14. Aphasia

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Key Points

Language therapy is efficacious in treating aphasia when provided intensely for the first 3 months; less intensive therapy given over a longer period of time does not provide a statistically significant benefit, although clinical benefits can be achieved.

Trained volunteers can provide an effective adjunct to speech language pathologists' treatment.

Participation in group therapy may result in communicative and linguistic improvements.

Community-based language therapy programs provide a setting for improved language functions taking into account limitations and constraints of the "real-world".

Supported Conversation for Adults with Aphasia improves conversational skill. In addition, training communication partners may result in improved access to conversation and increased social participation.

Group-based caregiver education may be associated with improvement in caregiver stress.

Educational seminars for aphasic individuals and their families/caregivers may improve not only knowledge, but may also be beneficial in terms of social participation and family adjustment.

Further research needs to be done to determine the impact of aphasia programs on the psychological well-being of patients and their families.

Computer-based aphasia therapy results in improved language skills and may improve functional communication.

Supplementary-filmed programmed language instruction does not provide a benefit in aphasic patients.

Forced-use aphasia therapy can result in improved language function and everyday communication in chronic aphasics.

The Evidence-Based Review of Stroke Rehabilitation (**EBRSR**) reviews current practices in stroke rehabilitation.

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Treatment with repetitive transcranial magnetic stimulation may be associated with improved naming performance in patients with non-fluent, chronic aphasia.

Site and polarity specific transcranial direct stimulation may improve naming ability in chronic aphasia.

Task-specific semantic therapy and task-specific phonological therapy improves semantic and phonological language activities respectively in aphasia.

Phonological and semantic cueing may improve naming accuracy in aphasics with word-finding deficits.

Target-specific therapy for global aphasia does not appear to improve language function.

Therapy specific to alexia in aphasic patients improves language functions.

Piracetam when combined with language therapy results in improved aphasia recovery.

Bromocriptine does not improve aphasia recovery post-stroke.

Dextroamphetamine appears to improve aphasia recovery when combined with language therapy.

Cholinergic treatment has not been studied sufficiently in aphasia recovery.

Dextran 40 treatment results in worse outcomes when compared to no treatment in aphasia recovery.

Treatment with Moclobemide, a MAO-inhibitor, does not enhance aphasia recovery.

Treatment with donepezil HCl may have a positive effect on global language function.

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Table of Contents

Aphasia

14.1 Defining Aphasia

The AHCPR Post-Stroke Rehabilitation Clinical Practice Guidelines defines aphasia as "the loss of ability to communicate orally, through signs, or in writing, or the inability to understand such communications; the loss of language usage ability." Darley (1982) noted that aphasia is generally described as an impairment of language as a result of focal brain damage to the language dominant cerebral hemisphere. This serves to distinguish aphasia from the language and cognitive-communication problems associated with non-language dominant hemisphere damage, dementia and traumatic brain injury (Orange and Kertesz 1998). Ninety-three percent of the population is right-handed, with the left hemisphere being dominant for language in 99% of right-handed individuals (Delaney and Potter 1993). In left-handed individuals, 70% have language control in the left hemisphere, 15% in the right hemisphere, and 15% in both hemispheres (O'Brien and Pallet 1978). Language function is almost exclusively the domain of the left hemisphere; for 96.9% of the population language control is localized primarily in the left hemisphere.

The concept of aphasia as simply a disorder of language fails to do the entity justice. Kertesz (1979) clinically described aphasia as a *"...neurologically central disturbance of language characterized by paraphasias, word finding difficulty, and variably impaired comprehension, associated with disturbance or reading and writing, at times with dysarthria, non-verbal constructional and problem-solving difficulty and impairment of gesture."* The Boston classification system is used frequently by researchers and clinicians to classify type of aphasias (Table 14.1). Type of aphasia is determined, primarily, by lesion location (Godefroy et al. 2002).

14.2 Natural History and Impact of Aphasia

It has been reported that aphasia is one of the most common consequences of stroke in both the acute and chronic phases. Acutely, it is estimated that from 21 – 38% of stroke patients are aphasic (Berthier 2005). Global aphasia is the most common type in the acute period affecting as many as 25-32% of aphasic patients, while other classic aphasias described within the Boston system of classification are seen less frequently (Laska et al. 2001,

Table 14.1 Boston Classification System - Characteristic Features of Aphasia

Type	Fluency	Comprehension	Repetition
Broca's	Nonfluent	Good	Poor
Transcortical motor	Nonfluent	Good	Good
Global	Nonfluent	Poor	Poor
Wernicke's	Fluent	Poor	Poor
Transcortical sensory	Fluent	Poor	Good
Anomic	Fluent	Good	Good
Conduction	Fluent	Good	Poor

Godefroy et al. 2002, Pedersen et al. 2004). The frequency of unclassified or mixed aphasias that cannot be assigned to a classic category is more difficult to determine. Godefroy et al. (2002) reported approximately 25% of patients as having nonclassified aphasias, comprised mostly of disorders similar to anomic aphasia in addition to some other impairments. In that study, the presence of nonclassified aphasia was significantly associated with a history of previous stroke.

In a recent population-based study of aphasia following first-ever ischemic stroke, Engelter et al. (2006) reported incidence rates of 33 to 52 individuals per 100,000 population. Both age (OR = 1.03, CI 1.01 – 1.07) and cardioembolic stroke (OR = 1.85, CI 1.07 – 3.2) were identified as significant risk factors for aphasia. Risk for aphasia increased significantly with age, such that each advancing year was associated with 1-7% greater risk. While 15% of individuals under the age of 65 experienced aphasia, in the group of patients 85 years of age and older, 43% were aphasic (Engelter et al. 2006).

During the first year following the stroke event, aphasia tends to improve. A review by Ferro et al. (1999) reported that approximately 40% of acutely aphasic patients experience complete or almost complete recovery by one year post stroke. Within the literature, most longitudinal studies have reported that the greatest amount of spontaneous recovery occurs in the first 3 months following stroke. After this, the amount of recovery slows and very little additional spontaneous recovery can be expected after the first 12 months (Ferro et al. 1999). Pedersen et al. (2004) reported that during these first 12 months, aphasia of all types (even global aphasia) tended to evolve to a less severe form. Non-fluent aphasias evolved to a fluent aphasia, although the reverse was not observed. While 61% of aphasic patients in the Copenhagen Aphasia Study still experienced aphasia at one year post stroke, it was usually of a milder form.

Similarly, Bakheit et al. (2007) demonstrated that patients with all types of aphasia experienced significant improvement in the first 6 months post-stroke when treated with conventional speech and language therapy as part of a comprehensive rehabilitation program. Improvements were greatest in the first 4 weeks, and then slowed to a lesser though still significant rate. Further, individuals diagnosed with Broca's aphasia demonstrated the greatest gains despite greater initial impairment. In general, patients with Broca's aphasia made greater gains in terms of scores on the Western Aphasia Battery than patients with global aphasia, who in turn demonstrated greater improvement than those with Wernicke's, anomic or conduction aphasia.

The degree and rate of recovery may be different for various facets of language. In their 1999 review, Ferro et al. reported that comprehension, especially for everyday functional communication, recovers most rapidly. Repetition is also quick to recover, while naming and fluency are slower to recover and are least likely to recover entirely. Patients may improve less on language production than on language comprehension and more in oral expression than in written (Ferro et al. 1999). However, Pedersen et al.

(2004) reported no significant differences in recovery on the various parts of the Western Aphasia Battery and found that gains ranged from 54% for comprehension to 78% for naming.

The most powerful predictor of recovery is the initial severity of aphasia in the acute period (Ferro et al. 1999, Laska et al. 2001, Pedersen et al. 2004, Berthier 2005). Greater initial severity of aphasia is associated with poorer outcome. Initial stroke severity and lesion volume have been associated with initial severity of aphasia (Pedersen et al. 2004, Laska et al. 2001, Ferro et al. 1999). The influence of other factors on the degree of recovery is less clear. While some studies report recovery to be significantly better for younger patients (Ferro et al. 1999, Lasko et al. 2001), others report that age does not predict recovery (Pedersen et al. 2004). Similarly, while there are reported gender differences in type and severity of aphasia, sex does not predict recovery (Pedersen et al. 2004, Laska et al. 2001). Studies examining handedness, and education also provide conflicting results (Ferro et al. 1999, Berthier 2005).

The presence of post-stroke aphasia has been associated with higher rates of mortality over both the short and long-term. A recent study demonstrated that mortality among aphasic patients was 11% in the acute period compared to 3% among non-aphasic patients (Laska et al. 2001). While this comparison did not reach statistical significance, the same comparison was significant at 18 months ($p=0.02$). Mortality among aphasic patients was reported to be twice that of non-aphasic patients (Laska et al. 2001). In the Copenhagen Aphasia Study, Pedersen et al. (2004) reported mortality in aphasic patients to be 27% one year following stroke. In that study, there was a tendency for mortality at one year to be associated with the severity of aphasia at the time of the acute admission. The presence of aphasia has also been reported to have an adverse effect on mood, functional and social outcomes as well as overall quality of life (Ferro et al. 1999, Wade et al. 1986).

In a recent study of 240 stroke patients, Paolucci et al. (2005) reported that, while all patients experienced significant gains over the course of rehabilitation, patients with aphasia and comprehension deficits had poorer outcomes in terms of activities of daily living, mobility and urinary continence at discharge than patients with no aphasia or patients with aphasia but no comprehension deficits. The most powerful predictor of effectiveness of rehabilitation as assessed on the Barthel Index and Rivermead Mobility Index was performance on a semantic-associated word comprehension task. For patients with aphasia and comprehension deficits, the risk of poor response to rehabilitation was approximately 5 times greater than for patients with aphasia and no comprehension deficits or patients with no aphasia (Paolucci et al. 2005).

14.3 Therapies for Aphasia

Reviewing and critiquing therapies for aphasia was challenging because of the extensive number of heterogeneous studies, many of which relied on small samples and were poorly designed or of overall low quality.

14.3.1 Language Therapy Reviews

Robey (1994) performed a meta-analysis of 21 studies of aphasia treatments that revealed several important findings. The significant findings of this meta-analysis were summarized by Orange and Keresz (1998) into four points: "(1) the performance of individuals who receive language therapy in the acute stage of recovery is nearly twice as large as the effect of spontaneous recovery alone; (2) language therapy initiated after spontaneous recovery has a positive, albeit small, effect on language performance; (3) a medium to large effect is present in comparisons of treated versus untreated individuals when therapy is begun in the acute phase and (4) a small to medium effect is present in treated versus untreated groups when therapy is begun in the chronic stage of recovery (i.e. 6 – 12 months post onset)." (pp. 508).

Robey (1998) conducted a second meta-analysis to investigate the general effectiveness of aphasia treatments across stages of recovery and to assess the different experimental and clinical dimensions of aphasia treatment. The meta-analysis involved 55 articles. Again, Robey (1998) found that the average effect for treated recovery was nearly twice that for untreated recovery when treatment was begun in the acute phase. When treatment was initiated in the acute phase, the average effect size, although smaller, was 1.68 times greater than that of spontaneous recovery alone. When treatment was delayed until the chronic phase, the average effect size for treated patients was smaller, but still exceeded that of non-treated patients. In addition, the meta-analysis revealed that the more intensive the therapy, the greater the improvement. Robey (1998) suggested that two hours of treatment per week should be the minimum length of time for patients who can tolerate receiving intensive therapy. Finally, it was noted that large gains were made by individuals with severe aphasia treated by speech-language pathologists.

Both the Robey (1994) and (1998) meta-analyses examined aphasia therapy as it pertained to all aphasic patients and not just stroke-based patients with aphasia. . Furthermore, both meta-analyses excluded drug treatment therapies. Finally, neither Robey (1994) nor Robey (1998) assessed the quality of methodology of the trials reviewed.

A Cochrane Systematic Review by Greener et al. (2001a) identified 12

Table 14.2 Cochrane Review of Efficacy of Aphasia Therapy (Greener et al. 2001a)

Study	Types of Intervention
Lincoln 1984	Speech Language Therapist vs. No Support
Meikle 1979 David 1982 Hartmann 1987 Mackay 1988 (*method assessment*) Leal 1993 (*abstract*)	Speech Language Therapist vs. Support from Volunteer
Wertz 1986	Speech Language Therapist vs. No Support and Support from Volunteer
Di Carlo 1980	One Type of Speech Language Therapy vs. Another Filmed Language Instruction plus Tradition SLT vs. Traditional SLT alone
Smith 1981	Intensive Treatment vs. No Support of any Kind
Wertz 1981	Group Non-directive vs. Individual Directive Treatment
Kinsey 1986 (*within subject design* Prins 1989	Computer Delivered vs. Conventional Treatment Systematic Therapy Program for Auditory Comprehension Disorders vs. Conventional Treatment

trials investigating speech and language therapy for aphasia following stroke that were rated as suitable for review (Table 14.2). However, they noted that most of these trials were old, often had poor quality or used methodology that could not be evaluated unambiguously. Accordingly, the trials lacked sufficient detail for Greener et al. to carry out complete descriptions and analyses. Consequently, they were unable to determine whether formal language therapy was more effective than informal support. Their main conclusion was that *"speech and language therapy treatment for people with aphasia after a stroke has not been shown either to be clearly effective or clearly ineffective within a RCT."* They suggested that anyone attempting to undertake further research to determine the effectiveness of speech and language therapies should use trials with samples sufficiently large enough to have statistical power and to report clearly on the exact nature of the therapies.

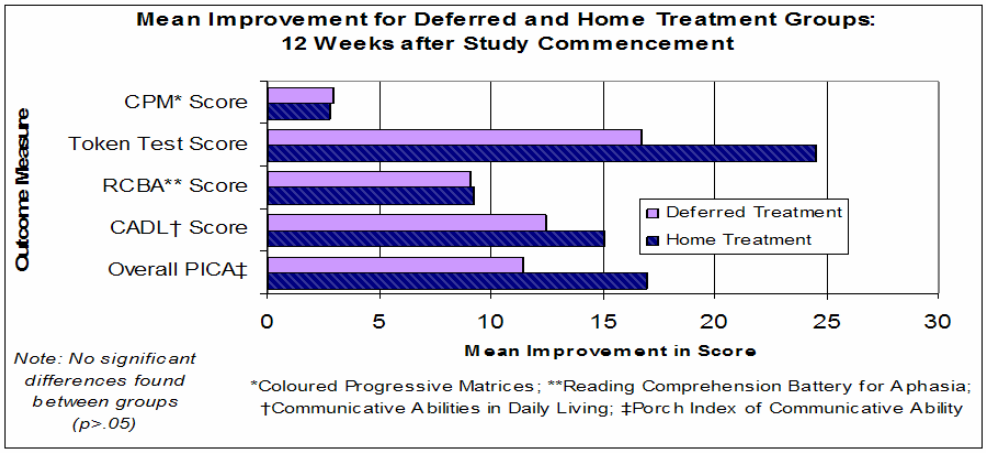
The present review excluded abstracts and unpublished studies, several of which were used in the Cochrane review (e.g., Mackay et al.1988 and Leal et al. 1993). In addition, Smith (1981) was not considered because its main focus was the efficacy of intensive therapy versus conventional care in stroke rehabilitation and not aphasia treatment, per se. In general, Cochrane reviews have highly restrictive methodology, potentially missing some useful studies while simultaneously including others with questionable merit.

14.3.2 Individual Studies of Language Therapy for Aphasia after Stroke

There is a large literature on studies on speech and language therapy in aphasic patients. Robey et al. (1998) included no fewer than 55 studies in his meta-analyses. Robey et al.

Home Treatment for Aphasic Patients by Trained Nonprofessionals. (Marshall et al. 1989)

This study involved 121 males who were 2 to 12 weeks post onset from a single left hemisphere thrombosis infarct resulting in aphasia. Patients were randomized to receive home therapy treatment given by a wife, friend or relative, treatment by speech-language pathologist or treatment by speech-language pathologist deferred for 12 weeks. Therapy was provided for 8 to 10 hours a week for 12 weeks. At 12 weeks, the SLP group showed significantly more improvement than deferred group. Improvements noted in home treatment group not differ from SLP group. At 24 weeks deferred treated group caught up to other 2 groups and no significant differences between groups was noted.



concluded that there was sufficient evidence showing speech and language therapy had a significant positive impact on aphasia recovery in the acute phase and a lesser, but still significantly positive, impact during the chronic phase. However, many of the studies contained small samples and were of poor quality (non-RCT) studies. Several studies included participants who were aphasic due to aetiologies other than a stroke.

Table 14.3 Effects of Language Therapy on Aphasia Post-Stroke

Author, Year Country Pedro Score	Methods	Outcome
Meikle et al. 1979 UK 4 (RCT)	31 patients who had suffered a stroke 3 weeks prior and passed through the acute phase being left with disabling dysphasia were randomly assigned to 1 of 2 groups. One group received conventional speech therapy from a quality speech therapist while the other group received therapy from a non-professional volunteer.	No significant differences were observed between the two groups on Porch Index of Communicative Ability (PICA) scores.
David et al. 1982 UK 5 (RCT)	155 aphasic stroke patients at 3 weeks post-stroke were randomised to receive either therapy from a speech-language pathologist for 30 hours over 15 to 20 weeks or from an untrained volunteer providing support and encouragement for a similar time.	Patients in both groups showed improvement; however, no significant differences in Functional Communication Profile (FCP) scores were noted between the groups.
Lincoln et al. 1984 UK 6 (RCT)	327 aphasic stroke patients who were able to cope with language testing assessment were randomised at 10 weeks post-stroke to receive 2, 1-hour therapy sessions per week at either a hospital or at home for 34 weeks or to receive no treatment.	Patients in both groups demonstrated improvement; however, no significant differences in language recovery were noted between the groups on the PICA, FCP, and the Boston Diagnostic Aphasia Examination (BDAE).
Shewan et al. 1984 Canada 5 (RCT)	100 aphasic stroke patients who were unable to recover their language skills within the first 2 to 4 weeks post-stroke were randomised to one of 3 treatments: (1) language oriented therapy (LOT) provided by a speech-language pathologist (SLP), (2) stimulation facilitation therapy (ST) provided by a SLP and (3) unstructured settings therapy (UNST) provided by nurses. Patients who did not want/were unable to participate formed a control group. Patients in each of the 3 treatment groups received 3, 1-hour sessions a week for 1 year.	No difference in Western Aphasia Battery (WAB) scores, its subsets Aphasia Quotient (AQ) and Cortical Quotient (CQ) scores and Auditory Comprehension Sub-Test for Sentences scores between the groups. The AQ scores of patients in the treatment groups were significantly higher compared to the control groups. Individually, LOT and ST patients significantly improved compared to the control patients, but no significant differences were observed between the UNST and the control group. The CQ scores of the treatment groups were significantly higher compared to patients in the control group. Individually, ST patients had higher CQ scores than the controls but the LOT and UNST groups were not significantly different from the controls.
Wertz et al. 1986 USA 6 (RCT)	121 male veterans under the age of 75 year and between 2 to 4 weeks after onset of single thromboembolic stroke with lesion confined to the left hemisphere and demonstrated language severity from 10th-80th percentile on PICA on entry into the study. Patients were randomized into one of three groups: (1) 8 to 10 hours a week of clinic treatment with speech therapy for 12 weeks	After 1st 12 weeks of treatment clinic treated patients performed significantly better than those deferred on the PICA. No significant difference noted between home treated and clinic or between home treated and deferred treated patients. After 24 weeks of treatment there was no significant difference between any groups.

	followed by 12 weeks of no treatment; (2) 8 to 10 hours a week of home treatment by a trained volunteer for 12 weeks followed by no treatment; or (3) Treatment deferred for 12 weeks followed by 12 weeks of clinic treatment with a speech-language pathologist.	
Hartman 1987 USA 6 (RCT)	60 right-handed patients with acute aphasia due to left hemispheral stroke were randomly assigned to 1 of two 2 of therapies for six months, beginning one month post-stroke. Conventional language therapy provided by professional speech pathologists twice weekly was compared with emotionally supportive counselling therapy, also provided by professional speech-language pathologists at the same intervals. Language function was measured by the PICA. 50 patients were also retested at 10 months post stroke.	Hartman noted no significant difference in the amount of improvement between the two groups.
Brindley et al. 1989 UK 4 (ABA)	This study involved Broca's aphasic patients defined by the BDAE without predominate apraxia and who were 1-year post stroke. Two groups of 5 patients each received five hours of language therapy for 5 days a week for 12 weeks. Comparison was made language during the intensive period of therapy with a 12-1week non-intensive period pre-course and a similar 12-week non-intensive period post-stroke.	Significant improvement on FCP - details in movement, speech, reading, and overall score were noted during the intensive period. There was a significant ratio of improvement on FCP between intensive period and 2nd non-intensive period in movement, speech and overall score. Language Assessment Remediation and Screening Procedure showed significant improvement in intensive period on sentence length increase, reduction in element omission, and increase in percentage of full utterances.
Marshall et al. 1989 USA 5 (RCT)	This study involved 121 males who were 2 to 12 weeks post onset from a single left hemisphere thrombosis infarct resulting in aphasia. Patients were randomized to receive home therapy treatment given by a wife, friend or relative, treatment by speech-language pathologist or treatment by speech-language pathologist deferred for 12 weeks. Therapy was provided for 8 to 10 hours a week for 12 weeks.	At 12 weeks, the SLP group showed significantly more improvement than deferred group. Improvements noted in home treatment group did not differ from SLP group. At 24 weeks deferred treated group caught up to other 2 groups and no significant differences between groups was noted.
Poeck et al. 1989 Germany No Score	The study involved 160 aphasic stroke patients with CT revealing involvement of left hemisphere only and beyond the acute stage of neurological illness. Patients received intensive language treatment for 9 hr/week, for 6 to 8 weeks. Results were compared to a previous multicentre study of 92 German aphasic patients who did not receive language treatment. Patients were sub-grouped as early or late treated patients.	In the early phase mean gains for each measure were significant for both treatment and control group on the Token Test and for repetition. About 2/3 of treatment patients showed a significant improvement in Aachen Aphasia Test.
Prins et al. 1989 Netherlands 5 (RCT)	32 patients with aphasia for at least 3 months following a left hemispheric stroke were randomized to receive either systematic therapy (STAC) or conventional therapy (STIM). The STAC comprised of a series of 28 different tasks on four levels: nonverbal, phonology, lexical-semantics and morphosyntax. The STAC group received treatment twice a week for 5 months. The STIM group received therapy during the same period of time with the same frequency as the	No significant differences were noted between the groups on any of the test batteries.

	STAC group. Eleven patients received no treatment during the 6-month period of the study trial. Patients were tested on a test battery with two parts: subtests for auditory comprehension (items used as practice material in the STAC group) and 8 tests for auditory comprehension, reading comprehension and oral expression (items not used as practice material in either treatment group).	
Bakheit et al. 2007 UK 8 (RCT)	97 patients with aphasia post first-ever stroke were randomly assigned to receive either 5 1-hour long sessions of speech therapy per week (intensive therapy, n=46) vs. two 1-hour long sessions (standard therapy, n=51). An additional 19 patients received therapy via National Health Service (NHS) therapists, but were not randomized to a treatment condition. Language function was assessed at 4, 8, 12 and 24 weeks using the Western Aphasia Battery.	Overall, there were no significant differences noted in performance on the WAB between standard and intensive therapies. However, none of the patients assigned to the intensive therapy group received the full course of therapy – only 13/51 received 80% or more. Patients assigned to the intensive therapy group were often too ill or refused therapy during the first 4 weeks of the study. When the subgroup of patients that received the most therapy was compared to the standard therapy group, no significant difference in WAB scores was noted at any assessment point. The NHS group received the least amount of therapy (mean = 6.9 hours over 8.6 sessions vs. 19.3 hours over 19.3 sessions). WAB scores were significantly higher in patients receiving standard therapy vs. NHS level therapy.

Discussion

There are many factors that often are uncontrolled in aphasia treatment studies. These include small sample sizes, lack of power calculations, the mixing of aetiologies, inappropriate use of non-standardized measures, inappropriate measures, weak design, lack of clarity regarding aphasia types or levels of severity, undocumented type of language therapy and frequency of therapy, among other deficiencies. For example many of the tests used to measure change in these studies were never designed for such tasks, such as the Porch Index of Communicative Ability (PICA), which does not contain any subtests on auditory listening comprehension.

Our review identified 10 RCTs, 8 of which compared the effectiveness of speech and language therapy (SLT) delivered by a trained therapist vs. a non-therapist or non-SLT control. Four of the studies were positive and four were negative (see Table 14.4). However, an examination of intensity of treatment and mean change scores undertaken by Bhogal et al. (2003) showed significant positive treatment effects for a mean of 8.8 hours of therapy per week for 11.2 weeks versus negative studies that provided approximately 2 hours per week for 22.9 weeks. Hours of therapy provided in a week and total number of hours of therapy were significantly correlated with greater improvement on both the PICA and the Token Test while total length of therapy (i.e. time) was inversely correlated with mean change in PICA scores. Bhogal et al (2003) concluded that intense therapy over a short amount of time could improve outcomes of speech and language therapy for stroke patients with aphasia. Bakheit t al. (2007) were unable to demonstrate an association between intensity and improvement on the Western Aphasia Battery; however,

Table 14.4 Efficacy of Aphasia Therapy Post Stroke

Study	PEDro Score	N	Intensity of Therapy	Result
Lincoln et al. 1994	6	327	2, 1-hour sessions per week for 34 weeks.	-
Wertz et al. 1986	6	121	8 to 10 hours a week for 12 weeks	+
Hartman 1987	6	60	2 times a week for 6 months	-
David et al. 1982	5	155	30 hours over 15 to 20 weeks.	-
Shewan et al. 1984	5	100	3, 1-hour session a week for 1 year.	+
Marshall et al. 1989	5	121	8 to 10 hours a week for 12 weeks	+
Prins et al. 1989	5	32	2 sessions a week for 5 months	-
Meikle et al. 1979	4	31	Minimum 3 and maximum 5 sessions/week for 45 minutes.	-
Brindley et al. 1989	4	10	5 hours over 5 days a week for 12 weeks.	+
Poeck et al. 1989	No Score	160	9 hours a week for 6 to 8 weeks.	+/-
Bakheit et al. 2007	8	97	4 hrs/week vs. 2 hrs/week (over 12 weeks)	-

the authors suggest that the amount of therapy received by patients in the intensive therapy condition (approximately 4 hours/week over 12 weeks) may not have reached the threshold necessary to enhance recovery.

Another interesting concept that emerges from these data is the use of trained volunteers to deliver speech and language therapy (SLT). The studies of Meikle et al. (1979), David et al. (1982), Wertz et al. (1986), Hartman (1987) and Marshall et al. (1985) indicated that trained volunteers can deliver SLT without adverse outcomes and may serve as an important supplement to scarce speech and language therapy resources.

Conclusions Regarding Efficacy of Aphasia Therapy

There is conflicting (Level 4) evidence whether speech and language therapy (SLT) is efficacious in treating aphasia following stroke. The failure to identify a consistent benefit appears to be due, in part, to the low intensity of SLT applied in the negative studies. Most positive trials provided very intense therapy over a relative short period of time, whereas, the negative trials provided much less intensive therapy over a longer period of time.

The most comprehensive meta-analysis concluded that language therapy for aphasia had a significant positive impact on aphasia recovery in the acute phase and to a lesser extent during the chronic phase. It also revealed that improvement was tied to more intensive therapy and that severe aphasics benefited the most.

There is strong (Level 1a) evidence that trained volunteers can provide speech and language therapy and achieve similar outcomes to speech- language pathologists. This could serve as an effective adjunct to speech-language pathologists' treatment.

Language therapy is efficacious in treating aphasia when provided intensely; less intensive therapy given over a longer period of time does not provide a statistically significant benefit, although clinical benefits can be achieved.

Trained volunteers can provide an effective adjunct to speech-language pathologists' treatment.

14.3.3 Group Therapy for Aphasia Post-Stroke

Group therapy for aphasic patients is a potential means to maximize limited language therapy resources and encourage social interactions.

Table 14.5 Efficacy of Group Language Therapy for Aphasics

Author, Year Country Pedro Score	Methods	Outcome
Wertz et al. 1981 USA 6 (RCT)	This study involved 67 male aphasic stroke patients with a stroke (left hemisphere and no worse than 20/100 vision in better eye, 4 weeks post onset and entry scores from the 15th to the 75th percentile on the PICA). Patients were randomly assigned to either group A or group B. Patients in group A received 4 hours a week of individual treatment with a therapist in traditional stimulus response type treatment. Patients in group B received group treatment designed to facilitate language use in a social setting.	Group A patients performed significantly better on the graphics sub-test of the PICA.
Aten et al. 1982 USA No Score	7 male patients received functional communication intervention consisting of group therapy in one-hour sessions twice per week for 12 weeks. Topics included shopping, giving & following directions, social greetings and exchanges, supplying personal information, reading signs and directories and gestural responding.	Scores on the PICA did not differ significantly pre to post intervention. However, scores on the Communication Abilities of Daily Living (CADL) scale were significantly improved ($p<0.01$).
Marshall et al. 1993 USA No Score	25 patients with mild aphasia due to stroke met in groups of 6 to 10 with a clinician undertaking problem-solving group therapy approach.	14 patients showed an overall improvement on the PICA while only 4 patients showed little or no change. Those who improved attended weekly meetings, participated avidly and displayed concern and interest for other members.
Bolllinger et al. 1993 USA No Score	14 patients at least 18 months since stroke onset and presenting with aphasia were received Contemporary Group Treatment (CGT) involving a group interactive process with encouragement of multimodal stimulation and communication and Structured Television Viewing Group Treatment (STVGT). Patients were divided into two groups based on the Communicative Abilities in Daily Living results (high vs. low) to ensure adequate communication proficiency within groups. Group therapy consisted of 1-hour sessions, 3 times a week for 10 weeks, followed by 10 weeks of STVGT followed by a 10-week withdrawal period. After the withdrawal period, 10 weeks of STVGT was re-initiated followed by 10 weeks of CGT and concluded with another 10-week withdrawal period.	10 patients completed the study protocol. There were statistically significantly increases on the Porch Index of Communicative Abilities (PICA) and CADL after the first block of treatments with retention of skills during withdrawal. A significant increased in PICA scores was noted during the 2nd block of treatments and withdrawal. Significant gains were demonstrated on the CADL during the intial therapy block were maintained through the successive treatment/withdrawal interval. There was no change in the Auditory Comprehension for Sentences.
Brumfit and Sheeran 1997 UK No Score	6 aphasic patients participated in 10 sessions of approximately 90 minutes duration of group therapy. The group therapy programme consisted of communication activities within the group that encouraged sharing of personal experiences,	Significant improvement noted in patients on communicative competence and attitudes in communication over the course of the intervention.

	videotaping of role-play activities for self- and group-evaluation and practice tasks completed outside the group.	
Elman and Berstein-Ellis 1999 USA 4 (RCT)	Chronic aphasic patients were randomly assigned to two treatment and two deferred treatment groups. 24 patients completed the 4-month treatment trial. The treatment patients participated in 5 hours of group communication treatment weekly provided by a speech-language pathologist. Focus of treatment included increasing initiation of conversation and exchanging information using whatever communicative means possible. The deferred group, while awaiting treatment, engaged in activities such as support, performance or movement groups to control for effects of social contacts.	Patients in the treatment group demonstrated significantly higher scores on the WAB AQ ($p<0.05$) and CADL ($p<0.05$). There was no significant difference between groups reported on the SPICA. Significant increases in performance were evident at 2 and 4 months. No significant decline in performance occurred at time of follow-up (4-6 weeks post-intervention).

Conclusions Regarding Group Therapy for Aphasia Therapy Post-Stroke

There is moderate (Level 1b) evidence based on one RCT of fair quality that group intervention results in improvements on communicative and linguistic measures among patients with chronic aphasia. There is limited (Level 2) evidence that participation in group therapy results in improved communication.

There is moderate (Level 1b) evidence, based on one "good" RCT (PEDro = 6), that group therapy results in less improvement in graphic (writing) elements of aphasia when compared to individualized therapy.

Participation in group therapy may result in communicative and linguistic improvements.

14.3.4 Community-Based Treatment Programs

As noted by Aftonomos et al. (1999), most conclusions regarding the efficacy of aphasia therapy are derived mainly in academic research; however, it is in the community that patients with aphasia are identified, reached and treated. Thus, aphasia therapy depends on "its ability to promote and improve functional outcomes in real-world settings of constraints and limitations," (Aftonomos et al. 1999).

Table 14.6 Community-Based Aphasia Programs

Author, Year Country Pedro Score	Methods	Outcome
Aftonomos et al. 1999 USA No Score	60 patients with aphasia enrolled in 2 community-based, comparably managed and equipped therapy programs. The program incorporated specially designed computer-based tolls before and after treatment at the impairment (speech-language test performance) and disability levels (functional communication). The Western Aphasia Battery (WAB) and the Communicative Effectiveness Index (CETI) were admininstered.	Patients' mean performance scores improved significantly in response to treatment on the WAB and the CETI. No significant difference between improvements in patients in acute versus chronic stages aphasia, between different impairment severity levels, different locations, at the functional function or of different diagnostic types.
Worrall & Yiu 2000 USA	14 aphasic patients were randomly assigned to participate in either recreational activities or the Speaking Out program. The Speaking Out	There was a significant difference for both groups before and after the Speaking Out intervention on the WAB (group A

5 (RCT)	intervention consisted of 10 scripted modules addressing issues in everyday functional communication. Subjects participated in both conditions in a crossover design. Each 10-week intervention phase was separated from the next by a 10-week withdrawal phase. Group A participated in Speaking out first (1-2 hours per week for 10 weeks), then withdrawal followed by recreational activities (crafts, cards & games). Group B participated in recreational activities first, then withdrawal and then the Speaking Out program. Both recreational activities and the Speaking Out Program were conducted in the home by trained volunteers.	p=0.046; group B p=0.036). For group A, there was a significant difference in general health perception assessed on the SF36 before and after participation in Speaking Out (p=0.028). For Group B, there was a significant difference in scores on the ASHA Functional assessment of Communication Skills before and after Speaking Out (p=0.018). When scores were analyzed to compare the Speaking Out intervention with just recreational activities, no significant between group differences were noted.

Discussion

While there seems to be a generally positive effect associated with community-based aphasia intervention. There is little to recommend any one treatment over the other. In the sole randomized controlled trial of a community-based program, intragroup analysis revealed a significant difference between pre- and post-treatment scores on both body function (impairment) and activity (functional) level assessments. However, there were no significant differences reported between patients receiving recreational activity interventions and those receiving the experimental intervention (Worrall & Yiu 2000). In fact, in-home social or recreational visits may have had as much effect as the targeted program intervention.

Conclusions Regarding Community-Based Aphasia Programs

There is limited (Level 2) evidence that a community-based program improves language outcomes at both the impairment and disability level independent of severity, setting, diagnostic type or stage of aphasia.

There is moderate evidence (Level 1b – based on a single "fair" RCT) that an in-home program administered by trained volunteers improves language outcomes at the impairment and functional levels. However, there is no evidence that a targeted aphasia program is superior to in-home visits for the purpose of simple recreational activity.

Community-based language therapy programs provide a setting for improved language functions taking into account limitations and constraints of the "real-world".

14.3.4.1 Training Conversation/Communication Partners

Conversation is important in social participation and plays a key role in many social functions such as establishing and maintaining relationships, sharing ideas and opinions or making plans. According to Kagan et al. (2001), it is also the means by which individuals reveal their inner competencies. Individuals living with aphasia have lost, to varying degrees, the tools of conversation. This loss impacts the ability of the individual to participate in social roles and obscures the individual's inner competencies (Kagan et al. 2001, Rayner and Marshall 2003).

Interventions focused on the restoration of conversation are not restricted to alleviating impairment of language but also attempt to remove barriers to social participation in the settings within which the individual with aphasia lives and interacts with others (Lyon et al. 1997). Training conversation or communication partners within the aphasic individual's social setting is one way to promote opportunities for restored access to conversation (Marshall 1998, Rayner and Marshall 2003).

Table 14.7 Training Conversation/Communication Partners

Author, Year Country Pedro Score	Methods	Outcome
Lyon et al. 1997 USA No Score	10 treatment triads (patient, caregiver and communication partner) enrolled over a 3 year period. 2/3 of triads were assigned to begin treatment immediately; 1/3 had treatment deferred for 2 months. Treatment consisted of 2 phases lasting for 5.5 months. Phase 1 consisted of 1- 1.5 hour sessions twice weekly for 6 weeks during which the volunteer learned specific strategies to promote communication together with the aphasic patient in his/her triad. Phase 2 consisted of twice weekly sessions. Session one was a review of the previous week's activity and planning for the next session. Session two consisted of activities/tasks of interest chosen by the aphasic individual and planned out by the patient, communication partner and clinician. Assessments included the Boston Diagnostic Aphasia Examination (BDAE), the Communication Activities in Daily Living (CADL) scale, the Affect Balance Scale (well-being) and 2 measures constructed for the study – the Communication Readiness and Use Index (CRUI) and the Psychosocial Well-being Index (PWI). Independent, subjective ratings of outcome were made by speech-language clinicians familiar with the patients.	No pre-post differences reached significance for scores on the BDAE, CADL or ABS measures. Patients in the deferred treatment groups also demonstrated no differences on these measures while awaiting treatment. On the non-standardized measures (CRUI & PWI), significant differences were found ($p<0.05$) whether they were rated by patient, caregiver or communication partner) when comparing baseline to post-treatment scores. Subjective judgements from independent clinicians did not correlate strongly with the gains on the CSUI or PWI. While almost all patients demonstrated gains on the CRUI and PWI, only 2/3 were rated as meeting or exceeding expectations by the 2 independent clinicians.
Wilkinson et al. 1998 UK No Score	In this study, an aphasic woman and her husband were asked to videotape themselves during peak conversation times at home for a week. The camera was then returned to the speech language therapist (SLT) who transcribed and analyzed their conversations verbally and nonverbally to determine which aspects of conversation the couple may wish to change. Therapy (termed 'interaction therapy') consisted of 3 stages: observation, where the couple and the SLT watch the video together; discussion, where they discuss how they feel about certain patterns of conversation; and suggestions for change, where the SLT	In the post-therapy assessment of conversation, the couple did not display the same 'other-repair' pattern that was causing disturbance in the prior assessment. Further research into this therapeutic approach is suggested. It is emphasized that language therapy must not neglect functional and psychosocial issues if it is to bring about meaningful change for aphasics and their conversational partners.

	highlights the problem areas and suggests ways to improve the flow of conversation. After 4 two-hour therapy sessions, the couple was asked to videotape themselves once again and the conversations were transcribed and analyzed to assess improvement.	
Booth & Swabey 1999 UK No Score	4 individuals with aphasia at least 6 months post stroke and an adult relative living with them participated in a communication skills program based on Conversation Analysis. A conversational analysis profile for people with aphasia (CAPPA) was created via a structured interview with carers to determine the carer's perception of the patient's language abilities and conversation as well as analysis of a 10-minute conversation between carers and patients with aphasia. The interview and conversation analysis were compared to derive a summary profile. After this initial assessment, carers participated in a weekly communication skills group for a total of 6 weeks. The group program consisted of lectures, discussions, workshops as well as personalized information & management strategies based on the conversation analysis. The CAPPA was repeated following the intervention.	Carers' perception of communication more closely matched results of conversation analysis following the communication skills intervention. Increased awareness, however, was not necessarily indicative of how well carers were able to manage communication problems arising during conversation. While there was a decrease in the rating of severity of problems following intervention, it was not significant. Carers expressed increasing distress with the burden of topic initiation and management during conversation. However, carers also reported that they found reinforcement and personalized conversational examples useful in understanding principles of CAPPA. Carers enjoyed the interactive nature of the workshops as well as the opportunity to interact with other people who shared their concerns.
Kagan et al. 2001 Canada & USA 6 (RCT)	Study included 40 stroke patients with moderate-to-severe aphasia and volunteers at an aphasia centre. Volunteers were randomly assigned to either receive a workshop training session designed to teach them how to acknowledge and reveal the competence of adults with aphasia through supported conversation (SCA) or were assigned to be exposed to aphasia by watching a video that told stories of patients with aphasia and their families. There were also given opportunity to interact with aphasia patients. Patients were randomly assigned to volunteers.	SCA trained volunteers scored higher than controls on rating of acknowledging competence and revealing competence of their aphasic partners. Patients assigned to trained volunteers scored higher on social and message exchange skills than did patients assigned to control volunteers.
Hopper et al. 2002 USA No Score	2 patients with chronic aphasia post stroke participated together with their spouses. Each couple participated in a baseline and instruction session in which the aphasic partner's ability to convey a story to the non aphasic partner was assessed and used to generate personalized communication strategies. Specific strategies offered by therapists were chosen by the couples. Each couple then participated in 10 treatment sessions in which the aphasic individual watched a videotaped story and then attempted to convey it to the nonaphasic partner. A clinician was present and intervened in the process to provide information about how to use effective strategies in the event of communication breakdown or miscommunication (conversational coaching). Pre and post treatment probes were conducted.	A trend toward improvement was identified in the number of main story concepts conveyed when baseline scores were compared to post-treatment scores. One aphasic individual demonstrated improvement on CADL-2 scores while the other did not. Naïve observers reported greater understanding of the conversation between both couples after treatment than at baseline.

	The primary outcome was number of main story concepts communicated successfully. Aphasic individuals were also assessed using the CADL-2.	
Cunningham & Ward 2003 UK No Score	Four individuals with aphasia post stroke and their spouses participated in a training program intended to improve conversation. Couples & researchers determined topics of conversation to be used in the study. Baseline evaluation consisted of 3 sessions (one week apart) in which conversations between patients and spouses were videotaped and analysed via conversational analysis. The frequency and type of nonverbal communication was also recorded. Intervention consisted of 5 sessions (1.5 hours for 5 weeks). Sessions 1&2 were educational/informative, session 3 included instruction/feedback based on the videorecordings taken during baseline, sessions 4 & 5 included active roleplaying and practise of supported conversations. Baseline assessments were repeated following intervention. At both assessment periods, couples completed the Visual Assessment of Self-Esteem Scale (VASES) and the Hospital Anxiety and Depression Scale (HADS).	Conversational analysis revealed that post-intervention 3 of 4 couples demonstrated an increase in successful conversational repairs. In addition, the number of trouble sources initiated by the aphasic partners decreased following intervention for 3 of 4 couples. No significant changes in the use of nonverbal communication were noted. However, there was a nonsignificant trend identified suggesting an increase in the use of gestures overall. There were no significant differences identified from baseline to post intervention on either the VASES or HADS scales.
Rayner & Marshall 2003 UK No Score	A training course, based on SCA (Kagan et al. 2001), was delivered to 6 volunteers at a social club for individuals with aphasia. Participants with aphasia were recruited from the same group. All aphasic participants had stable language functioning and were at least 1 year post-stroke. Training consisted of 3 3-hour morning sessions. Session one consisted of education/information regarding theories of conversation and aphasia, session two focused on the Aphasia Centre Instructional Video and discussion of alternate means of communicating and session three consisted of clarification, review and the opportunity to practise new strategies. The course was evaluated by assessing videotaped conversations between aphasic individuals and trained volunteers. Tapes were evaluated using Kagan's rating scales (Kagan et al. 2001). Two questionnaires were administered to volunteers before and after training to assess knowledge of aphasia and knowledge of communication strategies.	After training, there was a significant improvement in ratings of volunteer performance and of the aphasic person's performance/level of involvement in videotaped conversations ($p<0.001$). In addition, a significant ($p<0.001$) correlation was identified between volunteer skills/performance and level of participation by the aphasic individual. There was a significant improvement in volunteers knowledge about aphasia ($p<0.005$) and about strategies to use in conversation ($p<0.0.05$). When the questionnaire regarding strategies was administered twice to a group of untrained volunteers, no improvement was seen on the second administration.
Sorin-Peters 2004 Canada No Score	Five individuals with aphasia and their spouses participated in a communication training programme based on principles of conversation partner training and learner-centred adult education. The program was developed based on the experience, needs, learning styles and rhythms of the participants. Pre and post intervention as well as 2-month follow-up assessments included videotaped conversations	After training and follow-up, couples demonstrated improvements in interaction and transaction. Couples appeared more at ease and conversations more closely resembled natural adult conversation. Prior to training, spouses appeared to interview or test their partners with aphasia; after training, conversation included more discussion and reminiscence. Spouses used more verbal and non-verbal strategies resulting in more transfer of

	between the couples, the Couple Questionnaire (spouses' attitudes toward partners and couple's ability to communicate) and a semi-structured interview. Verbal and nonverbal communication behaviours were transcribed from the videos and analysed qualitatively using the categories of interaction and transaction.	information between spouses and aphasic partners. Prior to training, spouses dominated conversational turn control. Post training, turn control was more balanced. Spouses used more effective communication strategies after training allowing partners to convey more information. Themes identified during interviews, conversations and from the Couples Questionnaire included expression of anger, sadness and grief, acceptance (after the training) as well as the presence of marital issues.

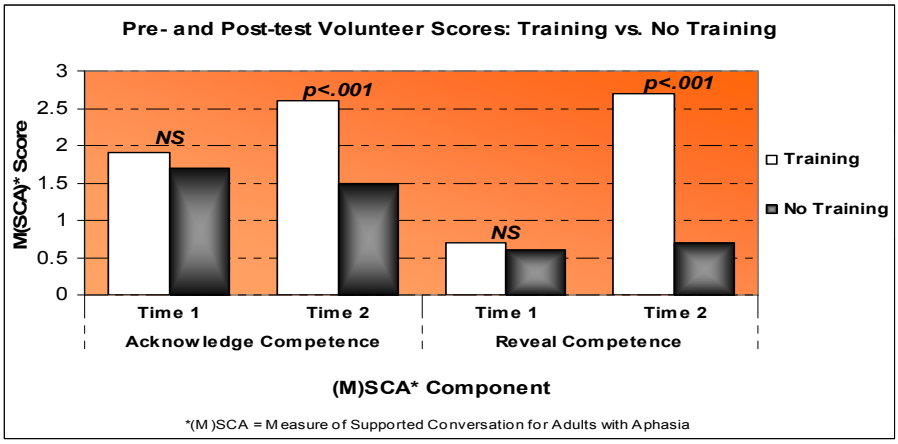
Discussion

All studies reported generally positive effects associated with training of conversation partners. Most studies, however, were very small with very few participants. In addition, in most of the studies summarized above, interventions were based, to varying extents, on individualized instruction according to the needs and communication styles of each communication dyad. The SCA technique (Kagan et al. 2001) represents a more generic tool used to teach communication partners skills they can use to promote conversation.

Training volunteers as conversation partners using "Supported Conversation for Adults with aphasia" (SCA). (Kagan et al. 2001)

40 volunteers were randomly assigned to either receive a workshop training session designed to teach them how to acknowledge and reveal the competence of adults with aphasia through supported conversation (SCA) or were assigned to be exposed to aphasia by watching a video that told stories of patients with aphasia and their families. There were also given opportunity to interact with aphasia patients. 40 stroke patients with moderate to severe aphasia were randomly assigned to volunteers.

SCA trained volunteers scored higher than controls on rating of acknowledging competence and revealing competence of their aphasic partners. Patients assigned to trained volunteers scored higher on social and message exchange skills than did patients assigned to control volunteers.



Conclusions regarding Training Conversation/ Communication Partners

There is moderate (Level 1b) evidence that the technique of training conversation partners, Supported Conversation for Adults with Aphasia (SCA) is associated with enhanced conversational skill for both the trained partner and the individual with aphasia. There is limited (Level 2) evidence, based on several small studies, that training conversation partners is associated with increased well-

being and social participation in addition to positive communication outcomes.

Supported Conversation for Adults with Aphasia improves conversational skill. In addition, training communication partners may result in improved access to conversation and increased social participation.

14.3.4.2 Patient and Caregiver Education

Community-based therapy, partner training and group therapy have both been examined as possible intervention approaches in long-term or chronic aphasia. The role of education for both the patient and family has also been examined as a means to improve communication in the home and social participation.

Table 14.8 Caregiver/Patient Education Programs

Author, Year Country PEDro Score	Methods	Outcome
Hinckley et al. 1995 USA No Score	Adults with aphasia and their families/caregivers participated in a brief education program presented in a 2-day conference format. Goals of the conference were to increase productivity, to learn about aphasia, to increase knowledge about therapy options and home practice and to learn coping skills and deal with psychological issues.	6-month outcomes demonstrated that attendance was associated with improvements in aphasia knowledge, independence in the home and increased communication with family members. The majority of participants had located useful community resources within 6 months of attendance. Participants completed a Community Integration Questionnaire at the time of the seminar and then again at 6 month follow-up. There was significant improvement in community integration scores noted at 6 month follow-up
Hinckley & Packard 2001 USA No Score	Subjects in the participant group (n=21) were recruited from among aphasic individuals and their caregivers who attended a 2-day educational seminar about living with aphasia. A comparison group (n=15) was recruited from the seminar mailing list and was comprised of interested aphasic individuals & their caregivers who did not attend the seminar. This study is based on the same seminar format as the above study but also includes a comparison group and assessment of additional outcomes (FAI, McMaster Family Assessment Device)	At 6-month follow-up, participating caregivers and aphasic individuals rated their level of knowledge higher than those individuals who did not participate ($p<0.05$). There was no difference between pre and post seminar assessments on any of the measures for the non-participant group. The participant group's scores on the Community Integration Questionnaire did not change from pre to post seminar assessments, however, significant changes were noted on the family assessment device and Frenchay activities index (both $p<0.05$).
Draper et al. 2007 Australia 4 (RCT)	39 caregivers of stroke patients with aphasia were randomly allocated to either participate in a group-based intervention (n=19) or be put on a 3-month waiting list (control group, n=20). The group training program included education, support, and functional communication/skills training, 2-hours per session once per week for 4 weeks. Primary study outcomes included caregiver stress (assessed using the General Health Questionnaire – GHQ), caregiver burden (Relatives' Stress Scale – RSS) and both use and effectiveness of 8 functional communication strategies. Assessments were conducted at	The treatment group demonstrated significant improvement in GHQ scores over the period of the intervention ($p=0.006$) whereas the waiting list group demonstrated no improvement. There were no other significant within group changes reported at either the end of intervention or at the end of the 3 month follow-up period. Improvements demonstrated on the GHQ for patients in the treatment group were not sustained at 3 months. Between group comparisons were not reported.

	baseline and completion of the intervention. Questionnaires were mailed at 3 month follow-up.	

Discussion

Of the three studies summarized here, only one was a randomized controlled trial. Draper et al. (2007) reported that participation in a group-based education and support program was associated with significant, though temporary benefits in terms of caregiver distress. No benefit was reported on any other outcome including use and perceived effectiveness of functional communication strategies. However, the study suffered from several notable limitations including problems in recruitment, insufficient power and no between group comparisons.

There is limited (Level 2) evidence that participation in educational seminars results in improved knowledge, participation in social activities and family adjustment. Further examination of the role of education is warranted.

Group-based caregiver education may be associated with improvement in caregiver stress.

Educational seminars for aphasic individuals and their families/caregivers may improve not only knowledge, but may also be beneficial in terms of social participation and family adjustment.

Conclusions Regarding Brief Family and Patient Education Interventions

There is moderate (Level 1b) evidence based on a study of 'fair' quality that group-based caregiver education is associated with temporary improvement in caregiver stress, but not with improved use or effectiveness of functional communication strategies.

14.3.4.3 Impact of Community-based Programs on Well-being

The effect of stroke not only impacts the patients but their family as well. Communication deficits post stroke can further impede patient - family interactions.

Table 14.9 Effect of Aphasia Treatment on Well-Being of Patients and Families

Author, Year Country	Methods	Outcome
Hoen et al. 1997 Canada No Score	Evaluation of the York-Durham Aphasia Centre's community-based programme. Patient and family members psychological well-being was evaluated using the Ryff's Psychological Well-being Scale to 35 patients and 12 family members.	Patients were observed to show positive significant change on five of six measures of well-being: self-acceptance, purpose of life, personal growth, autonomy and environmental mastery. Family members showed positive significant changes in five of 6 measures as well: personal growth, positive relations with others, purpose of life, self-acceptance.
Van der Gaag et al. 2005 UK No Score	38 patients with long-term stroke and aphasia together with 22 of their caregivers were recruited upon referral to a community-based aphasia therapy centre. Over a period of 20	Quality of life improved significantly by the end of 6 months as assessed on the EQ5D (p=0.02). The condition-specific scale (SAQoL-39) reflected significant improvement only on the communication

	weeks, patients received an average of 34 hours of group aphasia therapy while relatives/carers received an average of 22 hours of therapy specific to carers. An average of 8 hours of counselling was provided to each participant. Group activities included conversation, communication skills, use of art forms, discussion & self-advocacy, training and monitoring communication skills of partners. Assessments before and after participation in the programme included the EQ5D, Stroke and Aphasia Quality of Life Scale (SAQoL-39), the Communication Effectiveness Index (CETI) and the Carer's Assessment of Difficulties Index (CADI). In addition, patients and carers participated in semi-structured interviews both before and after participation in therapy.	subscale ($p<0.001$). Based on interviews, the majority of patients and carers reported positive changes in quality of life including increased self-confidence, better communication with strangers, family & friends and an increase in desire to participate (eg. in social activities). Scores on the CETI improved significantly from baseline to 6 months as reported by both the patient ($p=0.007$) and carer ($p=0.005$). Patients reported feeling more confidence in communicating and in using alternative forms of communication (e.g. gestures and writing). Differences from baseline to 6 months were not significant on the CADI; however, they reported feeling more supported and less isolated. Group therapy was seen as a good resource of advice and tips for coping and a means to hear from others in similar situations. Few carers found group sessions unhelpful or uncomfortable.

Conclusions Regarding Impact of Community-based Programs on Patient and Family Well-Being

There is limited (Level 2) evidence that a community-based aphasia program improves the psychological well-being of patients and their families. Further research needs to be done before definitive conclusions can be made.

Further research needs to be done to determine the impact of aphasia programs on the psychological well being of patients and their families.

14.3.5 Computer-Based Treatment in Aphasia

Computer-based aphasia therapy is appealing in that it provides a means for massed practice thereby increasing intensity of therapy (Wallesch & Johannsen-Horbach 2004), while minimizing use of therapist time and resources (Katz and Wertz 1997). However, the effectiveness of computer-based therapies has not been thoroughly investigated. A recent review of reports of computerised treatments for aphasia (Wertz and Katz 2004) identified 8 phase 1 studies, 3 series of phase 2 studies and a single phase 3 study using the model for clinical outcome research developed by Robey and Schultz (1998) (Table 14.10).

Phase 1 and 2 studies are concerned with the development and refinement of hypotheses and are appropriate for small, single group or single subject/case series designs while phase 3 studies examine the efficacy of treatment under controlled

Table 14.10 Studies included in Wertz and Katz 2004

Study	Phase
Seron et al. 1980	1
Mills 1982	1
Katz & Nagy 1982	1
Katz & Nagy 1983	1
Scott & Byng 1989	1
Deloche et al. 1993	1
Crerar & Ellis 1995	1
Crerar et al. 1996	1
Katz et al. (1984, 1985, 1989)	2
Loverso et al. (1988, 1992, 1985)	2
Steele, Weinrich et al. (1987, 1989); Weinrich et al. (1993, 1989); Aftonomos et al. 1997.	2
Katz & Wertz 1997	3

conditions (Wertz and Katz 2004). Results of phase 1 and 2 studies were mixed. Computer-based therapy appeared to have a positive effect in some of the studies; however all of the studies reported in the review provide evidence based on single small group or case study designs.

There was a single study identified as a phase 3 study, which evaluated the effects of computer-based therapy in a randomised controlled trial. The results of this single RCT favoured the efficacy of computerised treatment.

Table 14.11 Efficacy of Computer-Based Treatments in Aphasia

Author, Year Country Pedro Score	Methods	Outcome
Bruce and Howard 1987 UK No Score	This study involved 5 previous participants of a previous study that exhibited word-finding difficulties but could repeat single words, had Broca's aphasia and were more than 6 months post stroke. Patients were trained to use computer generated phonemic cues to assist with word retrieval. Two sets of pictures were presented. On each occasion the subject could use the aid with one of the two sets.	Significant differences between the aid and control conditions in word retrieval was noted in 4 out of the 5 patients
Aftonomos et al. 1997 USA No Score	This study involved 23 chronic aphasia patients who had previously been treated with traditional methods 6 months to 15 years post onset. Assessed aphasic patients' response to resumption of therapy using computer-based treatment. All subjects had 1 hr clinical sessions by speech therapist using designated computer based system, Lingraphica. The Lingraphica system allows patients to build messages via a string of selected pictures, which may be read or reproduced digitally as speech. Mean length of therapy = 16.2 weeks.	Patients improved approximately 10 percentile points on the PICA after 40 hours of therapy (3 patients) (p=0.005). The remaining 20 patients improved significantly from pre to post-treatment on the Boston Naming Test (p=0.005). Changes in the BNT were reported for most patients regardless of length of time between onset of aphasia and commencement of therapy. Similar improvements were reported for performance on subtests of the Western Aphasia Battery and the Boston Diagnostic Aphasia Examination.
Petheram 1996 UK No Score	10 patients at least 5 months since single left stroke with Functional Communication Profile (FCP) score of 42 - 89 received a computer for their home. A speech language pathologist provided initial instruction and demonstration of computer-based task. Patients worked on their own on each computer tasks: 10 exercises or 20 questions with 3 levels based on a psycholinguistic approach. If patients answered correctly 5 consecutive questions, the material was advanced to a higher level. If 3 of the 5 answers were incorrect, level of difficulty was lowered. Duration of treatment was 3 weeks.	Willingness of patients to make unsupervised use of microcomputers was confirmed: 9 of 10 patients made some use and 6 or 10 used it for an average of 2 hours of more per week. Response time significantly decreased at the end of treatment compared to the beginning of treatment. Post-FCP scores significantly improved.
Katz & Wertz 1997 USA 5 (RCT)	55 patients with aphasia due to single left hemisphere thromboembolic infarct at least 1-year post onset and scored between 5-90th percentiles on PICA. Patients were randomised to 3 groups: (1) computer reading treatment, (2) computer stimulation (non-verbal, cognitive rehab programs) or (3) no treatment. Subjects in computer groups used computers 3	Computer reading group better on PICA "overall" and "verbal" sections and on WAB Aphasia Quotient and repetition subtests than other 2 groups. The computer stimulation group improved only on the overall PICA score. Computerized reading therapy demonstrated generalization to

	h/week for 26 weeks.	non-computer, non-written language.
Aftonomos et al. 1999 USA No Score	60 aphasic patients with an assignment of 1 to 8 diagnostic categories through administration of WAB and had completed at least 1 month in the community-based program were involved. Patients were enrolled in 2 community-based programs, which use a computer-based tool, (the Lingraphica System – see Aftonomos et al. 1997) as part of an extensive, detailed formal patient care system. Treatment consisted of 1-hour sessions. Patients were also expected to complete prescribed activities at home. Mean number of sessions per patient was 41.7. The mean duration of treatment was 20.5 weeks. Outcomes were assessed via the Western Aphasia Battery (WAB) and Communicative Effectiveness Index (CETI).	Significant improvements were demonstrated on all subtests of the WAB ($p \leq 0.0006$). Functional communication as represented by CETI scores also improved significantly over the duration of treatment ($p < 0.0001$). Ratings on the CETI were obtained from individuals close to the subject (spouse, adjust child, sibling, etc).
Doesborgh et al. 2004 Netherlands 6 (RCT)	18 people with aphasia post stroke and who had received intensive impairment-based interventions for aphasia were randomly assigned to receive either 10 – 11 hours therapy with Multicue (n=8) or no treatment. Multicue is a computer program for the improvement of word finding based on cueing therapy. Sessions lasted 30 – 45 minutes and were conducted 2-3 times per week for approximately 2 months. While patients were treated via the Multicue program, apart from assigned language therapy and group psychosocial therapy, no other interventions were given. Participation in the "no treatment" condition continued for 6 – 8 weeks.	Mean improvement on the Boston Naming Test (BNT) and the Amsterdam-Nijmegan Everyday Language Test (ANELT-A) did not differ between groups. However, subjects who received treatment with Multicue improved their scores on the BNT significantly ($p=0.02$). Scores on the BNT did not improve for participants allocated to the control condition. Improvement on the BNT did not generalise to improvement in everyday verbal communication as assessed by the ANELT-A.
Cherney et al. 2008 USA No Score	AphasiaScripts is software package developed to function as a "virtual therapist". Scripts are recorded as per patient needs – the patient listens to these scripts and then may participate in word, sentence and conversation practice. 3 individuals with chronic aphasia participated in a computer script training program (AphasiaScripts) for 15 weeks. Individualized scripts were developed for each participant over the course of the first 5 weeks (1hr sessions, once per week). For weeks 6 – 15, scripts were practiced independently in the home (at least 30 minutes per day) and weekly meetings were held to assess progress and monitor compliance. Standardized testing (WAB, communication activities of daily living- CADL-2, Quality of Communication Life Scale) were conducted before and after the 9 weeks of training.	Positive changes in content, grammatical productivity and rate of production were reported associated with training. 2/3 participants demonstrated more than 5 points improvement on the WAB, but no changes in functional communication were noted. Only 1 participant demonstrated improvement on the quality of life scale. Qualitative analysis of exit interviews identified the following themes: increased verbal communication, improved communication skills evident in other modalities and situations, changes in communication noticed by others, increased confidence and satisfaction with the computer program.

Discussion

Overall, the results of studies examining computer-based intervention are positive. In 2 studies, improvements are reported on assessments undertaken not only at the impairment level, but also at the level of functional communication (Petheram 1996; Aftonomos et al. 1999). However, only 2 of the studies in the above table were randomized controlled studies examining the effectiveness of a specific computer-

based intervention. Both of these also reported positive results, although only the reading intervention (Wertz and Katz 1997) was able to demonstrate any generalization of effect. Cueing treatment provided by use of the Multicue program did not appear to have an effect on everyday, verbal communication (Doesborgh et al. 2004).

While all of the studies report a generally positive effect, none establish which element of the therapeutic intervention might be responsible for the demonstrated improvements (Wallesch et al. 2004). Whether improvements are attributable to the use of the computer, the opportunity to augment therapy intensity through additional practice opportunities or other concurrent activities is not known. This is particularly true of studies such as Aftonomos et al. (1999) in which patients took part in a comprehensive community-based program that used the Lingraphica computer system. Further study, especially at the level of randomized controlled trial, is indicated.

Conclusions Regarding Computer-Based Treatment of Aphasia

There were 2 RCTs identified; one of fair and one of good quality. Based on the results of these studies, there is strong evidence (Level 1a) that computer-based interventions can improve language skills assessed at the impairment level. There is limited (Level 2) evidence that improvements made via computer-based intervention generalize to functional communication.

Computer-based aphasia therapy results in improved language skills and may improve functional communication.

14.3.6 Filmed Language Instruction

The use of a prepared program of filmed language instruction has been assessed in a single RCT (Table 14.12).

Table. 14.12 The Impact of Filmed Language Instruction

Author, Year Country PEDro Score	Methods	Outcome
Di Carlo 1980 USA 4 (RCT)	14 aphasic patients were randomized to receive traditional speech therapy (ST) or to the experimental group receiving ST with a systematic filmed program instruction. The control group engaged in viewing slides and other nonprogrammed activity. Patients were tested on reading recognition, reading comprehension, figure background, visual learning, visual closure and vocabulary.	No significant differences were observed between groups.

Conclusion Regarding Filmed Language Instruction

There is moderate (Level 1b; 1 RCT, n=14) evidence that supplementary-filmed programmed language instructions did not provide a benefit in aphasic patients.

Supplementary-filmed programmed language instruction does not provide a benefit in aphasic patients.

14.3.7 Constraint Induced Therapy (CI) for Aphasia

Forced use paradigms are popular for subsets of stroke patients in an effort to encourage increasing use of non-functional limbs, especially the upper extremity. The use of this paradigm has now been extended to the treatment of aphasia with a form of CI therapy that was developed for treatment of linguistic functioning. Chronic aphasic patients use communication channels that are most accessible to them and which require the least amount of effort such as drawing and gesturing, or use only those communicative utterances they know they can produce with ease. Constraint induced aphasia therapy is based on three principles: (1) use of intensive practice for short time intervals is preferred over long-term, less-frequent training (intensive practice); (2) constraints are used that force the patient to perform action that (s)he normally avoids (constraint induction); (3) that the therapy focuses on actions relevant in everyday life (behavioural relevance).

Table 14.13 Constraint Induced Therapy for Aphasia

Author, Year Country Pedro Score	Methods	Outcome
Pulvermuller et al. 2001 UK, Germany 6 (RCT)	17 patients with language impairment due to a single stroke affecting the left middle cerebral artery with no severe perceptual or cognitive deficits were randomized to either the treatment or control group. Patients in the treatment group received constraint-induced therapy for 3 hours a day for two weeks. The control group received conventional therapy for 3 hours a day for 4 weeks.	Patients in the CI group demonstrated significant improvement on 3 of the 4 components of Aachen Aphasia Test scores while patients in the control group did not demonstrated significant improvement. Patients in the CI group had significantly higher Communicative Activity Log scores of communication of everyday life compared to patients in the control group.
Meinzer et al. 2004 Germany No score	28 patients with chronic aphasia (>12 months post onset following stroke) participated in intensive speech and language therapy – 3 hours/day for 2 weeks. Training techniques included intense use of language together with restraint of non-verbal methods of communication.	Following training, test performance increased significantly on the Aachen Aphasia Test (AAT)($p<0.0001$) and TokenTest ($p<0.0001$). 25/28 patients improved on at least one subtest or subscale of the AAT. A decrease in delta activity was demonstrated 16 patients and an increase in left hemisphere activity was demonstrated in 12 patients after training – this increase covaried with time since stroke. The magnitude of change was greater in patients who demonstrated significant improvements on the AAT.
Meinzer et al. (2005) Germany No Score	27 patients with chronic aphasia were assigned to receive either constraint induced therapy (CIAT, n=12) or constraint induced therapy "plus" (CIATplus, n=15). CIAT consisted of 30 hours of training over 2 weeks. This included communicative language games/tasks of increasing difficulty. Tasks took place in a group learning format with screens placed between players to limit nonverbal communication. CIATplus participants CIAT plus a written language component (task sessions) and individualized instructions for communication exercises in the home involving family and friends. Assessments included the	Participants in both training groups demonstrated significant improvements on the AAT and all subtests ($p<0.0001$ & $p<0.001$ respectively) when baseline scores were compared with post-training scores. Groups did not differ on any test score either before or after training. Scores at 6 months continued to demonstrate significant improvement over baseline in both groups ($p<0.001$). Communication effectiveness, assessed by patient relatives, was significantly improved for both groups. Relatives of patients in the CIATplus group reported further improvements at the 6-month follow-up. Patients and relatives in both groups reported an increase in the amount of

	Aachen Aphasia Test, the Communicative Effectiveness Index and the Communicative Activity Log.	communication following training though relatives of patients in the CIATplus group noticed a more pronounced increased in communication ($p<0.01$). Relatives of both groups reported significant increases in comprehension. Increases in communication and comprehension tended to be greater and more persistent in patients receiving CIATplus training.

Discussion

A single, small RCT has reported that the use of constraint-induced aphasia therapy is associated with improved language outcomes at the levels of both impairment and function. Two recent follow-up studies have also demonstrated improved language function subsequent to constraint-induced aphasia therapy. Most recently, Meinzer et al. (2005) reported that gains in functional communication made via enhanced constraint-induced therapy may be sustained over time (6 months). Further study in a randomized controlled trial with larger numbers is required.

Conclusions Regarding Constraint-Induced Aphasia Therapy

There is moderate (Level 1b) evidence, based on one "good" RCT (PEDro = 6), that forced-use aphasia therapy results in greater language performance in chronic aphasics over a short period of time. Given this is based on only one study with 17 patients, at least one additional study with larger numbers would be needed before more definitive conclusions can be made.

Forced-use aphasia therapy can result in improved language function and everyday communication in individuals with chronic aphasia.

14.3.8 Repetitive Transcranial Magnetic Stimulation (rTMS)

Transcranial magnetic stimulation is a non-invasive procedure that uses a rapidly fluctuating magnetic field to "create electrical currents in discrete areas of the brain" (Martin et al. 2004). Multiple stimuli can be used to increase or decrease the excitability of the affected cortex, temporarily.

In stroke patients with nonfluent aphasia, functional MRI studies have revealed unusually high levels of right-sided cortical activation during language tasks (Rosen et al. 2000, Martin et al. 2004, Naeser et al. 2004, Naeser et al. 2005). While the potential importance of activation of the right frontal cortex in language recovery can not be dismissed (Rosen et al. 2000), It has also been suggested that this unusually high level of activation is not necessarily associated with improved language performance, but rather may be a maladaptive strategy that hinders aphasia recovery in non-fluent patients (Rosen et al. 2000, Martin et al. 2004, Naeser et al. 2004, Naeser et al. 2005). Recent studies have examined the effectiveness of the application of slow rTMS to reduce excitability in right-sided Broca's homologue in improving naming function in patients with nonfluent aphasia.

Table 14.14 Repetitive Transcranial Magnetic Stimulation for Treatment of Nonfluent Aphasia

Author, Year Country PEDro Score	Methods	Outcome
Martin et al. 2004 International No Score	Phase 1: Slow, 1Hz rTMS was applied for 10 minutes to 4 R perisylvian language homologues in separate treatment sessions with 6 chronic stroke patients (1 – 30 years post left hemisphere stroke). Immediately following each session, naming ability was tested using a list of 20 Snodgrass and Vanderwart pictures. 5 test lists were generated each with the same level of difficulty. Phase 1 was intended to identify which region was associated with the best response following stimulation. Phase 2: 4 chronic aphasia patients received slow, 1 Hz rTMS for 20 minutes 5 days per week for 2 weeks to the area identified as having the best response in phase one of the trial. Language testing included the first 20 items of the Boston Naming Test and naming subtests of the Boston Diagnostic Aphasia Exam. Testing was conducted prior to treatment, at the end of treatment and at 2 months.	In Phase 1, application of rTMS to the posterior gyral portion of the pars triangularis portion of R Broca's homologue (R BA 45) was associated with the best response. Five of six patients demonstrated significant improvement in naming when post-treatment scores were compared to baseline. Naming scores associated with stimulation of this area were significantly greater than those associated with stimulation of any of the other areas tested. Phase 2: Stimulation of R BA 45 was associated with significant improvement on the Boston Naming Test (p=0.003) and on naming subtests of the Boston Diagnostic Aphasia Exam (12 tools/implements p=0.035 & 12 animals, p=0.015) at 2 months following treatment. No negative side effects or complications were observed during or after treatment sessions.
Naeser et al. 2005 International No Score	4 stroke patients with chronic, nonfluent aphasia were treated with 1 Hz rTMS for 20 minutes each day, 5 days a week for 2 weeks (10 treatments in total) applied to the anterior part of R Broca's homologue (pars triangularis). 1 – 2 weeks prior to treatment patients were assessed using the first 20 items of the Boston Naming Test, subtests of the Boston Diagnostic Aphasia Exam (BDAE) and naming lists generated from the standardized set of Snodgrass and Vanderwart. Naming reaction time was also assessed using the Snodgrass and Vanderwart lists. Patients were assessed again at 2 weeks, 2 months and 8 months post treatment.	Immediately following treatment, there was significant improvement on number of pictures named (p=0.028) and reaction time (p=0.04) on the Snodgrass and Vanderwart lists. At 2 weeks following treatment, patients showed significant improvement on the BDAE animal naming subtest (p=0.02). At 2 months, there was significant improvement on the Boston naming test (p=0.003), the Animal Naming subtest of the BDAE (p=0.02) and the Tools/Implements naming subtest of the BDAE (p=0.04). At 8 months, scores continued to improve relative to baseline, but only the Tools/Implements subtests were significant (p-0.003). Improvements were also noted in number of words per phrase used in the cookie theft picture subtest of the BDAE at 2 months, though these were not sustained. No patients experienced negative side effects.

Discussion

Neither Martin et al. (2004) nor Naeser et al. (2005) reported negative side effects associated with treatment. When asked, patients reported improved ability to recall words in addition to improved mood (Martin et al. 2004). However, these subjective reports could be driven by patient expectations. Both Martin et al. (2004) and Naeser et al. (2005) suggest that speech/language therapy be provided following rTMS to promote the potential for further language

recovery. However, neither study examined the effectiveness of rTMS when used in conjunction with appropriate speech therapy. Both studies outlined here are preliminary investigations. Further investigation of the use of rTMS as an adjunct to speech/language therapy is required.

Conclusions Regarding Repetitive Transcranial Magnetic Stimulation

There is limited (Level 2) evidence that treatment with slow repetitive transcranial magnetic stimulation to the anterior portion of right Broca's homologue is associated with improved naming performance in patients with chronic, nonfluent aphasia. As this is based on preliminary studies only, further investigation is required.

Treatment with repetitive transcranial magnetic stimulation may be associated with improved naming performance in patients with non-fluent, chronic aphasia.

14.3.9 Transcranial Direct Current Stimulation

Like transcranial magnetic stimulation, transcranial direct current stimulation (tDCS) is used to provoke changes in excitability in the brain. The polarity of the current flow determines whether excitability is increased (anodal tDCS) or decreased (cathodal tDCS) (Floel et al. 2008). In healthy adults, application of anodal tDCS over Wernicke's area has been associated with improved acquisition of novel vocabulary (Floel et al. 2008), suggesting that this technique may be useful in the rehabilitation of language.

Table 14.15 Transcranial Direct Current Stimulation (tDCS)

Author, Year Country PEDro Score	Methods	Outcome
Monti et al. 2008 Italy No Score	8 individuals with chronic non-fluent aphasia participated in sessions of anodal, cathodal and sham tDCS over i) Broca's region or ii) occipital areas. 2 months lapsed between i and ii. tDCS of 2mA, for 10 minutes was delivered via a constant current electrical stimulator connected to 2 electrodes. Testing of active (anodal & cathodal) and sham tDCS were conducted in random order and at least one week lapsed between sessions. Picture naming was assessed both for accuracy and response time immediately before and following each session.	Anodal and sham tDCS over Broca's region were not associated with any significant change in picture naming. Cathodal tDCS over the same area did produce significant improvement in naming accuracy. No significant changes were noted for response times. When applied over the occipital region, there were not significant effects noted for anodal or cathodal tDCS in terms of either picture naming accuracy or response time.

Discussion

A single small trial (Monti et al. 2008) has demonstrated a significant improvement in picture naming following 10 minutes of cathodal tDCS applied over the left frontotemporal area. This improvement was both polarity and site specific. No adverse events were reported by participants and the treatment appeared both safe and well-tolerated. Further investigation may be warranted.

Conclusions Regarding Transcranial Direct Current Stimulation

There is limited (Level 2) evidence that cathodal direct current stimulation applied over Broca's area may be associated with improvement in picture naming. Further investigation is required.

Site and polarity specific tDCS may improve naming ability in chronic aphasia.

14.4 Rehabilitation of Specific Aphasic Deficits

14.4.1 Specific Treatment for Word-Retrieval Deficits

Word finding difficulty, also known as a lexical retrieval deficit, is a phenomenon whereby an individual can usually supply an accurate semantic representation of an object, but they are unable to verbally label that same object (Saito and Takeda 2001). This deficit is the main feature of anomic aphasia however it is also a common problem in other types of aphasia. In all cases, this deficit can significantly impact the patient's verbal communication.

It has been hypothesized that word-retrieval deficits stem from "an impaired access to the phonological form of the intended word" (Saito and Takeda 2001). Levelt et al. (1991) claim that lexical access involves two stages: lexical item selection, which accesses the syntactically and semantically appropriate representation of the word, and phonological encoding of the selected item, which allows for its verbal articulation. Semantic and phonological therapies are based on the theory of lexical access and are widely used for remediation of word-finding deficits in aphasia. Therapies usually employ associative learning procedures including semantic and/or phonological cueing to aid lexical access and improve word retrieval abilities. Most studies (see Table 14.16) have administered picture-naming tasks which enable the patient to make a semantic connection with the word, thus if they are to see the picture again, they may be prompted to say the word. Often if the patient fails to name the picture they are prompted by a series of cues until they are able to say the word. The cue can be either semantic, requiring the patient to focus on the meaning of the word (for example, its use in a sentence or its belonging to a certain category), or phonological, requiring the patient to understand the structure of the word (for example, its initial syllable or its proper spelling).

Table 14.16 Treatment of Word-Retrieval Deficits in Aphasia Rehabilitation

Author, Year Country Pedro Score	Methods	Outcome
Love and Webb 1977 USA	20 subjects with nonfluent aphasia and with no gross comprehension deficits participated in this study. 4 cue conditions were used to examine their effect on word retrieval: initial syllable, sentence completion, printed word and word imitation. 30 black and white pictures were used for the picture-	The mean percentages of successful use of cues were significantly different across the cue conditions. The study ranked the cues in order of effectiveness (from highest to lowest) according to these differences: 1) word imitation, 2) initial syllable, 3) sentence completion/printed word.

	naming task and upon failure to name a picture the cues were given in random order until a correct response was provided.	
Seron et al. 1979 France	8 aphasic subjects having demonstrated word-finding difficulties were included in this study. The 4 patients in the control group received traditional language therapy, while the experimental group received training with a reduced subset of lexicon. The picture-naming test and semantic classification test (picture-word matching test) were administered to all subjects both prior to and after 20 sessions (2 months) of therapy.	3 out of 4 patients in the experimental group improved significantly from pre- to posttest on naming ability while only 1 patient in the control group did. 2 patients from each group improved significantly on semantic classification ability from pre- to posttest.
Howard et al. 1985 UK	12 adult neurological patients with acquired aphasia resulting in word-finding deficits participated in this study. The experimental design separated semantically- and phonologically-based treatments and each patient partook in both types with a 4-week interval between them. 6 patients completed 2 weeks of each treatment method and the other 6 completed only 1 week of each method. Half the patients received semantic followed by phonological treatment, and the other half received treatment in the opposite order. The experimental stimuli were black and white drawings from the 'Cambridge pictures' collection. 2 control conditions were included in the study: naming control pictures (presented during therapy) and baseline control pictures (presented in post-therapy tests). 80 pictures in total were used in therapy – these were randomly selected failures from the pretests. There were 3 different techniques used in each type of therapy to prompt the subject to either show understanding or retrieve the intended word. Before each therapy session, a pretest was administered and posttests occurred at 1 week and 6 weeks following the end of each therapy period.	Both the semantic and phonological treatment methods resulted in significantly improved naming accuracy.
Huntley et al. 1986 USA	16 aphasic patients with known word-retrieval deficits were selected for this study. 96 black and white photographs were used as the experimental stimuli. 5 cue conditions were employed: initial syllable, sentence completion, printed word, word spelled out loud, and 3 non-semantically/phonologically related words. Each subject was evaluated for photo-naming ability under a no cue (baseline measure) and simultaneous cue presentation. The photographs were randomized and matched with a specific simultaneous cue combination.	Simultaneous cueing significantly improved patient performance, with the severe aphasics displaying significantly greater improvement than the mild aphasics.
Freed and Marshall 1995 USA	This study included 10 aphasic adults having suffered a single left-hemisphere stroke at least 12 months prior. 10 age-matched adults with no brain damage also participated. The experimental stimuli used were 40 photographs of dogs and birds that could not be named by any subject. Subjects were taught the names of 20 of these animals through personalized cueing while the remaining 20 photographs served as untrained control items (10	The subjects without brain damage had significantly better performance than the aphasic subjects on all 3 stimulus sets (trained, untrained-related, untrained-unrelated). Analysis within each of the groups showed a nonsignificant stimulus effect, probe effect, and stimulus by probe interaction for the non-brain damaged subjects, but a significant stimulus effect for the aphasic patients. The latter suggests that the aphasic

	semantically related and 10 semantically unrelated). All subjects participated in the 12 training sessions that were conducted over 4 weeks. Labelling probes were given at 1 week and 30 days post-training.	subjects were more accurate at naming the trained stimuli.
Freed et al. 1995 USA	30 mildly to moderately aphasic patients having suffered a cerebrovascular accident at least 6 months prior were assigned to either a personalized-cue condition or provided-cue condition. Subjects were assigned to experimental groups according to ranked PICA overall percentile scores. The experimental stimuli used were 30 English words paired with 30 abstract, novel symbols – 20 of which were designated as cued stimuli and 10 remained noncued control items. The personalized-cue group had to create their own associations for the 20 cued stimuli, which were then transferred to the provided-cue group. The study consisted of 6 sessions in total involving a sequence of training trials and labelling probes.	Overall the differences between the 2 cueing conditions were nonsignificant; they were equally effective at prompting correct responses and they resulted in similar decreases in naming accuracy over the course of 30 days.
Saito and Takeda 2001 Japan No Score	11 mildly to moderately impaired aphasic patients with word-retrieval deficits but no comprehension problems were included in this within-subject study design. 4 different cueing conditions were investigated for their effect on target retrieval: phonological, semantically-related, semantic category member, and baseline (no cue). 68 black and white pictures were used as experimental stimuli and 6 cues were chosen for each picture (3 for each type of semantic cue). The study continued for 3 sessions (3 days) during which each subject performed a picture-naming task and then a picture-word matching task.	The phonological cue condition prompted significantly more correct responses than the other cue conditions. There was no significant difference in the number of correct responses received between the category member and baseline cue conditions.
Doesborg et al. 2004 Netherlands 8 (RCT)	55 stroke patients demonstrating semantic and phonological deficits were randomly assigned to receive either semantic treatment focused on interpretation of written words, sentences and text or to a control group treatment that focused on sound structure. Treatment started at 3 to 5 months post stroke onset and last until 10 to 12 months post-onset. Patients' received 40 to 60 hours of individual treatment.	After semantic treatment, patients significantly improved on the Semantic Association Test. Patients receiving sound structure treatment improved significantly on phonological measures. All patients significantly improved on the Amsterdam Nijmegen Everyday Language Test. However no significant differences were noted between groups. The authors' hypothesis that semantic treatment has more effect at the activities level (verbal communication) than phonological treatment was refuted.

Discussion

All of the non-RCTs found that treatment, whether semantic or phonological, resulted in an improvement in aphasic patients' word-retrieval and naming accuracy. Improvement was observed even with relatively short treatment duration (Saito and Takeda 2001) and in cases of chronic aphasia (Howard et al. 1985). Of the studies that reported significant differences between different cue conditions, it was found that phonological cues were more effective than semantic cues (Love and Webb 1977; Saito and Takeda 2001).

Freed et al. (1995) observed no difference in effectiveness between a personalized cue (one that the subject creates) and a provided cue (one that the administrator gives to the subject), suggesting that the semantic meaning attached to a word need not have any personal significance in order to be effective. With these findings, it is important to keep in mind that these studies were quite limited in many cases by lack of control conditions and randomization and small sample sizes.

Doesborgh et al. (2004) observed that at the impairment level, patients improved on semantic measures after semantic treatment and on phonological measures after phonological treatments. Furthermore, therapy-specific correlation between improvements on the Amsterdam Nijmegen Everyday Language Test was observed. The authors challenge the idea that equal improvement in verbal communication is a result of spontaneous recovery. In addition, the authors note that the different effects found at the impairment level suggest that each treatment is not the result of non-specific effects such as language exercises, receiving attention, or being stimulated.

Conclusion Regarding Word-Retrieval Therapy

There is moderate (Level 1b) evidence that task-specific semantic therapy improves semantic activities and that task-specific phonological therapy improves phonologic activities.

There is limited (Level 2) evidence that phonological and semantic cueing improve naming accuracy and word retrieval abilities.

Task-specific semantic therapy and task-specific phonological therapy improves semantic and phonological language activities respectively in aphasia.

Phonological and semantic cueing may improve naming accuracy in aphasics with word-finding deficits.

14.4.2 Specific Treatment for Global Aphasia

Global aphasia impairs all aspects of language. Patients suffering from global aphasia experience less recovery than any other aphasia category. Language therapy for individuals with global aphasia can be costly. Moreover, efficacy of language therapy is not yet proven for this aphasia type. Specific rehabilitation for global aphasia has evolved from experience and literature and fulfils two purposes:

1. Support the capacities likely to improve with natural recovery, primarily the capacity to make categorical and associational semantic discriminations;
2. Be sufficiently easy that most severe, acute global aphasic adults could comprehend the nature and purpose of the tasks. (Alexander & Loverso 1993).

Table 14.17 Specific Rehabilitation for Global Aphasia

Author, Year Country Pedro Score	Methods	Outcome
Alexander &	6 right-handed stroke patients presenting with global aphasia	2 patients with global aphasia

Loverso 1993 No Score	(n=5) and Wernicke's aphasia (n=1) received treatment stimuli of 24 common, everyday objects, realistic pictures of those objects, and realistic pictures of the location in which those objects would unambiguously be found. Therapy was designed to support categorical and associational semantic discrimination using 8-step hierarchy. Therapy was initiated at the level of performance breakdown, in that, patients moved to the next level using a 90% accuracy criterion. Failure was defined as 5 sessions completed with less than 60% accuracy. Treatment was provided 6 times a week for a range of 4 to 10 weeks following 3-baseline session prior to therapy. Measure of performance was the Western Aphasia Battery (WAB)	completed the treatment program successfully with little evidence of generalization to untreated stimuli. The other 3 patients could not achieve success higher than level 3.

Discussion

Alexander and Loverso (1993) noted that although the treatment was not an overall success, their treatment was partially successful in that 2 of the 5 global aphasic patients reached the goal of treatment by demonstrating semantic capacity across categorical and associational boundaries. The authors purpose that this precondition is necessary to the use communication boards or substituted iconic language.

Conclusions Regarding Target-Specific Therapy for Global Aphasia

There is limited (Level 2) evidence that target-specific therapy does not benefit patients suffering from global aphasia post-stroke.

Target-specific therapy for global aphasia does not appear to improve language function.

14.4.3 Specific Treatment for Alexia In Aphasia

Alexia is an acquired disturbance in reading. Both left and right hemisphere pathology may induce alexia. Reading disturbances that occur after left-hemisphere injury results from linguistic deficits and may occur as an isolated symptom or as part of aphasia (Cherney 2004).

Table 14.18 Specific Treatments for Alexia in Aphasia

Author, Year Country Pedro Score	Methods	Outcome
Cherney et al. 1986 No Score	10 patients received oral reading for language in aphasia (ORLA) consisting of repeated reading aloud of sentences in unison with the clinician. ORLA focuses on the connected discourse rather than on single words, modeling natural intonation and speech.	There was a significant increase in post-treatment score on the Boston Diagnostic aphasia Examination, token Test and the reading comprehension subtest of the Gates-MacGintie Reading Test.

Conclusions Regarding Alexia-Specific Therapy

There is limited (Level 2) evidence that specific therapy for alexia in aphasic patients improves language function post-stroke.

Therapy specific to alexia in aphasic patients improves language functions.

14.5 Drug Therapy in Aphasia

An extension to the Cochrane review was made to include pharmacological treatments for aphasia following stroke (Greener et al. 2001b; see Table 14.19). The authors identified 10 studies that were suitable for review. Drugs that were used in the selected trials were piracetam, bifemalane, piribedil, bromocriptine, idebenone and Dextran-40. However, it should be noted that the only pharmacological treatment for aphasia available in Canada is bromocriptine. The authors found that in most trials, the methodological quality was not measurable with only one study providing adequate data for review and analyses.

Table 14.19 Drug Treatment in Aphasia

Study	Types of Intervention
Herrschaft 1988 (unpublished) Poek 1993 (conference) Platt 1993 Enderby 1994 De Reuk 1995 (unpublished)	Piracetam vs. placebo
Tanaka 1997	Bifemelane vs. no active substance
Bakchine 1990 (abstract)	Piribedil vs. no active substance
Gupta 1995	Bromocriptine vs. placebo
Price 1992 (abstract)	Idebenone vs. placebo
Spudis 1973	Dextran 40 vs. no active substances

Greener et al. (2001b) found evidence that patients were more likely to improve on any language measure at the end of a trial if they had received piracetam, although the treatment effect was small (odds ratio 0.46; 95% CI 0.3 to 0.7). Moreover, the treatment impact was even smaller when the dropouts were included in the analyses. Greener et al. (2001b) was unable to determine whether one drug was more effective than another. The main conclusion of their review was that drug treatment with piracetam *might* be an effective treatment for aphasia following stroke. They suggested that research should examine the long-term effects of piracetam to determine if it is more effective than speech and language therapy alone.

Unlike the Cochrane review of Greener et al. (2001b), the present review excluded abstracts, conference proceedings and unpublished studies (Herrschaft 1988, Poek 1993, De Reuk 1995, Bakchine 1990 and Price 1992). Platt et al. (1993) examined the efficacy and tolerance of piracetam as an additional therapy of hydroxyethyl starch and measured its effect on the rate of blood flow in the brain post-stroke. Although this study has been included (see table 14.20), it should be noted that Platt et al. (1993) did not address aphasia or the impact of treatment on aphasia specifically.

14.5.1 Piracetam

Piracetam is a γ-aminobutyrate derivative, a pharmacological agent with a potential effect on cognition and memory. Piracetam is thought to improve learning and memory by facilitating release of acetylcholine and excitatory amino acids, with increases in blood flow and energy metabolism (Kessler et al. 2000).

Table 14.20 Effect of Piracetam on Aphasia Recovery

Author, Year Country Pedro Score	Methods	Outcome
Platt et al. 1993 Germany 8 (RCT)	56 stroke patients with acute supratentorial first cerebral ischemia within prior 3 days were randomized to receive either piracetam of placebo for 28 days.	85.2% of treatment patients demonstrated a reduction in the area of brain regions displaying an impaired flow rate and only 20.7% of placebo treated patients showed this reduction. Significant improvement in impaired motor function observed in 23 of the 27 treatment patients and in 8 of the 29 placebo patients.
Enderby et al. 1994 Belgium 6 (RCT)	Multi-centre, double blind placebo controlled trial of 158 stroke patients who had sustained their injury 6 to 9 weeks prior to study were randomized to receive either 4.8g/day of piracetam or placebo for 12 weeks.	Aachen Aphasia Test (AAT) scores showed an overall significant improvement relative to baseline in favour of piracetam at 12 weeks.
Huber et al. 1997 Germany 7 (RCT)	66 patients with aphasia between 4 weeks and 36 months referred to a speech and language clinic of a university department of neurology. Patients were randomised to receive either 4.8g daily and 6 weeks of intensive language therapy or only 6 weeks of intensive language therapy.	Treated patients showed greater improvement than controls on the written language test of the AAT.
Kessler 2000 Germany 7 (RCT)	24 patients with acute aphasia and a diagnosis of a left hemisphere stroke made within 24 hours of study. Patients received 2400mg piracetam or placebo twice daily for 6 weeks.	Piracetam group showed greater increased activation effect than control in the left transverse temporal gyrus, left triangular part of inferior frontal gyrus and left posterior superior temporal gyrus after treatment. Piracetam group improved on 6 language areas while control improved on only 3.
Szelies et al. 2001 Germany 6 (RCT)	24 patients with mild to moderate aphasia after an ischemic stroke of left hemisphere and a token test score of 50 out of 150 in word repetition. Patients were randomised to receive either piracetam or placebo for 6 weeks while continuing with comprehensive language therapy, OT and PT.	Patients treated with piracetam demonstrated a significant improvement in syntactic structure of spontaneous speech compared to the controls.

Conclusions Regarding Piracetam in Aphasia

Piracetam's effect on aphasia has been the subject of 4 good (PEDro > 6) RCTs. The evidence from all 4 positive studies provides strong (Level 1a) evidence that there is a significantly positive impact on aphasia recovery in stroke patients also receiving language therapy over the short-term. There also is limited physiological evidence that piracetam serves to increase activation of language processing regions within the brain. Piracetam is not available in Canada.

Piracetam when combined with language therapy results in improved aphasia recovery.

14.5.2 Bromocriptine

Bromocriptine is a dopaminomimetic ergot derivative with D2-type receptor antagonist properties. It is primarily regarded as a dopamine agonist.

Table 14.21 Effect of Bromocriptine on Aphasia

Author, Year Country Pedro Score	Methods	Outcome
Gupta et al. 1995 USA 7 (RCT)	Study involved 20 adult males who had incurred a cerebral infarction resulting in aphasia at least 1 year prior to study and demonstrated a mean phrase length of 1 to 5 words and a score >5 on Auditory Comprehension subsection of WAB. Patients were randomised in Phase I to receive either Bromocriptine (5 mg gradually increased to 15mg by week 3) or placebo. In phase II the treatment was crossed over. Each phase lasted 8 weeks with a 6-week washout period followed between each phase.	No significant differences were found between groups on the WAB BNT, Selected subtests of Weschsler Memory Scale-Revised including Figure Memory, Visual Paired Associates I, Visual Reproduction I and Visual Memory subtests, Raven's Progressive matrices and the Rey-Osterrieth Figures.
Sabe et al. 1995 Argentina 6 (RCT)	Study involved 7 non-fluent aphasics who were 1-year post brain injury and had a stable scores on aphasia evaluations with a mean WAB Aphasia Quotient of 68.2 points. Patients started on 3.75mg/d of Bromocriptine and then dosage increased weekly to 7.5 mg/d and then for the final two weeks dose was maintained at 60mg/d followed by a three week wash out period, and then received identical looking placebo. Patients randomized to start on Bromocriptine and then cross-over to placebo or vice-versa.	No significant differences were found between groups on WAB, BDAE, Controlled Oral Work Association Test (FAS test) and BNT.
Bragoni et al. 2000 Italy No Score	Study involved 11 non-fluent chronic aphasic patients following stroke in a double blind protocol trial. All patients went through each phase of study: Phase 1 inclusion; phase 2 language retest to evaluate stability of aphasia; phase 3 placebo treatment combined with speech therapy; phase 4 treatment with Bromocriptine combined with speech therapy; phase 5 treatment with Bromocriptine alone; and phase 6 washout.	Significant improvements during Bromocriptine treatment observed in dictation, reading comprehension, repetition and in verbal latency. Improvement was also observed in qualitative scores reported by patients' relatives during phases 3 and 4 of treatment regime.
Ashtary et al. 2006 Iran 7 (RCT)	Study involved 38 non-fluent acute aphasic stroke patients in a randomized, double-blind, placebo-controlled trial. The first group started on a 2.5mg/d dosage of Bromocriptine which steadily increased to 10mg/d by week 4 – this dosage was maintained for the remaining 12 weeks of treatment. Those randomized to the second group received an identical looking placebo that was administered by the same dosage protocol as the active drug.	After 4 months of therapy, significant improvements were observed in both groups on tests of verbal fluency, gesture to command, naming, single-word response, automatic speech, prosody, repetition, and global score, at the $p<0.05$ level or better. There were no significant differences between treatment and placebo on any language outcome after 4 months of treatment.

Conclusions Regarding Bromocriptine in Aphasia Recovery

Based on three good quality RCTs there is strong (Level 1a) evidence that Bromocriptine does not improve aphasia recovery post-stroke.

Bromocriptine does not improve aphasia recovery post-stroke.

14.5.3 Amphetamines

The amphetamines belong to the general group of sympathomimetic amines. Effective doses can enhance of performance and wakefulness, decrease feelings of fatigue, increased alertness and mood (euphoria) in humans. Methylphenidate, an amphetamine, blocks the reuptake of serotonin and norepinephrine, and has dopaminergic activity as well.

Table 14.22 Amphetamines in Aphasia

Author, Year Country Pedro Score	Methods	Outcome
Walker-Batson et al. 1992 USA No Score (single group intervention study)	Study involved 6 patients with presence of aphasia as defined by an overall score between 10th and 70th percentile on the PICA. Patients received either 10 or 15 mg of d-amphetamine every 4th day for 10 sessions. 30 minutes after drug was administered, patient began a 1-hour session of speech and language therapy.	By 3 months post-onset, 5 of the 6 patients achieved scores in excess of 100% of the 6-month projection on PICA. SPECT neuroimaging revealed significant cortical hypoperfusion in all of the aphasic subjects regardless of lesion site of CT.
Walker-Batson et al. 2001 USA 8 (RCT)	In a prospective, double blind study, 21 aphasic patients with an acute nonhemorrhagic infarction were assigned randomly to receive either 10 mg dextroamphetamine or a placebo. Patients were entered between days 16 and 45 after onset and were treated on a 3-day/4-day schedule for 10 sessions. Thirty minutes after drug/placebo administration, patients received a 1-hour session of speech-/language therapy. The PICA was used at baseline, at 1 week off the drug, and at 6 months after onset as the dependent language measure	Although there were no differences between the drug and placebo groups before treatment, by 1 week after the 10 drug treatments ended there was a significant difference in gain scores between the groups, with the greater gain in the dextroamphetamine group. The difference was still significant when corrected for initial aphasia severity and age. At the 6-month follow-up, the difference in gain scores between the groups had increased.

Conclusion Regarding Amphetamines in Aphasia Recovery

There is moderate (Level 1b) evidence based on one small but "good" (PEDro = 8) RCT, that dextroamphetamine improves aphasia recovery when combined with language therapy.

Dextroamphetamine appears to improve aphasia recovery when combined with language therapy.

14.5.4 Bifemelane

Amadinci et al. (1981) proposed that cholinergic activity could be literalised to the left temporal lobe. Thus, damage to this area may result in anomia and verbal memory deficits. Moreover, Tanaka et al. (1997) suggested that neurological syndromes, other than aphasia (e.g. Alzheimer's disease), where anomia and verbal memory deficits are present, are associated with temporal lobe disease and are thus correlated with reduced cholinergic activity.

Table 14.23 Bifemelane in Aphasia

Author, Year Country Pedro Score	Methods	Outcome
Tanaka et al. 1997 Japan and USA 6 (RCT)	This study involved 4 right-handed patients with fluent aphasia and anomia after an unilateral left cerebral infarction 6 to 8 weeks post-stroke. Patients were assigned randomly to a treatment	The non-treated patients did not improve on language scores. CSF AChE decreased slightly. Treated patients showed significant improvement on language scores and CSF

	group receiving the cholinergic agent bifemelane 300mg. or to a non-treatment control group. All patients received standard speech therapy. Patients underwent cerebrospinal fluid (CFS) examination for analysis of acetylcholinesterase (AchE).	AchE increased slightly. Cholinergic treatment was significantly correlated with increased in language scores. Improvement in language function was significantly correlated with increases in CSF AchE.

Conclusion Regarding Bifemelane in Aphasia Recovery

Bifemelane, a cholinergic treatment, has not been sufficiently studied to draw any meaningful conclusions.

Cholinergic treatment has not been studied sufficiently in aphasia recovery.

14.5.5 Dextran-40

Dextran-40, or low molecular-weight dextran, was chosen as a potential treatment for acute stroke because of its role in altering red cell charge and in decreasing platelet aggregation.

Table. 14.24 Dextran-40 in Aphasia

Author, Year Country Pedro Score	Methods	Outcome
Spudis et al. 1973 USA 4 (RCT)	59 patients with onset of moderate to severe paralysis (< 24 hrs duration) were randomly allocated into a treatment group (Dextran 40) or to a control group (no medication).	Treated patients showed less restoration of language than the untreated patients.

Conclusion Regarding Dextran-40 in Aphasia Recovery

There is moderate (Level 1b) evidence that Dextran 40 when given to acute stroke patients results in worse outcomes than the non-treatment control.

Dextran 40 treatment results in worse outcomes than no treatment in aphasia recovery.

14.5.6 Moclobemide

Moclobemide is a reversible monoamine oxidase (MAO)-inhibitor, which causes a general increase in the concentrations of neurotransmitters. On the premise that enhancement of CNS neurotransmission might improve aphasia recovery, one randomized controlled trial has examined the effectiveness of moclobemide in the treatment of aphasia (Table 14.25).

Table 14.25 Moclobemide in Aphasia

Author, Year Country Pedro Score	Methods	Outcome
Laska et al. 2005 Sweden 9 (RCT)	90 stroke patients were randomly allocated to receive either 600 mg. Moclobemide or matching placebo daily. Treatment commenced within 3	At the 6 month assessment, there was a significant improvement in aphasia outcomes in both groups. There was no

	months of stroke onset and continued for 6 months. Effect on aphasia was assessed using Reinvang's Aphasia Test and the Amsterdam-Nijmegen Everyday Language Test.	significant difference between groups.

Conclusions Regarding Moclobemide in Aphasia Recovery

There is moderate evidence (Level 1b) that the use of Moclobemide does not enhance aphasia recovery.

Treatment with Moclobemide, a MAO-inhibitor, does not enhance aphasia recovery.

14.4.7 Donepezil

Donepezil is a selective acetylcholinesterase inhibitor used to stabilize cognitive deficits in individuals with mild to moderate dementia. In recent trials (Passmore et al. 2005), use of donepezil in patients with mild to moderate vascular cognitive impairment has been associated with significant improvements in cognitive and global function, including improvements in the performance of activities of daily living. The results of an open-label, 20-week pilot study (Berthier et al. 2003) suggested that patients with chronic post stroke aphasia experienced improvement in language function following treatment. The open label pilot study and subsequent RCT are summarized in Table 14.26.

Table 14.26 Donepezil in Aphasia

Author, Year Country Pedro Score	Methods	Outcome
Berthier et al. 2003 Spain No Score	11 patients with chronic aphasia following stroke (mean duration = 4.4 yrs) received 5 mg/day of donepezil for 4 weeks, followed by 10mg/day for 10 weeks. Treatment was followed by a 4-week withdrawal period. All patients also received 2 weekly sessions of conventional speech-language therapy. The primary outcome was the aphasia quotient (AQ) from the Western Aphasia Battery. Secondary outcomes included selected tests (9) from the Psycholinguistic Assessment of Language Processing in Aphasia (PALPA). Testing was conducted at baseline, week 4,16 and 20.	One patient discontinued treatment; data was presented for 10 patients. Compared with baseline, AQ scores were significantly improved at 4 and 16 weeks ($p<0.01$). Compared to week 16, scores at week 20 (following drug washout) decreased ($p<0.05$). Similarly, PALPA scores demonstrated significant improvement from baseline to 16 weeks on 6 of 9 subtests, but declined in oral word-picture matching from week 16 – 20. Few side effects were reported – 2 patients experienced irritability and increased sexual drive (10 mg/day).
Berthier et al. 2006 Spain 7 (RCT)	26 patients with chronic post-stroke aphasia (>1 year) and under the age of 70 years were randomly assigned to receive either treatment with donepezil (n=13) or matching placebo (n=13). Treatment consisted of donepezil HCl 5 mg/day for 4 weeks (titration), followed by 10 mg/day for 12 weeks (maintenance – with possible adjustments for tolerability) and 4 weeks washout. Primary outcome measures were mean change scores from baseline to endpoint (week 16) on the aphasia	AQ scores and PALPA subtest scores improved more in the treatment group than in the placebo group from baseline to week 16 ($p=0.037$ & $p=0.025$, respectively). Comparisons of the CAL revealed no significant differences from baseline to week 16 and by week 20 (post washout) CAL performance had declined in the treatment group relative to the placebo condition ($p=0.008$). 61%

	quotient of the Western Aphasia Battery and the Communicative Activity Log (CAL). Secondary measures included PALPA subtests and the Stroke Aphasic Depression Questionnaire (SADQ).	(8) patients in the treatment condition reported adverse events – irritability (4 patients) & insomnia or tiredness (2 patients), recurrence of post stroke seizures (2 patients). Seizures occurred during maintenance only and did not recur following dose reduction.

Discussion

Both studies summarized above (Berthier et al. 2003, Berthier et al. 2006) reported improvement in global language function on the Aphasia Quotient of the Western Aphasia Battery during treatment with donepezil HCl. However, these improvements appeared to fade following the end of treatment. In addition, gains do not appear to extend to functional, everyday communication as evidenced by the lack of improvement on the Communicative Activity Log associated with treatment (Berthier et al. 2006).

Conclusions Regarding Donepezil in Aphasia Recovery

There is moderate evidence (Level 1b) that the use of donepezil may have a positive effect on global language function. However, this improvement is reported only during active treatment and may not extend to everyday communication ability.

Treatment with donepezil HCl may have a positive effect on global language function.

14.6 Summary

1. ***There is conflicting (Level 4) evidence whether speech and language therapy (SLT) is efficacious in treating aphasia following stroke. The failure to identify a consistent benefit appears to be due, in part, to the low intensity of SLT applied in the negative studies. The positive trials provided very intense therapy over a relative short period of time, whereas, the negative trials provided much less intensive therapy over a longer period of time.***
   The most comprehensive meta-analysis concluded that language therapy for aphasia had a significant positive impact on aphasia recovery in the acute phase and to a lesser extent during the chronic phase. It also revealed that improvement was tied to more intensive therapy and that severe aphasics benefited the most.
2. ***There is strong (Level 1a) evidence that trained volunteers can provide speech and language therapy and achieve similar outcomes to speech-language pathologists. This could serve as an effective adjunct to speech-language pathologists' treatment.***
3. ***There is moderate (Level 1b) evidence based on one RCT of fair quality that group intervention results in improvements on communicative and linguistic measures among patients with chronic aphasia. There is limited (Level 2) evidence that participation in group therapy results in improved communication.***
4. ***There is moderate (Level 1b) evidence, based on one "good" RCT (PEDro = 6), that group therapy results in less improvement in graphic (writing) elements of aphasia when compared to individualized therapy.***
5. ***There is limited (Level 2) evidence that a community-based program improves language outcomes at both the impairment and disability level independent of severity, setting, diagnostic type or stage of aphasia.***
6. ***There is moderate evidence (Level 1b – based on a single "fair" RCT) that an in-home program administered by trained volunteers improves language outcomes at the impairment and functional levels. However, there is no evidence that a targeted aphasia program is superior to in-home visits for the purpose of simple recreational activity.***
7. ***There is moderate (Level 1b) evidence that the technique of training conversation partners, Supported Conversation for Adults with Aphasia (SCA) is associated with enhanced conversational skill for both the trained partner and the individual with aphasia. There is limited (Level 2) evidence, based on several small studies, that training conversation partners is associated with increased well-being and social participation in addition to positive communication outcomes.***
8. ***There is moderate (Level 1b) evidence based on a study of 'fair' quality that group-based caregiver education is associated with temporary improvement in caregiver stress, but not with improved use or effectiveness of functional communication strategies.***
9. ***There is limited (Level 2) evidence that participation in educational seminars results in improved knowledge, participation in social activities and family adjustment. Further examination of the role of education is warranted.***
10. ***There is limited (Level 2) evidence that a community-based aphasia program improves the psychological***

well-being of patients and their families. Further research needs to be done before definitive conclusions can be made.

11. *Based on the results of two RCTs (one of fair and one of good quality), there is strong evidence (Level 1a) that computer-based interventions can improve language skills assessed at the impairment level. There is limited (Level 2) evidence that improvements made via computer-based intervention generalize to functional communication.*

12. *There is moderate (Level 1b; 1 RCT, n=14) evidence that supplementary-filmed programmed language instructions did not provide a benefit in aphasic patients.*

13. *There is moderate (Level 1b) evidence based on one "good" RCT (PEDro = 6), that forced-use aphasia therapy results in greater language performance in chronic aphasics over a short period of time. Given this is based on only one study with only 17 patients, at least one additional study with larger numbers would be needed before more definitive conclusions can be made.*

14. *There is limited (Level 2) evidence that treatment with slow repetitive transcranial magnetic stimulation to the anterior portion of right Broca's homologue is associated with improved naming performance in patients with chronic, nonfluent aphasia. As this is based on preliminary studies only, further investigation is required.*

15. *There is limited (Level 2) evidence that cathodal direct current stimulation applied over Broca's area may be associated with improvement in picture naming. Further investigation is required.*

16. *There is moderate (Level 1b) evidence that task-specific semantic therapy improves semantic activities and that task-specific phonological therapy improves phonologic activities.*

17. *There is limited (Level 2) evidence that phonological and semantic cueing improve naming accuracy and word retrieval abilities.*

18. *There is limited (Level 2) evidence that target-specific therapy does not benefit patients suffering from global aphasia post-stroke.*

19. *There is limited (Level 2) evidence that specific therapy for alexia in aphasic patients improves language function post-stroke.*

20. *Piracetam's effect on aphasia has been the subject of 4 good (PEDro > 6) RCTs. The evidence from all 4 positive studies provides strong (Level 1a) evidence that there is a significantly positive impact on aphasia recovery in stroke patients also receiving language therapy over the short-term. There also is limited physiological evidence that piracetam serves to increase activation of language processing regions within the brain. Piracetam is not available in Canada.*

21. *Based on three good quality RCTs there is strong (Level 1a) evidence that Bromocriptine does not improve aphasia recovery post-stroke.*

22. *There is moderate (Level 1b) evidence based on one small but "good" (PEDro = 8) RCT, that dextroamphetamine improves aphasia recovery when combined with language therapy.*

23. *Bifemelane, a cholinergic treatment, has not been sufficiently studied to draw any meaningful conclusions.*

24. *There is moderate (Level 1b) evidence that Dextran 40 when given to acute stroke patients results in worse outcomes than the non-treatment control.*

25. ***There is moderate evidence (Level 1b) that the use of Moclobemide does not enhance aphasia recovery.***

26. ***There is moderate evidence (Level 1b) that the use of donepezil may have a positive effect on global language function. However, this improvement is reported only during active treatment and may not extend to everyday communication ability.***

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