Journal of the International Neuropsychological Society (2007), **13**, 846–853.

DOI: 10.1017/S1355617707071111

Intensive language training in the rehabilitation of chronic aphasia: Efficient training by laypersons

MARCUS MEINZER, SILKE STREIFTAU, AND BRIGITTE ROCKSTROH
Department of Clinical Psychology and Neuropsychology, University of Konstanz, Konstanz, Germany

(RECEIVED January 2, 2007; FINAL REVISION March 26, 2007; ACCEPTED March 28, 2007)

Abstract

Intense language training has been found to be more efficient in the rehabilitation of chronic aphasia than treatment spread across time. Intense treatment, however, challenges personnel and financial resources of the health care system. The present study examined, whether laypersons can be trained to apply standardized language training for chronic aphasia with effects comparable to training by experts. Twenty individuals with chronic aphasia participated in the training, Constraint-Induced Aphasia Therapy (CIAT), which comprises communicative language games with increasing level of difficulty in a motivating context for 3 hr/day on 10 consecutive days. Following a random-control design, training was applied either by experienced therapists ($n = 10$) or trained laypersons ($n = 10$). Standardized language assessments revealed significant within-group improvements, however, between-group differences were not present. We conclude that a standardized training program, such as CIAT, can be efficiently accomplished by trained laypersons with results comparable to that of experienced therapists. (*JINS*, 2007, *13*, 846–853.)

Keywords: Language therapy, Treatment outcome, Stroke, Language disorders, Volunteers, Intensive training

INTRODUCTION

Cerebrovascular stroke is the most frequent cause of acquired disability in adulthood and among the fastest growing cost factors in the health system (Dobkin, 2005). As a consequence, much attention is devoted to effective rehabilitation strategies. A pressing example of the consequences of stroke affecting the perisylvian region of the left cerebral hemisphere is aphasia. This acquired language disorder affects production and comprehension and is associated with long-term social consequences and even psychiatric comorbidities (Code & Herrmann, 2003).

Immediately after a stroke, nearly two fifths of patients suffer from aphasia (Pedersen et al., 1995). While substantial spontaneous recovery of language functions is observed within the first 6 months after a stroke, further improvement is small to minimal without treatment (Robey, 1998). Approximately 40–60% of the patients move from the acute stage to the chronic stage as the condition persists 6 to 12 months after the stroke (Pedersen et al., 2004). It has been suggested that improvement of language functions in the chronic stage of aphasia depends on intense and frequent treatment (Bhogal et al., 2003a). In a review of the literature, Bhogal et al. (2003b) concluded that improvement was found only in studies, in which intense treatment was provided within a short time (ø intensity, 8.8 hr/week; ø duration, 11.2 weeks), but not when training sessions were spread across extended time intervals (ø intensity, 2 hr/week; ø duration, 22.9 weeks). Meinzer et al. (2005) found substantial improvement of language functions in 27 chronic aphasia patients after 2 weeks of intensive training. However, no further improvement during a 6-month follow-up period during which patients received approximately 2 hr/week outpatient language therapy. Similarly, Pulvermueller et al. (2001) demonstrated more improvement of language functions after 2 weeks of intensive treatment (3 hr/day) than after the same number of treatment hours extended across several weeks.

Given that 40–60% of patients suffer from chronic aphasia, considerable financial and/or personnel burdens are placed upon rehabilitation institutions, in particular and the health system in general (Pedersen et al., 2004). It cannot be expected that rehabilitation institutions have the necessary personnel/financial resources for intense training by professional speech therapists at their disposal. As a consequence, chronic patients with aphasia may not receive sufficient treatment to further improve language functions.

Trained laypersons may add to professional treatment, indeed with promising effect (Bhogal et al., 2003a). For example, several studies found no differences in language

Correspondence and reprint requests to: Marcus Meinzer, University of Konstanz, Department of Psychology, Universitätsstr.10, P.O. Box 23, 78457 Konstanz, Germany. E-mail: marcus.meinzer@uni-konstanz.de

improvement of patients with aphasia, when treatment was applied by trained laypersons or by professional therapists (David et al., 1982; Lesser et al., 1986; Marshall et al., 1989; Meikle et al., 1979; Shewan & Kertesz, 1984; Wertz et al., 1986; Worrall & Yiu, 2000). However, methodological caveats like large dropout rates (David et al., 1982; Worrall & Yiu, 2000), small sample sizes (Lesser et al., 1986; Worrall & Yiu, 2000), few treatment hours/week (David et al., 1982; Lesser et al., 1986), lack of random assignment of patients to the treatment groups (Worrall & Yiu, 2000), or missing evaluation of treatment effects by standardized language tests (David et al., 1982) limits the significance of the reported results. In one study only, focus on the treatment of a group of chronic aphasia patients by trained volunteers eliminated the potential influence of spontaneous restitution of language functions, on the improvements after treatment (Worrall & Yiu, 2000). Moreover, patient groups received different trainings in some studies (Lesser et al., 1986; Meikle et al., 1979) as well as a highly variable amount of treatment hours (Meikle et al., 1979).

The present study evaluated effects of aphasia training applied by trained laypersons in a sample of patients with chronic aphasia randomly assigned to two treatment groups (one run by professionals and one by trained laypersons). All patients received the same standardized intensive training, Constraint-Induced Aphasia Therapy (CIAT, Meinzer et al., 2005; Pulvermueller et al., 2001). CIAT is an adaption of Constraint-Induced Movement Therapy (CIMT), a well-evaluated therapeutic tool for the treatment of poststroke paresis (Taub et al., 1999). Substantial and lasting improvement of motor functions and transfer of therapeutic gains to activities of daily living has been demonstrated after CIMT (for review, see Elbert & Rockstroh, 2004; Taub et al., 2002). In the case of motor rehabilitation, some researchers suggest that the non-use of a paretic extremity is learned during the early period after stroke, when physiological damage induces depression of function (learned non-use model; Taub et al., 1999). This non-use can be overcome by creating situations that induce patients to re-use the neglected extremity. The use of the less affected extremity is "constrained," for example, in the case of the upper extremity by using a sling. Moreover, patients receive intensive training of the more affected extremity for several weeks usually 3–6 hr per day (massed practice principle). Finally, the difficulty of the required motor actions is gradually increased during treatment progression (shaping principle).

CIAT is based on the core principles of CI movement therapy (Pulvermueller et al., 2001). Similar to the observed non-use of the affected limb in hemiparesis, patients with aphasia often use nonvocal communication channels as a compensatory mechanism for spoken language (e.g., gesturing). Even when they communicate by means of verbal language, they rely on inexact or simplified expressions that they can still produce easily. Therefore, during CIAT, patients are encouraged to use verbal expressions as a primary means of communication at the upper limit of their individual capacities. The training procedure consists of interactive language games provided in a motivating context that is created in a group setting that involves two to three patients and two therapists. The training also includes a heavy training schedule (3 hr/day on 10 consecutive days).

In the present study, we selected CIAT as the treatment of choice because substantial and stable improvement of language function in chronic aphasia has been demonstrated (Maher et al., 2006; Meinzer et al., 2005; Pulvermueller et al., 2001). The short-term nature of the treatment controls for confounds related to extended treatment intervals (e.g., dropouts, influence of unspecific factors). Moreover, we hypothesized that the structured setting and training material of CIAT could be applied by trained laypersons and that the interactive group setting would enhance motivation and compliance of the participants.

METHOD

Design

Patients referred to the training by local neurologists/speech and language therapists were screened according to the inclusion criteria of the study (see below). After preselection as potential training candidates, patients and their relatives were offered participation. In the experimental program, CIAT was either provided by trained laypersons or by trained psychologists. CIAT requires similar levels of severity within a training group. Therefore, group members were selected to comprise two to three patients with similar severity of aphasia. Severity of aphasia was determined by either: (1) personal contact with the patient, (2) the results of a recent aphasia test, or (3) by contacting the patient's speech and language pathologist. Aphasia was classified as mild, moderate, or severe. The training groups included either mild and moderate or severe and moderate but never mild and severe aphasia patients. Patients with different syndromes (e.g., Wernicke's aphasia, Broca's aphasia) were included in the same group as long as the approximate severity level was similar.

If at least two relatives related to a homogenous training group of two to three patients agreed to participate, this group was submitted to the random assignment. (Note: In the present study, all of the patients who were offered participation had at least one family member who agreed to participate.) If more than two relatives per training group were interested in the study, the relatives alternated as layperson trainers on a daily basis across the 10-day training period. Eight such groups were established, which were then randomly assigned to two treatment groups, four being trained by experienced psychologists (group A) and four by trained laypersons (relatives; group B). All patients received CIAT for 3 hr/day on 10 consecutive working days.

Intervention Procedure (CIAT)

The training is based on communicative language games, including pairs of cards with pictures of objects and photo-

https://doi.org/10.1017/S1355617707071111 Published online by Cambridge University Press

graphs of everyday situations or words. Cards are distributed so that none of the players has two identical cards. Screens between the participants (two to three patients, one therapist) prevent them from seeing each others cards or pointing at them. A co-therapist is present to help patients, whenever problems arise during the game (e.g., by prompting with the first letter in case of word-finding difficulties) and to provide social reinforcement. The task of each player is to select a card from his/her own set and ask for the identical card from one of the co-players. The addressed co-player has to explicitly reply whether his/her set includes the card (or not) before handing it over. For each player, the aim is to collect as many cards as possible. Language abilities are "induced" by shaping, in that the level of ability of required spoken questions and answers is adjusted to the individual level of impairment. Task difficulty is gradually increased, that is, across successive sessions of treatment, increasingly complex card sets are introduced. Initially, cards depict high-frequency nouns of a single object. Then minimal pairs, cards with objects of different colors or number, or more complex cards depicting activities of daily living (photographs) are introduced. Constraints are determined depending on the initial level of each patient's verbal ability. For example, a severely handicapped patient is allowed to use any approximately relevant utterance to ask for a card. More advanced or improving patients are gradually encouraged to articulate the correct word using correct pronunciation, explicitly address the asked co-player by his name, and use politeness formulas or syntactic sentence frames instead of one to two word utterances. Every patient is encouraged by the therapist to use his/her highest level of language skill. Performance requirements are increased depending on patient improvement. Finally, patients at different levels of performance are reinforced differentially by the therapist.

Constraint of nonverbal communication strategies: In the rehabilitation of motor functions (CIMT), a restraining mitt/sling on the less affected arm has frequently been cited as the main active ingredient behind improvements in motor function. Substantial data suggest that restraint makes actually a relatively small contribution to treatment outcome in motor rehabilitation (for a recent review, see Morris et al., 2006). Moreover, results from Hadar et al. (1998) suggest that gestures might actually facilitate spoken language. Therefore, in this study, it was not our goal to prevent gestures. Rather, the use of verbal communication was enforced (induced) and gesturing was permitted as long as it (1) was not the primary means of communication and (2) facilitated verbal language output during the language game.

Layperson Training

Patients' relatives were trained in the present study mainly for pragmatic reason. Because relatives usually accompany patients to the outpatient rehabilitation, they have gathered experience in how to communicate with aphasia patients. However, participating relatives had neither formal training in speech and language pathology nor prior experience with CIAT. Laypersons received a 2-hr introduction into the basic principles of CIAT, which included (1) materials, (2) procedures, (3) approaches to constraining communication to verbal expressions, and (4) how to adjust individual task difficulty.

During the first 2 of the 10 training sessions, laypersons served as "layperson trainers" under the supervision of an experienced therapist. For the remaining eight sessions, the trained laypersons led the training, while experts were available in a nearby room in case of major problems (e.g., major strains between patients and relatives, loss of confidence of the relatives to provide the training). Education/training sessions for the laypersons were offered at the end of each daily training session. All of the laypersons were present during these sessions. In each of the sessions, the laypersons who administered the training on a given day provided a summary of the training (e.g., which sets of cards were used, shaping strategies, amount and kind of cues provided, motivation of the patients, confidence of the relatives) to the other relatives and the professional therapist. Moreover, they were encouraged to report specific problems encountered during the training. The laypersons and therapist discussed strategies/solutions for problems experienced the previous day in preparation for the next day of training. The implementation and feasibility of these strategies was then discussed in the session on the next day. Therefore, professional therapists could oversee the training provided by the laypersons and provide continuous feedback to the layperson trainers.

Sample

Twenty patients (mean age, 56.1 years; range, 35–72 years; 4 women, 16 men; see Table 1 for details) suffering from aphasia consequent upon a single left hemispheric cerebrovascular stroke participated in the study. All patients were in the chronic stage of stroke as defined by symptom duration of at least 6 months (mean, 38.6 months; range, 6–79 months). Two patients (patients 5, 12) had comorbid mild apraxia of speech. Well-recovered patients with minimal symptoms who cannot be distinguished from nonaphasic speakers using standard aphasia tests and other neurological or psychiatric comorbid disorders were excluded. Patients with global aphasia were considered eligible for the program when they exhibited residual expressive language capacities (e.g., repeating short phrases). During the training period, patients did not participate in any other rehabilitation program. Patients and participating relatives were informed about the aim of the study, the study design, and training procedure and signed a written consent before the beginning of layperson training and CIAT. The study protocol followed the Helsinki Declaration and was approved by the ethics committee of the University of Konstanz.

https://doi.org/10.1017/S1355617707071111 Published online by Cambridge University Press

Table 1. Clinical and demographic characteristics of the patient sample

ID	Treatment group[a]	Age (years)	Sex	Handedness	Education (years)	Etiology	Duration of aphasia (months)	Classification	Severity
1	Therapists 1	44	Female	Right	9	Ischemic	12	Not classified	Moderate
2	Therapists 1	65	Female	Right	9	Ischemic	34	Broca	Moderate
3	Therapists 2	43	Male	Right	9	Ischemic	72	Broca	Mild
4	Therapists 2	35	Male	Right	13	Ischemic	33	Broca	Mild
5	Therapists 2	49	Female	Right	9	Ischemic	6	Broca	Mild
6	Therapists 3	61	Male	Right	11	Ischemic	48	Broca	Moderate
7	Therapists 3	46	Male	Right	13	Ischemic	34	Global	Severe
8	Therapists 3	41	Male	Right	11	Hemorrhagic	24	Global	Severe
9	Therapists 4	57	Male	Right	13	Ischemic	18	Broca	Mild
10	Therapists 4	61	Male	Right	13	Ischemic	27	Broca	Mild
ø		50.2			11.0		30.7		
11	Relatives 1	62	Male	Right	11	Ischemic	79	Broca	Moderate
12	Relatives 1	69	Male	Right	9	Ischemic	30	Broca	Moderate
13	Relatives 2	51	Male	Right	13	Ischemic	59	Wernicke	Moderate
14	Relatives 2	69	Male	Right	11	Ischemic	67	Wernicke	Moderate
15	Relatives 2	66	Male	Right	11	Ischemic	35	Amnestic	Mild
16	Relatives 3	56	Male	Right	13	Ischemic	48	Wernicke	Moderate
17	Relatives 3	44	Male	Right	13	Ischemic	36	Broca	Moderate
18	Relatives 3	72	Male	Right	9	Ischemic	43	Global	Severe
19	Relatives 4	65	Male	Right	11	Ischemic	44	Amnestic	Mild
20	Relatives 4	66	Female	Right	9	Hemorrhagic	24	Broca	Mild
ø		62.0			11.0		46.5		

[a]Numbers identify patients belonging to the same training group.

Assessment of Training Effects

Language functions were assessed 1 day before treatment initiation and 1 day after completion with the German standardized language test the Aachen Aphasia Test (AAT, Huber et al., 1983). Tests were administered by a trained psychologist or speech and language pathologist, who was not involved in the training. The AAT includes five subtests (Token Test, TT; Repeating, Re; Written Language, WL; Naming, Na; Comprehension, Co). Each subtest can be divided into subscales for assessment of specific improvements [e.g., the naming subtest includes the subscales naming of objects (simple nouns and composite nouns), colors (adjectives), and situations (sentences)]. A profile score (weighted average of all subtests) serves as a measure of aphasia severity. Individual scores are referred to norms for significant individual improvements of the profile score and for all subtests/subscales (critical differences).

Data Analysis

Improvement of language test scores for each training group was verified by one-tailed *t* tests of *t*-transformed raw scores. Differences between groups at the first assessment and across training were evaluated using repeated measures analyses of variance with the between-subjects factor GROUP and the within-subject factor TIME. Differences between groups in categorical variables at the first investigation and across time were assessed by χ^2 tests.

RESULTS

All patients completed the CIAT and received the same number of training sessions. Patients of group B (trained by layperson trainers) in particular appeared motivated and were compliant to the program.

Comparability of Groups Before Treatment

Patients of both training groups were comparable regarding duration of aphasia [$F(1,18) = 3.78$; $p > .06$] and education [$F(1,18) = 0$; see Table 1]. As a consequence of the random assignment, patients of group B were significantly older than patients of group A [$F(1,18) = 7.62$; $p < .012$]. As treatment success was not correlated with age in a previous study (Meinzer et al., 2005), age was not considered as covariate in the statistical analyses. Before treatment, aphasia severity (profile score) was comparable between groups [$F(1,18) = .85$; $p > .3$]. Furthermore, no differences in any subtest of the AAT could be substantiated between treatment groups [TT: $F(1,18) = .08$, $p > .7$; Re:

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$F(1,18) = 4.2$, $p > .05$; WL: $F(1,18) = .8$, $p > .3$; Na: $F(1,18) = .57$, $p > .4$; Co: $F(1,18) = .96$, $p > .33$].

Treatment Effects

Aphasia severity was reduced in both treatment groups after the 2-week training period as indicated by significant improvement in the AAT profile score [TIME: $F(1,18) = 72.45$, $p < .0001$; group A: $t(9) = 7.05$, $p < .0001$; group B: $t(9) = 5.65$, $p < .002$]. Patients of both treatment groups improved in all subtests of the AAT (see Table 2 for details). The interaction GROUP × TIME did not yield significant results for the profile score [$F(1,18) = 1.26$; $p > .2$] or any subtest of the AAT (see Table 2 for details). Therefore, it can be concluded that training gains were similar in both training groups.

Individual Subject Analyses

Aphasia severity was reduced as indicated by significant improvement of the individual profile score for 19 of the 20 patients (10 of group A, 9 of group B). Significant improvement in at least one AAT subtest in seven patients of group A and in seven patients of group B was found. For the other patients, improvement on at least one subscale was substantiated (three patients of group A, two patients of group B). Only one patient of group B (patient 11) showed no improvement on a subtest or subscale. Thus, groups did not differ in the number of patients that improved in at least one subscale/subtest ($\chi^2 = 1.58$; $p > .45$). Similarly, the total number of subtests and subscales (significantly improved subtests/subscales: group A, 11/9; group B, 9/16) was comparable between groups [$F(1,18) = 1.38$; $p > .25$].

Table 2. Language performance (AAT) for both treatment groups before (pre) and after (post) Constraint-Induced Aphasia Therapy

ID	Treatment provided by[a]	Profile score		Token test		Repeating		Written language		Naming		Comprehension		Individual improvement (AAT subtests)	Individual improvement (AAT subscales)
		Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post		
1	Therapists 1	48.2	49.6*	43	46	51	51	46	49	52	51	46	49	WL	Co3,4
2	Therapists 1	49.5	52.2*	49	55	46	51	51	51	53	52	52	56	TT, Re	
3	Therapists 2	58.5	61.9*	58	66	55	59	63	62	59	62	58	64	TT	Re4
4	Therapists 2	52.8	55.4*	48	55	54	56	56	55	49	53	61	64	TT	Na2,4
5	Therapists 2	54.7	56.9*	61	69	49	50	52	53	58	59	71	71		WL3
6	Therapists 3	50.4	52.5*	48	48	55	59	48	49	48	50	50	51	Na	Re4
7	Therapists 3	43.3	44.9*	37	41	47	49	42	42	42	43	52	54		Re3
8	Therapists 3	43.9	44.5*	41	37	47	46	40	42	41	44	39	50	Na, Co	
9	Therapists 4	50.2	54.4*	55	60	50	55	46	51	48	50	65	66	TT, Re, WL	
10	Therapists 4	54.9	57.3*	73	73	45	46	53	55	55	62	70	70		WL3
Mean		50.4	52.6	51.2	54.5	49.5	52.0	49.5	50.6	50.1	52.1	56.2	59.0		
t test	(Within group)	$p < .0001$		$p < .008$		$p < .004$		$p < .036$		$p < .010$		$p < .009$			
11	Relatives 1	48.9	50.0	46	48	50	51	47	49	52	52	47	46		
12	Relatives 1	54.1	55.5*	49	48	62	62	52	53	49	54	49	54	Na	Co2
13	Relatives 2	50.5	54.2*	47	50	51	53	53	59	48	52	57	62	TT, WL, Na	
14	Relatives 2	51.1	54.9*	47	51	48	50	51	55	59	64	51	60	TT, WL	Na4, Co2,4
15	Relatives 2	58.6	60.6*	63	66	55	59	61	61	58	58	58	60		Re4, Na4
16	Relatives 3	46.9	49.1*	41	47	52	55	44	44	47	47	46	51	TT	Re5, Co3,4
17	Relatives 3	50.6	52.9*	43	47	49	51	50	53	59	59	53	57	TT	Re4,5, Co3
18	Relatives 3	48.9	50.8*	45	48	56	60	45	45	47	47	41	44		Re5
19	Relatives 4	59.2	65.1*	58	62	61	68	67	75	48	52	60	61	Na	Re4
20	Relatives 4	56.8	62.3*	62	67	55	60	55	58	56	66	63	65	Na	Re3, Re5
Mean		52.5	55.5	50.1	53.4	53.9	56.9	52.5	55.2	52.3	55.1	52.5	56.0		
t test	(Within group)	$p < .0002$		$p < .0002$		$p < .0006$		$p < .006$		$p < .014$		$p < .002$			
ANOVA	(Between groups)	$p > .27$		$p > .77$		$p > .46$		$p > .17$		$p > .59$		$p > .77$			

Note. The pre/post scores refer to *t*-transformed raw scores; *p* values: one-tailed *t* tests (improvement within groups) and repeated-measures ANOVAs (between groups), individual improvement was determined according to the manual of the AAT (critical differences, one-tailed), individual improvement is reported for subtests and subscales (e.g., Na3 = subscale 3 of the AAT naming subtest). AAT = Aachen Aphasia Test; ANOVA = analysis of variance; TT = Token Test; Re = Repeating; WL = Written Language; Na = Naming; Co = Comprehension.

[a]Numbers identify patients belonging to the same training group

*Significant improvement of the AAT profile score (>1.1 *t* scores, one-tailed);

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DISCUSSION

The present study was designed to evaluate the effectiveness and practicability of CIAT for chronic patients with aphasia administered by trained nonprofessionals. Patients were randomly assigned to either experienced psychologists or trained laypersons. Both groups received the same treatment, whereas the person who administered the training varied systematically between groups.

Language functions improved significantly in both groups and on an individual basis on standardized language measures. However, no significant differences were present between groups. These findings replicate previous studies that report substantial improvement in language functions and measures of connected speech after CIAT in patients with different aphasia syndromes and levels of aphasia severity (Barthel et al., 2006; Maher et al., 2006; Meinzer et al., 2005; Pulvermueller et al., 2001). These results also agree with previous evidence of effective treatment provided by trained laypersons (David et al., 1982; Lesser et al., 1986; Marshall et al., 1989; Meikle et al., 1979; Shewan & Kertesz, 1984; Wertz et al., 1986; Worrall & Yiu, 2000).

All participants, patients and relatives, enrolled in the study completed the intense treatment. The trained relatives appeared confident in the administration of the training even though they had no previous experience with rehabilitation programs. They found the introduction and supervised training to be sufficient to apply the training. Relatives were provided daily education/training to assist in treatment administration.

Moreover, the daily sessions provided a setting to discuss problems and to ask questions and receive feedback about their performance from the professional therapists. Additionally, an experienced therapist was available throughout the training. Trainers were assured that assistance would be available in case of major problems. In fact, no major problems arose during the daily training sessions and the professional therapists were not consulted during the scheduled sessions. Only one of the patient groups evidenced problems during the 2-week program. In this group, one patient (patient 13) displayed profoundly disturbed communication, although preselection AAT results had suggested aphasia severity comparable to his group companions. Because his performance negatively impacted the interactive card game training (i.e., the patient required extensive coaching by the laypersons, while the two co-players already operated at ceiling levels), the patient spent only 2 hr per day in the group training. The patient received individual training for an additional hour per day (on days 4–9 of the training). These individual sessions consisted of the same training material as the group training and was also provided by a trained layperson. A comparison of the group's performance with and without patient 13's scores revealed no significant differences in overall group performances.

Relatives were chosen as trainers mainly for pragmatic reasons, that is, their motivation and availability. It might be argued that such an approach might be at risk to provoke strains between individual patients and their relatives during the training. We did not observe any conflicts. This finding might be due to the fact that several relatives alternated in providing the training across the treatment interval. However, the possibility of such risk factors must be considered, when engaging relatives as trainers. An alternative approach might be to rely on nonfamily members as trainers. Previous studies substantiated improvement of language functions when the training was provided either by family members (Lesser et al., 1986; Marshall et al., 1989; Meikle et al., 1979; Wertz et al., 1986) or strangers (David et al., 1982; Shewan & Kertesz, 1984; Worrall & Yiu, 2000). Therefore, the results of the present study might have been similar if nonfamily members had administered the training.

One critical issue in the present study relates to the transfer of treatment gains to functional communication. Even though we demonstrated statistically significant improvement across the patient group and on an individual basis (in 19/20 patients), we did not assess transfer of treatment gains to everyday communication. Two previous studies demonstrated improvement of functional communication after CIAT (i.e., increased participation in everyday communication and increased effectiveness of communication attempts; Meinzer et al., 2005; Pulvermueller et al., 2001). However, functional improvement was examined with self-reported measures (Communicative Activity Log, CAL, Pulvermueller et al., 2001; Communicative Effectiveness Index, CETI, Lomas et al., 1989). Future studies might benefit from the addition of therapist-administered measures of functional communication to adequately capture improvements in functional ability (e.g., Communication Activities of Daily Living, CADL, Holland et al., 1999).

We further note that, as a consequence of the random assignment, patients trained by layperson were significantly older and the duration of aphasia tended to be longer. In our previous work, we did not find improvement of language functions after CIAT to be influenced by age or duration of aphasia (Meinzer et al., 2005). However, the influence of age and duration of illness on the benefit of layperson training cannot be ruled out even though both training groups showed similar improvement in this study.

One potential weakness of this study was that we did not establish stability of language function across repeated baseline intervals before treatment. However, we only included chronic aphasia patients, for whom major spontaneous improvements without treatment are typically not expected (Robey, 1998). Additionally, stability of language functions across short time intervals has been established for the AAT (2-day interval: retest reliability $> .91$ for all subtests in chronic aphasia patients; Huber et al., 1983). Moreover, Barthel et al. (2006) demonstrated stability of language impairment across two repeated baseline assessments in chronic patients with aphasia. Significant improvement was substantiated after a subsequent 2-week intensive treatment interval. Additionally, Meinzer et al. (2007) assessed language functions in a formerly bilingual (German/French)

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patient with chronic aphasia using functional magnetic resonance imaging (fMRI). Improvement of naming skills (during an overt fMRI naming task) and concomitant cortical reorganization after CIAT were restricted to the (trained) German language, while stability of his (untrained) French language skills/brain activation patterns provided a measure of intra-individual stability. In summary, based on previous reports, we conclude that the improvement of language functions in the present study is likely to be attributed to the treatment provided.

Taken together, the adaptation of a structured training such as CIAT to a program that can be administered by trained laypersons is effective to improve language functions in chronic aphasia. Additional features like the interactive group setting or the motivating context of a language game might be especially suited to ensure compliance of the patients and confidence of the trainers. In the present pilot study, which was primarily designed to examine the practicability and effectiveness of the CIAT when administered by laypersons, we were not able to assess the impact of the interactive group setting.

Recently, we have however, compared the effectiveness of the CIAT to model-oriented aphasia therapy (MOAT; Barthel, 2005). MOAT's fundamental approach is a model-based therapy (Nickels, 2002) that emphasizes different levels of language production (semantic system, phonological output lexicon, connection between semantic system and phonological output lexicon and phonological output buffer). Additionally, MOAT comprises several other treatment approaches (e.g., the linguistic approach, the strategy approach, the communicative approach and the involvement of relatives) to optimally account for impairments, disabilities, and handicaps of the patients with the overall aim to improve verbal expressive language performance.

The MOAT was administered by a professional speech and language pathologist on the same intensive schedule. Patients were either offered treatment in a group setting or a specific individualized therapy based on their symptoms and their disturbed level of language productions (Nickels, 2002). Treatment effects were comparable between the groups immediately after the 2-week treatment interval and at a follow-up visit after 6 months. These findings suggest that novel treatment approaches for the chronic stage of aphasia may benefit from a more intensive training schedule.

Future studies should be designed to examine whether structured programs like CIAT can be administered efficiently by trained laypersons in a community-based setting (e.g., in the context of self-help groups). Study designs should include assessments of the trainers' ability to accumulate sufficient knowledge from the supervised sessions to proceed without supervision (e.g., pre–post tests asking for appropriate semantic/phonemic cues). Measures should be selected that enable therapists to gain information about the actual performance of the laypersons as trainers during the course of the training. Moreover, the effect of trainers being supplemented with written instructions that optimize the standardization of the programs administered by laypersons should be considered. It is only after these factors are adequately examined that implementation of intensive aphasia programs in a community setting can be considered effective.

Whereas the present study focused on language functions (i.e., the core linguistic deficit), treatment of chronic aphasia needs to take in account further factors, like the psychosocial consequences of the language disorder (e.g., reduced activity and participation in community life, reduced self-esteem, and associated psychiatric comorbidities). Several recent studies (e.g., Hinckley & Packard, 2001; Kagan, 1998; Lyon et al., 1997; Rayner & Marshall, 2003) focused on integration in everyday life activities by training individuals with aphasia and their caregivers to initiate and maintain social connections. The aim of those studies is to promote reintegration of the patients into community life and to improve emotional well-being. Given this perspective, future studies should determine whether the introduction of CIAT in self-help groups might facilitate patient reintegration/re-engagement into everyday life and to foster general activity and well-being of the patients and their caregivers as well.

ACKNOWLEDGMENTS

This work was supported by the Deutsche Forschungsgemeinschaft (DFG, Grant RO 805/11-4) and the Kuratorium Zentrales Nervensystem (ZNS, Grant 2001013). We gratefully acknowledge the support of D. Djundja. All authors declare that they have no competing financial interests. We thank S. Cornell for editorial assistance.

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