

# Language and the brain: strategies to recover language after a stroke and adaptation to daily life

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## Résumé – Introduction

Jürg Schwyter est linguiste à l'Université de Lausanne, Professeur et chercheur dans les domaines de la linguistique historique de l'anglais, de la sociolinguistique, avec de nombreuses publications et livres à son actif. En 2009, Jürg Schwyter souffre d'un accident vasculaire cérébral qui entraîne une aphasie sévère, affectant toutes les modalités du langage dans les différentes langues qu'il maîtrise (suisse-allemand, allemand, anglais, français et italien). Après 4 mois de thérapie intensive au Centre Hospitalier Universitaire Vaudois et à la Clinique Valens l'évolution est très positive : Jürg Schwyter ne souffre ni de difficultés de compréhension, ni de trouble de lecture. Cependant, il persiste une anomie légère et une anarthrie, mais surtout une agraphie sévère qui l'empêche d'écrire des textes. Au cours de sa thérapie du langage, Jürg Schwyter a appris à utiliser le logiciel de reconnaissance vocale «Dragon Naturally Speaking». C'est à travers ce moyen qu'il nous parle de sa rencontre avec l'aphasie. Et parce que Jürg Schwyter est un spécialiste du langage, il se met à étudier son propre langage avec un esprit de chercheur, le témoignage qu'il nous propose ici étant le résultat de cette recherche. Il aborde en parallèle certains aspects théoriques des aphasies qu'il enrichit d'éléments de vécu personnel au quotidien. Il suggère également quelques solutions et conseils pratiques pour faciliter et/ou résoudre des difficultés de communication dans différentes situations de la vie quotidienne.

## Zusammenfassung – Einführung

Jürg Schwyter ist Linguist an der Universität Lausanne, Professor und Forscher in den Bereichen der historischen Linguistik der englischen Sprache und der Soziolinguistik. Er ist Autor von zahlreichen Publikationen und Büchern. 2009 erleidet Jürg Schwyter einen cerebrovasculären Insult mit schwerer Aphasie und Beeinträchtigung aller sprachlichen Modalitäten in allen vorher beherrschten Sprachen (schweizerdeutsch, deutsch, englisch, französisch und italienisch). Nach 4 Monaten Intensivtherapie im Universitäts-spital Waadt und in der Rehabilitationsklinik Valens ist der Verlauf sehr positiv: Jürg Schwyter zeigt weder Sprachverständnisstörungen noch Leseverständnisprobleme. Trotzdem bestehen weiterhin eine leichte Benennstörung und eine Sprechapraxie, vor allem aber eine schwere Agraphie. Im Rahmen der Aphasierehabilitation lernt Jürg Schwyter den Umgang mit der Spracherkennungssoftware «Dragon Naturally Speaking». Dank diesem Hilfsmittel berichtet er uns von seiner «Begegnung» mit der Aphasie. Und weil Jürg Schwyter ein Sprachspezialist ist, beginnt er seine eigene Sprache

mit Forschergeist zu studieren: so ist der Erfahrungsbericht, den er uns vorlegt, eine wahre Zeugenaussage. Er spricht gewisse theoretische Aspekte der Aphasie an und beleuchtet diese mit Beispielen aus seinen persönlichen Erlebnissen mit der Aphasie im Alltag. Er bietet auch einige Lösungen und konkreten Ratschläge im Umgang mit Kommunikationsschwierigkeiten in unterschiedlichen Alltagssituationen an.

## Abstract – Introduction

Jürg Schwyter is a linguist at the University of Lausanne, he is a Professor and researcher in the fields of historical linguistics of English and sociolinguistics: he has published numerous articles and books in his field.

In 2009, Jürg Schwyter suffered a cerebrovascular accident (stroke) which affected all language modalities in his different languages (Swiss-German, German, English, French and Italian). After 4 months of intensive therapy at the CHUV and then at Valens, progress was spectacular: Jürg Schwyter is not impaired in his oral and written comprehension. However, he still experiences mild word finding problems and apraxia of speech, and, importantly, a severe dysgraphia which prevents him from composing texts.

In the course of his speech-language therapy, Jürg Schwyter has learned to use the speech-to-text software “Dragon Naturally Speaking”. This is the tool he uses to tell us about this encounter with aphasia. And because Jürg Schwyter is a language expert, he goes about studying his own language from a research perspective: the witness account he proposes for this publication is the result of this approach. As we shall see, he discusses a number of theoretical aspects relative to aphasia, enriched with his own observations about living with aphasia on a day-to-day basis. He also presents some advice and recommendations aimed at providing facilitations and solutions to communication difficulties encountered in everyday situations.

## 1. Introduction

Many of you will ask yourselves why he talks funny; why he can't find the words; and why he makes grammatical errors – he is after all a Professor of linguistics at Lausanne University. The answer lies in the brain, or more specifically, in language and the brain.

Let me begin by saying that I had a stroke a three years ago. I was 45 years old. I was found lying on the floor after about 36 hours; that is quite a while. Anyway, it is long enough *not* to have an injection that thins the blood and dissolves a clot. Had I got that, things might have been very different indeed.<sup>1</sup> I then spent 11 days at CHUV's stroke

<sup>1</sup> Subsequent to the stroke, I had a massive brain hemorrhage. Had I been injected with a blood thinner, the hemorrhaging might have continued. But there is no way of knowing for sure how much time passed between stroke and hemorrhage.

unit before being transferred at Rehabilitation Clinic at Valens (SG), where I spent initially 4 months. Ever since, I return to Valens for more intensive therapies once a year for 3 weeks.

Among the many consequences, I had and continue to have aphasia. Aphasia is rather a broad term. It can range from

describing people who don't seem to find just 'the right word', to people basically talking meaninglessly, to people labouring to say anything at all. Aphasia is caused by damage to the left hemisphere in the brain; this is what I had – language is a left-hemisphere phenomenon (Figure 1).

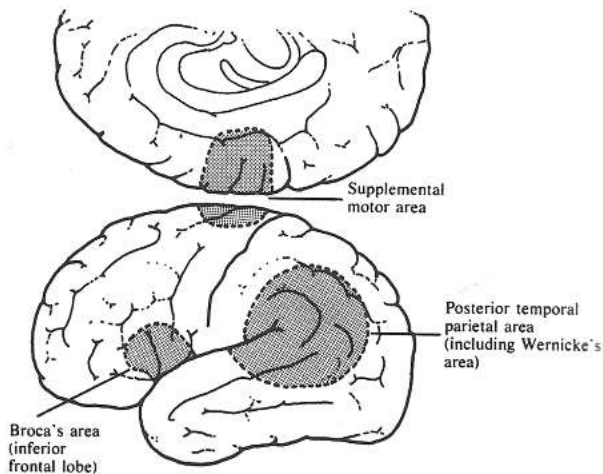


Figure 1. Broca's and Wernicke's areas (Bayles 2001: 530)

In 1860, a French researcher named Paul Broca defined what has come to be known as Broca's area, that is, the frontal lobe in the left cerebral hemisphere (Libben 1996: 422). Broca produced this finding on the basis of a patient who had difficulty articulating speech. Broca's area is one of the principal motor speech areas. Injuries in this region will affect your speech out-

put greatly; you basically have a severe speech impediment. This is what happened to me.

What I did not have is Wernicke's aphasia. In 1874 the German Carl Wernicke investigated patients with lesions in the left hemisphere outside Broca's area (Libben 1996: 428). He found that these patients had comprehension difficul-

ties, although they basically could speak fluently: they had *no* difficulties finding words or speaking in grammatically correct sentences; it was the understanding that was missing (for the location of Wernicke's area, see Figure 1). Initially, I was not able to talk at all and therefore it was unknown whether I was suffering from Wernicke's aphasia, too. Thankfully I very quickly regained full comprehension abilities in terms of following, understanding and analyzing verbal and written communication.

This location of language competence in the left hemisphere is confirmed by the numbers of individuals who have brain injuries: about 70% of those with left-hemisphere injuries will experience aphasia, whereas of those with right-hemisphere injuries, it is only about 1% who experience language difficulties, as has been confirmed many times by more recent research (Bayles 2001: 528).

In my own case, I can read perfectly well in all the languages I know – German, English, Italian and French – and of course I can also *understand* these languages. But speaking is a very different matter. With the help of speech therapy I have managed to achieve rather good oral competence in my mother tongue, Swiss German, and in my main professional language, English. (I have degrees from Cambridge Univer-

sity and the University of Pennsylvania, and I am Professor of English Linguistics at the University of Lausanne.) But, distressingly though fascinatingly, I cannot produce coherent utterances in French or Italian, nor, perhaps most surprisingly, in Standard German, the very first language apart from my mother tongue which I learnt, starting at school at the age of 7. This mismatch between speaking and comprehending may come as a surprise, but it is perfectly logical when one looks at the structure of the brain: active and passive knowledge are located in quite separate regions.

But how is it that I can actually speak at all, because after a stroke, the affected areas are, and remain, dead? The answer lies in how the brain is constructed. Left and right hemispheres are linked to each other by a whole network of brain connections. The lesion caused by the stroke – which in my case was in the area involved with active language use – can be taken over by neural networks in areas that were originally *not* primarily concerned with that task (Kesselring 2010: 8). Thus, through training and a lot of effort, I have so far been able to retrieve some of my languages, i.e. English and Swiss German.

But there is also a second reason why I was able to regain some of my speech: I am (partly) left-handed. In el-

elementary school I was re-trained to write with my right hand, but in spite of that I always performed certain activities with the left, such as drawing, underlining, opening doors, switching on lights, and so on. This makes the whole cerebral system even more complex. Contrary to what might be expected, the brains of left-handed people are not a mirror image of the brains of right-handers, with language being concentrated in the right hemisphere. Instead they show strong language activity in both hemispheres. Left-handers, or originally left-handed people, therefore have less brain lateralization than right-handers (Libben 1996: 419) – and that probably gave me an advantage in saving part of my language abilities. And being rather young probably also helped.

## 2. Aphasia

Aphasia manifests itself as a series of performance errors mostly due to left-hemisphere strokes – cerebrovascular accidents (Bayles 2001: 542-544). (I say «performance error» because in spite of all these difficulties, my reading was as I said before hardly affected.) In my case, the aphasia was drastic: I was totally mute for the brief period of 5-6 days (this, together with comprehension difficulties, is referred to as global aphasia). At the time, I was unaware of that and convinced I talked to people attending to me. But then, speech

therapy training made all the difference. In the first four weeks or so of rehabilitation, for instance, I was trained to learn to produce the differences in English between /s/ and /ʃ/, between /t/ and /θ/, between /r/ and /l/, and so on; and of course there were similar exercises for Swiss German – a hard task if ever there was one! Initially I had a rather strong Swiss-German accent in my English, but in time I was able to return to the (so my British friends tell me) near-RP (Received Pronunciation) accent which I had prior to the stroke.

In fact, we can distinguish further between several different types of aphasia, the most important being Broca's aphasia (Bayles 2001: 542-544), which is the problem I have. In Broca's aphasia there is confusion between phonemes, as well as partially faulty sentence structure, and a total lack of prosodic features such as stress, rhythm and intonation. It is tempting to think that this is somehow related to the physical paralysis of the speech apparatus – in my case the right side of my face and mouth, because I had left-hemisphere stroke – and this may actually be part of the explanation. However, even people with no apparent physical paralysis still find it extremely hard to construct sentences, and there is no doubt that the main problem is damage to the Broca's area of the brain, which has very language-specific tasks.

Another feature which I suffered from only slightly is a sort of telegraphic speech in which all function words are omitted – even now I can, for example, omit an *is*, *it* or a *have*. This is what is called a syntactic disorder in Broca's aphasia. One explanation might be that it is a great deal more economical and much less of an effort to speak without function words. However it might be that the explanation lies at a deeper level of syntax, which I shall not go into here.<sup>2</sup>

What all of us Broca patients share is a deep awareness of our linguistic shortcomings – and we are very much frustrated by this. We have a complete understanding of what we want to say, but just can't say it!

Aphasia, then, will allow us to draw some interesting conclusions with regard to specific features and rules. It may be implicated in the dropping of function words, for example: they do not take affixes (like nouns, verbs and adjectives do) and are never truly

stressed, so they are 'less important' and can just be left out as you would do in telegrams or newspaper headlines. On another linguistic level, getting the phonology right is a matter of target practice of distinctive features, e.g. /t/ versus /θ/ as in the distinction between *wit* and *with*. Very often this goes wrong and the target, from a Swiss German speaker's point of view, is missed. And, finally, the features of an agrammatical sentence may have something to do with processing the hierarchical ordering of constituents (for example, subject NP versus object NP). All this may raise an interesting question, namely whether language loss in the brain can ever be, or partly be, compensated for (see Section 3).<sup>3</sup>

### 3. Brain plasticity

We have seen that the issues involved are very complex indeed. Broca's and Wernicke's areas are responsible, to some considerable extent, for active and passive language capacities, and

<sup>2</sup> See for example the introductory 'Linguistic Theory and Aphasia' in Gary Libben, *Contemporary Linguistics*, ed. William O'Grady et al. (1996, 3rd ed.), pages 431–434, or the much more advanced, Herman Kolk and Claus Heeschen, 'Adaptation Symptoms and Impairment Symptoms in Broca's Aphasia', *Aphasiology*, volume 4.3, (1990), pages 221–231.

<sup>3</sup> Another type of aphasia is Wernicke's aphasia. I am not affected by it and therefore I do not have any personal experience in dealing with it. Patients with Wernicke's aphasia have speech problems as well: while their pronunciation is perfectly alright and their prosody is intact as well, they just don't make any sense. In short, in a question and answer session, for example, the patient simply does not understand any of the questions, so seemingly replies at random, though all the sentences are perfectly grammatical and well-formed.

the left-handed / right-handed dichotomy makes everything even more complicated. But, having said that, it is necessary for the left and the right hemispheres to communicate with one another in order for speech to function normally. For example, it is no longer true that the left hemisphere is regarded as superior to the right; new research technologies have provided insights that holistic processing can be linked with speech and writing, recog-

nition of melodies with analytical processing, and so on (Figure 2). It is now more accurate to refer to the hemispheres as complementary specialized. The degree of hemispheric specialization is different from individual to individual. So for example, right-handers show greatest hemispheric specialization whereas left-handers, with a possible history of left-handedness in their families, show least hemispheric specialization.

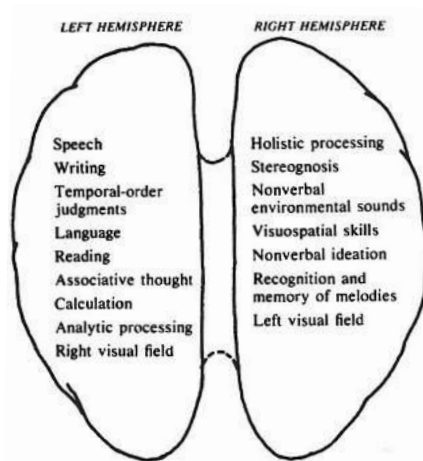


Figure 2. Complimentary specialization of left and right hemispheres (Bayles 2001: 441)

Researchers have found in split brain-research (that is, where one half of the brain is severed from the other) that the right hemisphere can understand the basics of oral as well as written language; but the research also shows that this linguistic competence is really minimal and basically restricted to

single words (Libben 1996: 424). However, with people who sustained left-hemisphere injuries very early in life, it is not uncommon for such patients to show right-hemisphere language dominance. This adaptability, however, seems to decrease in later life, so that after puberty the danger of (sustained)

aphasia is much greater. Nonetheless, the neural networks are linked to each other and, in the case of accidents or lesions that cause dysfunction, slowly take over tasks for which they were not primarily designed. That is what has come to be known as brain plasticity or neuroplasticity (Papathanasiou & Whurr 2000: 31). The damaged areas remain damaged, but the neuronal networks, as I mentioned earlier, «go outside» that damaged area and, in my case, slowly take over the active language function.

Latest research has shown that there are two levels of brain plasticity, namely at the micro level (cellular) and at the macro level (behavioural) (Papathanasiou & Whurr 2000: 35-37). The direct consequence of this is that the brain can learn new behaviours while, at the same time, the same behaviour can alter the brain. So, the structure of the brain allows plastic changes to take place, which allows, in turn, recovery to occur. For my language problem, this may mean:

- language may have more than one «channel», so that in the damaged brain, intact areas can take over the language task; and
- language in left-hemisphere dominant individuals may also, partly, be activated by the right hemisphere.

This may evolve over several months or even years, as brain plasticity sets in and the functions of a lesion (prima-

ry changes) are slowly taken over by a new organisation in the brain (secondary changes). It has been established that these complex brain processes take place over a lengthy period, and that they actually produce changes throughout the entire nervous system (Papathanasiou & Whurr 2000: 35-37). For example, they can affect areas which were *not* previously involved at all in language tasks taking over this function from damaged areas – the «unmasking» of a pre-existing function, so to speak. This finding has been confirmed by one researcher who observed, in reading and speaking tasks, bilateral language activation in recovered patients, which may indicate a degree of involvement of the right hemisphere in some (elementary and basic) language functions (Papathanasiou & Whurr 2000: 34-35).

So for me it is encouraging that a slow process of compensation seems entirely possible – although the right hemisphere will probably never have quite the same capacity for language specialization that the left one has. Not everybody who has suffered a stroke will have a left hemisphere which is totally «out of action» – the extent to which this is so will obviously be directly related to the degree of severity of the aphasia. In such cases of less than complete destruction, part or even total compensation and thus recovery of language ability is entirely possible.



And the fact that I was just 45 years young when the stroke happened certainly helped. The only thing needed is speech therapy and training. And training. And then more training...

#### **4. Conclusion: How to live with a stroke**

Living with a stroke is not always easy (see for example, de Partz 2008). Partly because the uninitiated general public tends to regard you either as slightly retarded (for example, a waiter impatiently waiting for your menu choices while you are struggling to find and utter the right words) or as obstinate and non-cooperative (for example, a telephone operator who wants to sell you something and you just say to all his suggestions 'no', 'no' and 'no' again because it is too much of an effort to respond otherwise). And finally, being physically handicapped (partial paralysis of the right side of the body) in today's fast moving world poses some formidable physical challenges. Of course, not everybody falls into these categories; people may be helpful and concerned – especially if they know what is wrong with you! However, it may definitely help if you have the following communication strategies ready:

- always prepare what you want to say in advance when talking on the phone or to administrators, banks, etc.;

- always say that you have a speech impediment which has nothing to do with your intelligence or willingness to cooperate;
- demand your right to speak, even when the topic of conversation has already shifted and you may be a bit late; and
- when shopping, for example, have a written list of the things you want to buy, so that you are not 'mute' or struggling for words when the shop assistant asks you what you would like.

It takes some training and, frankly, quite a bit of overcoming your inhibitions for these suggestions to work, but once you have achieved this, it will definitely ease your life considerably. You will be free of pressure (for it is to a large degree pressure that makes you totally «mute», and the «fear» of performing in front of strangers), and you then will have all the time in the world. These strategies may also work if you are at a meeting or at university (I'm still struggling, for example, to imitate all English dialect regions...).

Reflecting on the time since 20 February 2009, the day of my accident, it has taken about one year of solid therapies and practice to regain spoken Swiss German, my mother tongue. It is also remarkable that stress, rhythm and intonation have improved greatly; I no longer talk like a machine or a robot. My reading abilities have not been affected, as I said, and my writing abili-

ties continue to pose a challenge; I continue to misspell many words especially when I am tired or excited. I am especially prone to omit the middles of words, too, so that *excitable* can be written as *excible*, for instance.

Sociolinguistically, there are also problems. Because I am still not competent in spoken Standard German, I tend to speak Swiss German in situations where other Swiss people would speak Standard German. Swiss Germans always speak Swiss German amongst themselves, but we always speak Standard German to Germans and Austrians. I find I can't do that, which is not too much of a problem with people from southern Germany and Austrians, who can often understand what I am saying, but it does not work at all well with northern Germans. We would also always, for example, give conference presentations in Standard German, but at the moment I am afraid that would be beyond me.

I was fortunate enough to have a bilingual Swiss German / English speech therapist who, as early as May 2009, introduced English speech therapy. I am now more competent in spoken English than spoken Standard German. It is a struggle, however, to regain my French competency levels – a particularly hard situation when living in Lausanne, which is located in the French speaking part of Switzerland.

There are, of course, also wider professional activities to consider: for example 90% of new employees need to communicate clearly, rapidly and/or in groups, using sophisticated communication techniques. And, to give an example of newspaper reporting, aphasia is mentioned significantly less in the US media than other diseases or handicaps (de Partz 2008: 143). I could go on. In my case, today I work part-time (30%) and team-teach two seminars on bilingualism and sociolinguistics. A formal lecture course, however, is impossible because one needs the stamina to keep going for one hour – something I cannot do.

And then there are, as I said, also the paralysed, or partially paralysed, limbs, but this is another matter. What I have dealt with here is how language is created by the brain, how easily it is affected by a stroke and how difficult it is to repair it. In order to do that, you need a speech therapist, training, a lot of will-power and, above all, a *supportive* environment.

It is quite tough when one is ignored or belittled; after all, aphasia has serious implications for our interpersonal relationships, on all levels. I say it again: we have got something to say – we just can't express our thoughts and ideas, and this is immensely frustrating.

## Note:

Due to partial paralysis of my right arm, the text was dictated using a speech recognition program, *Dragon Naturally Speaking* 10.1, and then was automatically typed into the file.

Most of the factual information stems from Katheryne Bayles, «Language and the Brain», in *Linguistics: An Introduction to Language and Communication*, ed. Adrian Akmajian et al. (2001, 5th ed.); Jürg Kesselring, *Im Anfang war das Wort ...und die Evolution: Gedanken zur Sprachentwicklung aus neurologischer Sicht*, Vorträge der Aeneas-Silvius-Stiftung an der Universität Basel (2010); Gary Libben, «Brain and Language», in *Contemporary Linguistics*, ed. William O'Grady et al. (1996, 3rd ed.); Ilias Papathanasiou and Renata Whurr, «Recovery of Function in Aphasia», in *Acquired Neurogenic Communication Disorders: A Clinical Perspective*, ed. Ilias Papathanasiou (2000); and M.-P de Partz, «L'aphasie au quotidien: Du déficit au handicap», *Neuropsychologie de la vie quotidienne*, ed. A.-C. Juillerat Van der Linden et al. (2008).

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