another variable: time from onset. They analyzed 23 studies including a total of 57 patients subdivided into 6 groups according to the time between the morbid event and the beginning of treatment. Data indicate that the effect of rehabilitation did not diminish with the passing of the years, at least until the seventh year.

Conclusions

As this chapter illustrates, aphasia rehabilitation has undergone many changes since it became widely practiced after the Second World War. Many of these changes have been the result of increased knowledge in areas such as brain functioning, learning theory, and the structure of language. Others have resulted from changing social attitudes. Many disciplines, including neurology, linguistics, speech-language pathology, cognitive psychology, and others, have contributed to the knowledge base that underlies aphasia rehabilitation. It is highly likely that knowledge in these areas will
continue to evolve, and that aphasia therapy will continue to evolve as well. Although it is now quite evident that aphasia therapy is effective, it remains true that most aphasic people do not fully recover their language. For those engaged in rehabilitation of aphasia, the goal remains to provide the best possible therapy based on current knowledge, while always attending to the developing state of knowledge, and incorporating new knowledge into their treatment of aphasia.
Table Caption

Approaches to aphasia rehabilitation and their theoretical underpinnings.

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<table>
<thead>
<tr>
<th>Approach</th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>Stimulation Approach</strong></td>
<td>Simulation of inaccessible language mainly through comprehension exercises that vary only according to the severity of the aphasic disorder.</td>
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<tr>
<td><strong>Holistic School</strong></td>
<td>Language is a complex, indivisible psychological function, a property of the total brain. Aphasia can only vary in severity; in aphasia, language is not lost but inaccessible.</td>
</tr>
<tr>
<td><strong>Behavior Modification Approach</strong></td>
<td>Applies to aphasia therapy the principles of operant conditioning and programmed instruction. Shaping and fading are the most important techniques. Stresses methodology.</td>
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<tr>
<td><strong>Operant Conditioning</strong></td>
<td>Human behavior is determined by external stimuli; verbal behavior is not qualitatively different from other behaviors. Only external stimuli and responses can be studied scientifically.</td>
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<tr>
<td><strong>Functional Reorganization Approach</strong></td>
<td>Analysis of all the steps underlying the execution of the impaired task and conscious execution of each step, with external aids. Conscious substitution of the impaired link with one from an undamaged system.</td>
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<tr>
<td><strong>Luria</strong></td>
<td>Language functions are based on a network of neurological structures, each playing a different role but all contributing to correct processing. Aphasia syndromes differ according to the site of lesion, which interferes with a basic component of a language function.</td>
</tr>
<tr>
<td><strong>Pragmatic Approach</strong></td>
<td>The main goal of therapy is to restore communicative competence by whatever means: language, gestures, mimic, drawing, and so forth.</td>
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<tr>
<td><strong>Pragmatics</strong></td>
<td>Stresses communication and studies the use of language in context. Views aphasia as a communication disorder.</td>
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<tr>
<td><strong>Neurolinguistic Approach</strong></td>
<td>Scattered and rather vague suggestions to base therapy on linguistic principles. Principles of Chomsky's competence-performance dichotomy and transformation grammar have been used.</td>
</tr>
<tr>
<td><strong>Neurolinguistics</strong></td>
<td>Analyzes in terms of a linguistic theory the language impairments that follow brain damage.</td>
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<tr>
<td><strong>Neoassociationist or Syndromic Approach</strong></td>
<td>Therapy is still mainly based on stimulation, but more attention is given to the level of the linguistic disorder (phonemic, lexical, or syntactic) and therapy varies according to the type of aphasia. Much research on aphasia therapy effectiveness.</td>
</tr>
<tr>
<td><strong>Neuassociationism</strong></td>
<td>Language is the sum of a number of faculties-comprehension, production, reading, writing. Damage to different areas of the brain differently affects verbal behavior.</td>
</tr>
<tr>
<td><strong>Cognitive Neuropsychological or Impairment-based Approach</strong></td>
<td>Therapy targets the &quot;damaged&quot; sub-component(s) of language, as inferred from a model of normal language processing.</td>
</tr>
<tr>
<td><strong>Cognitive Neuropsychology</strong></td>
<td>Language consists of a series of independent sub-components that perform different functions and interact with other parts of the system. Impaired language performance is explained in terms of damage to one or more of the sub-components in a model of normal language processing.</td>
</tr>
<tr>
<td><strong>Social or Consequences-based Approach</strong></td>
<td>Therapy aims to reduce whatever barriers prevent aphasic people from using language and communication to participate in life.</td>
</tr>
<tr>
<td><strong>Social Consequences</strong></td>
<td>Aphasia, with its effects on both language and communication, results in barriers to an individual's ability to participate in life.</td>
</tr>
</tbody>
</table>
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