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RESEARCH PAPER

Communication impairment and activity limitation in stroke patients with severe aphasia

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Abstract

Purpose. This study investigated how patients with severe aphasia communicated in daily living, which verbal and non-verbal communication skills were spared and which were impaired, and whether activity limitations in communication are related to verbal impairments.

Methods. Twenty-seven patients with severe aphasia and 9 with moderate aphasia originating from a sample of 102 aphasic persons followed up in a French regional survey were assessed with a communication test and a communication activity limitation questionnaire 12–18 months after a first stroke.

Results. Patients with severe aphasia suffered severe activity limitations in communication, with performance 3-fold lower than that of patients with moderate aphasia, and 4-fold lower than scores attained by normals. Both aphasia severity and communication disability at follow-up were related to the initial severity of aphasia. Using a phone, credit card and a chequebook, reading and filling in administrative documents, and communication behaviours involved in social life were the most severely impaired. Non-verbal communication performance was not related to aphasia severity.

Conclusions. We conclude that there is a great need for speech therapy research to develop new compensatory or alternative strategies for patients with severe aphasia.

Keywords: *Communication, aphasia, stroke, ICF*

Introduction

According to epidemiological surveys, one-third of stroke patients suffer from aphasia associated with hemiplegia [1,2]. As a whole, 25% of aphasic patients have a good recovery without noticeable functional consequences, 50% suffer from moderate disability with communication impairment in daily living and 25% are left with severe aphasia [3–5]. In this article, we define severe aphasia as the presence of long-lasting global (or total) aphasia, with severe limitations in communication abilities and poor recovery [6]. Aphasia is one of the most disabling consequences of stroke. It stops sufferers from enjoying free and fruitful relationships with others, and is a source of frustration [7], psychological distress, depression [8], isolation, social withdrawal [9,10] and poor quality of life [11–14]. Within the ICF theoretical framework, it is important to identify which activity limitations and participation restrictions are related to severe aphasia in order to target speech therapy goals and plan for social support and service delivery. It is also important to know whether Audrey Holland's famous statement that 'aphasic persons communicate better than they speak' is true even in severe aphasia [15], i.e. to assess to what extent patients with severe aphasia still communicate in daily living and try to overcome their difficulties by means of residual speech utterances and non-verbal communication. Previous studies have attempted to address this question, [16–21] but findings remain sparse and controversial because of methodological drawbacks: standardised assessment tools were lacking, with little consensus on the criteria for defining what constitutes non-verbal communication behaviour, e.g. gesture. Communication has been

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assessed until now in the context of experimental protocols, 'off-line', and not ecologically in daily living. Patient samples have been too small, the inclusion criteria were not always explicit, and patients were labelled as Broca's or Wernicke's, or fluent *vs* non-fluent, but the overall severity was not mentioned. In other studies, patients with severe aphasia were explicitly excluded. This might be an error, because non-verbal communication skills might play an important contribution in daily living communication competency, so they might be more explicit – and more useful to develop – in patients with severe aphasia [22]. Fortunately, recent studies are more convincing and the psycho-social consequences of aphasia have been addressed ecologically [23]. Successful therapy programmes involving drawing competence [24] or gesturing [25,26] are being developed to help patients with aphasia to compensate for their communication problems. Very recently, one of the present authors observed that stroke patients with left cortico-subcortical lesions showed an increase in gesture production compensating for aphasia, as compared with patients with right cortical, frontal or posterior fossa patients [27]. However, the relationships between impairment and activity limitation in communication, and the possible influence of severity of aphasia, remain unclear.

The purpose of the present study was to document activity limitations in the communication of patients with severe aphasia as compared to moderate aphasia, to assess their verbal and non-verbal communication skills, and to investigate whether activity limitations in communication are related to verbal impairments.

Methods

The present study is a part of a larger prospective cohort study which was conducted in 164 stroke patients with aphasia. These were included consecutively during a 14-month period in 3 French southwestern centres: Bordeaux (urban), Libourne (semi-urban) and Mont-de-Marsan (rural). The stroke unit in Bordeaux and all the neurology, neurosurgery and emergency units in these hospitals participated in the survey.

Patients were included if they were between 18 and 85 years of age, French-speaking, living in the Aquitaine region, and suffered a first documented stroke with obvious language impairment lasting at least 24 h. All patients were seen in the acute units during the first month post-stroke. After explanation of the goals of the study, written consent to participate was received from the patients themselves when possible and/or from a significant relative. Demographics, data about the CVA, neurological impairments assessed by Orgogozo's score and activity limitation in daily living assessed by the Barthel Index on inclusion were registered [28,29]. The aphasia examination was restricted to a clinical assessment of fluency, auditory comprehension and global severity from a face-to-face interview (Appendix 1). No formal aphasia test was performed at this time because of confusion or fatigue after the stroke.

Twelve to 18 months after inclusion, survivors were assessed again at their home by a medical doctor and a speech therapist. The follow-up examination included questions about general health status and events since the inclusion, and an assessment of aphasia impairment with a French adaptation of the previous version of the Boston Diagnostic Aphasia Examination [30]. Severe aphasia was defined according to the Goodglass and Kaplan Aphasia Severity Rating Scale (ASRS), grade 0: 'No usable speech or auditory comprehension' to grade 2: 'conversation about familiar subjects is possible with help from the listener. There are frequent failures to convey the idea, but the patient shares the burden of communication', and moderate aphasia as ASRS grade 3: 'the patient can discuss almost all everyday problems with little or no assistance. Reduction of speech and/or comprehension, however, makes conversation about certain material difficult or impossible' [31]. Communication features were assessed by means of the Test Lillois de Communication (TLC) and communication activity limitation with the Echelle de Communication Verbale de Bordeaux (ECVB). The TLC (Appendix 2) is a well-validated standardised assessment of communication features which is composed of three parts: participation in communication (P), verbal communication (VC) and non-verbal communication (NVC). The TLC has been validated in a population of stroke patients. Fair inter-rater reliability has been confirmed for each subtest, with a Cohen κ value always greater than 0.90. Norms have been obtained in a group of 96 normal control subjects from the community and we found an effect of education level on the global VC score [32]. Performances of patients with severe aphasia on TLC were compared to those of 48 healthy subjects who participated in the TLC validation study.

The ECVB is a limitation activity questionnaire addressed to the aphasic patient and a significant other, which includes 24 questions about current communication behaviours in daily living (see examples on Appendix 2). Items are scored by the examiner, according to the patient's and significant other's opinions. In case of disagreement, the examiner asks both of them to debate until agreement. If they fail to agree, the item is not scored (which did not happen during the present study). Because of high variations in communication

behaviour in the general population, the ECVB has been designed to provide a full ceiling effect in normals, with questions about the capacity to do (limitation activity) and not about performance. It also includes questions about motivation for communication, strategies implemented by the patient to cope with his/her difficulty, qualitative features of communication, understanding humour, planning for expenses and budget and an analogical visual scale about satisfaction with communication. It has been validated in 126 patients with chronic aphasia of traumatic or vascular origin [33].

Statistical processing of data was performed with SPSS 9.0. Univariate analysis was done with parametric procedures for ECVB scores and with non-parametric (Kruskal–Wallis, Mann & Whitney) test for others, χ^2 for qualitative variables. Correlations between dependent variables were looked at with Spearman's correlation rank test.

Results

One hundred sixty-four patients were included in the general study. One hundred and two were assessed at follow-up 12–18 months after inclusion, 34 were dead, 11 refused a second assessment and 17 were lost to follow-up (Table I).

Appendix 1 shows for each patient a global assessment of verbal fluency, impairment in auditory comprehension and the ASRS score on inclusion. Table II provides demographic and pathological data. ASRS score on inclusion was related to the initial severity of stroke (Orgogozo's score: $H = 7.3$, $p < 0.05$), but was independent of age, gender, type of stroke and functional status (Barthel Index).

At the date of the present study (one year and a half on average after stroke), 27 patients still had severe aphasia (ASRS 0–2) and 9 had moderate aphasia (ASRS 3). Among patients with severe aphasia, 11 did not improve on the ASRS from inclusion to follow-up. Fourteen improved slightly: 6 from grade 0 to grade 1, and 8 from grade 1 to grade 2 (none improved more than one grade); 2 worsened, probably for depressive reasons. Among patients with moderate aphasia (grade 3), 2 improved from grade 0, 3 from grade 1 and 4 from grade 2. The ASRS follow-up score was related to the ASRS inclusion score ($\chi^2 = 15.4$, $p < 0.05$), but no significant relationship was found on univariate analysis between aphasia severity at follow-up and age, gender, type of stroke, Orgogozo score and Barthel Index on inclusion. Patients with severe aphasia received twice as many speech therapy sessions as patients with moderate aphasia.

Table III shows aphasic impairments (Boston Diagnostic Aphasia examination item scores) at follow-up. Eight patients had fluent aphasia (impairment of auditory comprehension with a mean score of 3.2, presence of paraphasia, speech relatively fluent with a score above 10), although 5 others had a non-fluent aphasia (auditory comprehension score over 10, severe expression impairment with a mean score 2). All others [23] had a global aphasia with both severe oral and written language impairments. Patients with severe and moderate aphasia differed significantly in terms of verbal fluency, confrontation naming, written naming and written comprehension, but did not differ on Complex ideational material item, presence of word missing or paraphasia.

Table I. Patients enrolled in the general survey.

Patients included	Urban area, $N = 102$	Mid-urban, $N = 35$	Country, $N = 27$	Total, $N = 164$
Dead	22	8	4	34
Refusals	7	1	3	11
Lost to follow-up	10	3	4	17
Assessed at 1 year	63	23	16	102

Table II. Patients with severe ($N = 27$) and moderate ($N = 9$) aphasia at follow-up.

	Severe aphasia	Moderate aphasia	
Age (year; mean, Sd)	63.7 ± 15.1	64.1 ± 10.4	NS
Gender: men, women	10, 17 (63%)	4, 5	NS
Education:			
No diploma	11 (47%)	3	
Primary	11 (47%)	5	
Secondary	2 (7%)	1	
Higher education	3 (11%)	0	NS
Brain damage			
Left middle artery ischemia	17 (63%)	6	
Other ischemic attack	1 (4%)	0	
Hemorrhage	9 (11%)	3	NS
Orgogozo score			
Median	45	75	*$p < 0.05$
Barthel Index			
Median	10	60	*$p < 0.05$
N patients with score 0–60	23	5	
60–100	4	4	
Presence of:			
Verbal fluency reduction	25	7	
Auditory comprehension impairment	23	7	NS

Demographic and CVA data on inclusion. Percentages in brackets. *Indicates a significant difference between patients with severe and moderate aphasia.

Limitations in communication activity as evidenced by ECVB scores can be seen in Table IV. Calling an unknown person by phone, using credit card and checks, filling in administrative documents, writing letters, going shopping alone, calling friends on the phone and using money were in a decreasing order the most impaired communication activities. Reading time, reading family mail, talking about one's needs, wishes and purposes, reading books or newspapers, answering the phone and participating in family meetings were the least impaired communication activities. As assessed by ECVB complementary questions, planning for expenses and budget was significantly impaired in patients with severe aphasia as compared to patients with moderate aphasia ($t = -2.2$, $p < 0.05$), but motivation for communication and understanding humour were relatively spared. Listening without talking was more frequent in patients with severe aphasia than in those with moderate aphasia (mean score, respectively, 2.22 and 1.25, $p < 0.05$). Asking for repetition was also more frequent in patients with severe aphasia than in those with moderate aphasia (mean scores, respectively, 2.88 and 2.42, $p < 0.05$). However, satisfaction with communication was not significantly higher in patients with moderate aphasia (mean scores, respectively, 5.5 ± 1.1 and 3.96 ± 3.2, NS).

In the 36 patients, age, gender and educational level had no significant influence on verbal communication efficacy (ECVB score). Because of small sample size and these negative findings, no multivariate analysis was undertaken. No significant relationship was found between ECVB score and the initial severity or type of stroke, but the initial ASRS score (global severity of aphasia) was significantly related to ECVB total score at follow-up (KW = 8.1, $p < 0.05$), i.e. initial severity of aphasia predicted communication activity at follow-up. There was also a strong and logical relationship between ASRS and ECVB scores at the date of follow-up ($U = 21$, $p < 0.001$), with a ECVB score nearly three times higher in patients with moderate aphasia as compared to those with severe aphasia (Figure 1). In patients with severe aphasia, ECVB total score was correlated with confrontation naming (rho = 0.53, $p < 0.01$), verbal fluency (rho = 0.59, $p = 0.001$, and reading text to completion (rho = 0.53, $p < 0.01$), but with no other aphasic impairment.

Communication features and impairments arising from TLC can be seen in Table V. No significant difference was found between TLC healthy controls and patients with regard to age (64.7 ± 11.0 for controls, 63.7 ± 15.1 for patients with severe aphasia and 64.1 ± 10.4 for patients with moderate aphasia, NS), gender and education level. Significant differences were observed between healthy controls and patients with severe aphasia in the three subscales ($U = 178.5$ and 378.0, $p < 0.001$ for motivation and verbal communication, $U = 438.5$, $p < 0.05$ for non-verbal communication), and in all items except accurate looks and deictic gesture.

Patients with severe and moderate aphasia differed significantly on the verbal communication subscale ($U = 34.5$, $p < 0.001$), but not on motivation and non-verbal subscales. Providing new themes, symbolic gesture, and form pantomime were the most impaired communication skills in severe aphasic patients, whereas providing non-verbal feedback of

Table III. Aphasic impairments and speech therapy sessions at follow-up.

	Severe aphasia	Moderate aphasia	
Items scores from BDAE			
Complex reasoning material	3.5 ± 2.7	5.0 ± 3.0	NS
Confrontation naming	34.4 ± 28.1	82.3 ± 20.0	$^*p < 0.001$
Verbal fluency	2.0 ± 2.6	7.7 ± 4.8	$^*p = 0.001$
Reading text to completion	2.8 ± 2.5	4.7 ± 2.4	$^*p < 0.05$
written naming	1.5 ± 2.8	6.3 ± 4.3	$^*p < 0.01$
Word missing (presence)	25	7	NS
Semantic paraphasia (presence)	10	1	NS
Phonological cue (effective)	16	5	NS
Speech therapy sessions since CVA (mean)	136.0 ± 61.8	59.5 ± 48.1	$^*p < 0.01$

BDAE = Boston Diagnostic Aphasia Examination; CVA = stroke.
*Indicates a significant difference between severe and moderate aphasia.

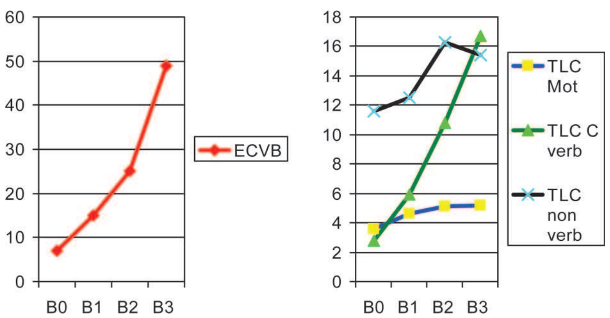

Figure 1. Mean scores on ECVB (on the left) and TLC subscales (on the right) as function of aphasia severity at follow-up. TLC Mot = TLC Participation subscale; TLC C verb = TLC verbal communication subscale; TLC non verb = TLC non-verbal communication subscale; B0, B1, B2, B3 = scores on BDAE ASRS.

Table IV. Limitation in communication activity, mean scores from ECVB.

	Severe aphasia	Moderate aphasia	
Total score	17.3 ± 14.1	49.0 ± 18.7	*$p < 0.001$
Basic communication			
Asking for daily living needs	1.37	2.5	
Talking about wishes and purposes	1.18	2.1	
Asking for one's way	0.44	1.7	
Conversation			
With proxy, usual theme	0.81	2.0	
With proxy, complex theme	0.33	0.8	
Engaging oneself a conversation	0.70	1.0	
Expressing feelings	0.74	1.7	
Conversing with unknowns, usual theme	0.51	1.2	
With unknowns, complex theme	0.22	0.6	
Talking the first	0.22	1.2	
Phone use			
Calling relatives	0.37	1.4	
Calling friends	0.14	1.3	
Calling for a meeting	0	0.6	
Calling an unknown	0	1.3	
Answering when alone	0.92	2.4	
Answering when others cannot	0.40	1.0	
Passing on a phone message	0.22	1.5	
Shopping			
Shopping alone	0.07	1.3	
Asking the seller	0	1.5	
Using money	0.18	1.5	
Using check and credit card	0	0.6	
Social communication			
Family/friend meeting	0.88	1.0	
Asking for information	0.37	1.5	
Social leisure	0.59	1.4	
Ordering in a restaurant	0.29	1.2	
Talking with a grocer or a salesman	0.37	1.7	
Reading			
Newspapers, books	1.11	1.8	
Family mail	1.40	2.2	
Administrative mail	0.48	0.7	
Time	1.92	2.3	
Writing			
Shopping list	0.66	1.5	
Letters	0.07	1.1	
Administrative documents	0.03	0.2	
Checks	0.07	0.5	

Maximum score: 102 for total score, 3 for all other items.
*Indicates a significant difference between severe and moderate aphasia.

misunderstanding, deictic gesture and looks were relatively spared. Patients with severe and moderate aphasia also differed significantly in two compensatory strategies: listening while refraining from talking ($U = 58.0$, $p < 0.05$) and asking for repetition ($U = 67.5$, $p < 0.05$) were more frequent in patients with severe aphasia.

In all 36 patients, the TLC verbal communication score was related to age (ANOVA, $F = 17.4$, $p < 0.001$), but the motivation and non-verbal communication scores were not. Gender and educational level had no significant effect on TLC scores. With regard to the relationship with aphasic symptoms, the TLC verbal communication score was related to BDAE items: complex reasoning material (rho = 0.40, $p < 0.05$), confrontation naming (rho = 0.73, $p < 0.001$), verbal fluency (rho = 0.72, $p < 0.001$), written naming (rho = 0.67, $p < 0.001$) and reading text to completion (rho = 0.48, $p < 0.01$). The TLC motivation score was correlated with verbal fluency (rho = 0.46, $p < 0.005$), and the non-verbal communication score with verbal fluency (rho = 0.46, $p < 0.01$), reading text (rho = 0.39, $p < 0.05$) and written naming (rho = 0.53, $p = 0.001$).

When only severe aphasic patients were considered, it was nearly the same: the TLC verbal communication score was related to age (ANOVA, $F = 9.7$, $p < 0.05$), but the motivation and non-verbal communication scores were not. Gender and education level had no significant effect on any TLC scores. The TLC motivation score was not correlated with any BDAE item. The TLC verbal communication score was related to BDAE items: complex reasoning material (rho = 0.54, $p < 0.005$), confrontation naming (rho = 0.62, $p = 0.001$), verbal fluency (rho = 0.68, $p < 0.001$) and written naming (rho = 0.57, $p < 0.01$). The non-verbal communication score was correlated with verbal fluency (rho = 0.38, $p < 0.05$) and written naming (rho = 0.46, $p = 0.05$).

Univariate analysis showed that the ECVB score was related to TLC verbal communication score (all patients: rho = 0.74, $p < 0.001$; severe aphasic patients only: rho = 0.59, $p = 0.001$), but not to participation and non-verbal communication scores, whatever the severity of aphasia. The non-verbal communication score seemed to be slightly better in patients with ASRS 2 score than in those with ASRS 3 (Figure 1).

Discussion

In this study, 27 of the 102 stroke survivors with aphasia (35%) included in a French regional survey suffered from severe aphasia as defined by a Boston

Table V. Communication features and impairments from TLC.

	Controls	*	Severe aphasia	**	Moderate aphasia
Global scores					
Participation (6)	6.9 ± 0.3	*$p < 0.001$	4.6 ± 1.2	NS	5.2 ± 0.8
Verbal communication (30)	28.8 ± 1.3	*$p < 0.001$	7.1 ± 5.1	**$p < 0.001$	15.4 ± 4.
Non-verbal communication (30)	15.7 ± 1.9	*$p < 0.05$	13.7 ± 5.5	NS	16.7 ± 7.2
Items					
Verbal communication					
Keeps on the theme (2)	1.89	*$p < 0.001$	0.65	**$p < 0.05$	1.55
Provides new themes (2)	1.39	*$p < 0.001$	0.13	**$p < 0.05$	0.88
Provides verbal feed-back when misunderstanding (2)	1.9	*$p < 0.001$	0.52	NS	0.88
Non-verbal communication					
Speech turn (1)	0.9	*$p < 0.05$	0.73	NS	0.88
Accurate prosody (1)	1.0	*$p < 0.001$	0.52	NS	0.77
Accurate looks (1)	0.9	NS	0.82	NS	1.0
Spontaneous use of non-verbal communication (2)	0.1	*$p < 0.001$	0.78	NS	0.44
Deictic gesture (2)	1.0	NS	0.91	NS	0.66
Symbolic gesture (2)	0.9	*$p < 0.001$	0.17	NS	0.66
Iconic gesture and pantomime (2)	1.0	*$p < 0.01$	0.73	NS	1.11
Form pantomime (2)	0.9	*$p < 0.001$	0.34	NS	0.33
Provides non-verbal feed-back when misunderstanding (2)	1.7	*$p < 0.001$	0.95	NS	0.88

Mean scores. Maximum test scores in brackets.
*Indicates a significant difference between controls and patients with severe aphasia.
**Between severe and moderate aphasia.

ASRS 2 or below at 12–18 months follow-up. Despite receiving twice as many speech therapy sessions on average as the moderate group, they suffered severe limitations in communication activity, with mean scores approximately 3-fold lower than those of patients with moderate aphasia, and 4-fold lower than the maximal score reached by normals during ECVB validation.

Some limitations of the study should be underlined. First, in agreement with Marshall and Phillips' opinion [34], we performed only a brief, global assessment of verbal fluency, auditory comprehension and severity of aphasia on inclusion, which deprived us from analysing the role of aphasic impairments as possible predictors of communication competence at follow-up. Second, ECVB scoring may lack of objectivity, as it relies mainly on the patient's and a significant other's opinions, which may be the first too optimistic, and the second too pessimistic.

While taking into account these points, both aphasia severity and communication disability at follow-up were related to the initial severity of aphasia, but no significant influence of age, gender, education or clinical severity of stroke was observed on communication performance. This is in accordance with previous data [34–38]. In patients with severe aphasia, daily communication behaviours were spared: conversation with relatives, requesting everyday needs, reading time. As might be expected, communication about simple concrete subjects was more effective than about complex themes [39]. Skills related to reading and writing for administrative papers, affairs and budget were also lost, so persons with severe aphasia need to be represented or assisted for administrative affairs and those where interaction with other citizens is involved. Previous works showed that severe aphasia had a negative impact on friendship, social participation and the amount of time people spent in community activity [9,40]. We did not address here psychological issues, and data about depression and quality of life, which will be reported in a forthcoming paper.

Like other authors, we observed good correlations between aphasic symptoms (impairments) and limitation in verbal communication activity [41–43]. In our study as in Marshall's, communication activity as assessed by the ECVB score was related to word fluency, but unlike Marshall's it was not related to auditory comprehension [34]. A possible explanation for this difference might be that the task we used, the Boston and Kaplan's Complex Reasoning Material, might lack sensitivity. Whether communication activity was more influenced by verbal fluency than by auditory comprehension could not be firmly established from our study because 23 of the 36 patients had global aphasia. Further studies should investigate the role of auditory comprehension to establish whether aphasic patients whose comprehension is relatively preserved use non-verbal communication more effectively than those whose comprehension is impaired.

With regard to the compensatory role of non-verbal communication (NVC), performances in NVC were not related to ECVB total score, and patients with severe aphasia got lower scores than those with moderate aphasia on many NVC items:

looks, facial movements and prosody were slightly lower, at the difference of previous findings in which speech sounds, facial movements, prosody and most of all arm/hand movements were all more frequent in aphasic patients than in non-aphasic brain-damaged subjects and healthy controls [17]. However, that last study was not restricted to patients with severe aphasia. Iconic gesture and symbolic gesturing were severely reduced, which supports the hypothesis that aphasia could be related to the impairment of a central core communication device controlling for all modalities of both verbal and non-verbal communication behaviour [44]. Nevertheless, we cannot conclude that our patients were unable to use NVC to compensate for communication: first, because many ECVB items are exclusively verbal, and cannot be compensated by NVC; second, spontaneous use of NVC and making deictic gestures were not severely impaired in our patients with severe aphasia. However, the difference did not reach significance, mean scores on these two items being higher than those of patients with moderate aphasia, and scoring on deictic gestures not significantly differing from that of controls. Furthermore, a distinction should be made between preserved skills and effective communication behaviour in daily living. As early as 1979, Cicone suggested that many aphasic patients do not spontaneously exploit some spared non-verbal modality to a significant degree [19]. This would fit well with the ICF distinction between competence (impaired as activity limitation) and performance (involved in participation) [45], and would be convergent with recent studies showing that NVC might be developed in a compensatory role by specific speech therapy. For instance, Damico et al. demonstrated that aphasic patients were able to be trained to use a wide range of gesturing in view of overcoming their verbal communication problem [25]. An important question is that some studies [46,47] and very recently a high-quality methodology and controlled trial by Daumuller and Goldenberg [26] showed that gesturing, like drawing, seemed to be item-specific and of poor generalisation. Thus, therapy using NVC in severe aphasic patients should be focused on skills immediately useful in daily living and of high psychological benefit, such as participating in conversation, expressing feelings and emotional states, needs or desires. Other factors, like time elapsed since stroke, previous personal communication styles and partner's role and behaviours should of course be taken into account in these situations, which are highly complex and variable from one person to another.

As to conclude, severe aphasia has a large and negative impact on communication ability, by far more important than other forms of aphasia. To assess whether speech therapy intervention – for instance PACE therapy, or gesture therapy – might enhance unexploited non-verbal behaviour in severe aphasia is beyond the scope of this article, but offers a challenge for all those who wish to help patients to participate better in society.

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Appendix 1

Patients with severe aphasia at the date of the study.

Patient (inclusion number)	On inclusion			At follow-up
	Verbal fluency	Auditory comprehension	ASRS score	ASRS score
1014	Red	Imp	1	2
1018	Red	N	1	1
1038	Red	N	1	2
1039	Red	Imp	0	0
1053	Red	Imp	0	1
1056	Red	Imp	1	1
1063	Red	Imp	2	2
1064	Red	Imp	0	1
1065	Red	Imp	0	0
1073	Red	Imp	0	1
1076	Red	Imp	1	1
1084	Red	Imp	0	1
1085	Red	Imp	0	0
1100	Red	Imp	1	2
1103	Red	Imp	0	1
2005	Augm	Imp	0	1
2010	Red	Imp	1	1
2011	Red	Imp	1	2
2017	Red	Imp	1	2
2025	Augm	Imp	1	2
2034	Red	N	1	2
3001	Red	Imp	1	0
3002	Red	N	1	2
3011	Red	N	2	2
3016	Red	Imp	1	1
3024	Red	Imp	1	2
3020	Red	N	1	1

Red = reduced; Augm = augmented; Imp = impaired; N = no impairment; ASRS score: see definitions in the text.

Patients with moderate aphasia at the date of the study.

Patient (inclusion number)	On inclusion			At follow-up
	Verbal fluency	Auditory comprehension	ASRS score	ASRS score
1060	Red	Imp	2	3
1078	Red	N	2	3
1086	Red	N	2	3
1105	Augm	Imp	0	3
2003	Red	Imp	2	3
2012	Red	Imp	0	3
2028	Red	Imp	1	3
3002	Red	Imp	1	3
3022	Augm	Imp	1	3

Red = reduced; Augm = augmented; Imp = impaired; N = no impairment; ASRS score: see definitions in the text.

Appendix 2

The Lille Communication Test (TLC) is composed of three parts, participation in communication (P), verbal communication (VC) and non-verbal communication (NVC). These are analysed in three situations of natural interaction, a directed interview, an open discussion about technical progress and a referential communication situation. In this latter condition, interlocutors are sitting at a table, facing each other. Each has a similar set of images in front of him, and one (either the patient or the investigator) has to make the other discover one of these images using oral language or gesture. Therefore, the patient and the investigator are alternatively speaker and listener. Its presentation time is about 1 h. For each subtest, a semi-quantitative scoring is performed by the examiner (0–1, 0–1–2, 0–1–3 or 0–2–4), the higher score indicates better performance and fair ability to manage the specific point, and absence of consequences of the patient–investigator communication.

Participation in communication is analysed with three subtests (global score/6), greeting behaviour (presence of verbal or non-verbal greeting;/2), attention to interlocutor production (using adapted posture, gaze, and verbal and non-verbal responses;/2), and engagement in the interaction (using verbal and non-verbal initiatives;/2).

Verbal communication is investigated with 14 subtests (global score/30). First, understanding words and sentences (fair comprehension which does not require repetition and simplification of the interlocutor production;/4), producing fluent language (normal speech outflow of about 150–200 words in 1 min;/2), producing intelligible utterances (which do not require more attention from the interlocutor;/2), producing words without word finding difficulties and paraphasia (/4), and producing adapted syntax (/2). Then pragmatics (/12), with responding to open questions (explicit and informative response to open questions), maintaining the topic of the exchange (respect of the topic without digressions), presenting new information (with presentation of information new to the interlocutor), introducing new topics (which are coherent with the previous ones, without perseverations), logically organising discourse (with explicit indications about the logic or chronologic nature of the relationship between the different parts), and adapting production to interlocutor knowledge (explicitly or implicitly). And finally, emitting verbal feedbacks (referring to comprehension difficulty) and adapting to verbal feedbacks from the interlocutor (readjustment of discourse when the listener reports comprehension difficulty or shows a verbal response which is not adapted to the patient production) (/4).

Non-verbal communication is evaluated with 19 subtests (global score/30). First, understanding limb gestures (deictic, symbolic, miming the use of objects, miming the shape of objects, gesture referring to physical or emotional state;/5), affective expressivity (expression of affects using gestures, facial expressions, vocal utterances, body orienta-

tions or physical contact(s);/3), and producing limb gestures (global spontaneous production, then production of different gesture subtypes: deictic, symbolic, pantomime, gestures miming the shape of objects, referring to physical or emotional state, sequential;/14). Then pragmatics with adapting prosody (both linguistic and emotional), orienting gaze (to the interlocutor), using regulatory mimogestuality (accompanying verbal utterances and turn taking) and turn-taking (respect of the interlocutor production, intervention during interlocutor pauses) (/4). Lastly, emitting non-verbal feedback (gesture, facial expression, head movement referring to comprehension difficulties) and adapting to non-verbal feedback from the interlocutor (readjustment of discourse when the listener emits non-verbal feedback) (/4).

In these subtests, the objective is both to assess the presence of specific deficits, and to analyse their consequences on communication, i.e. to identify the main mechanisms of communication disorders in a given patient. An example of poor verbal comprehension is the necessity for the listener (investigator) to repeat or simplify his production for efficient patient understanding.

Examples of ECVB items

- 4. Do you have difficulty to participate in a conversation with a family member on familiar subjects?

Possible answers: yes, everytime yes, often sometimes, but it is rare no, never

- 7. Do you feel any difficulty when you want to express feelings or emotions, like joy, fear, or anger?

Possible answers: yes, always difficult yes, often sometimes or rarely no, never

- 11. Is it difficult for you to call a family member on phone?

Possible answers: yes, always difficult yes, often sometimes or rarely no, never

- 25. When you are in a restaurant or a coffee bar, can you order by yourself?

Possible answers: no, never yes, but it is often difficult yes, but sometimes it is difficult no problem

- 31. Are you able to write full sentences, letters, birthday or Christmas postcards?

Possible answers: I can do it easily it is sometimes difficult it is often difficult no, I can’t do it