

USE OF TENSE IN PATIENTS WITH PRIMARY PROGRESSIVE APHASIA

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Abstract: *This paper focuses on PPA-patients' ability to use tense in various linguistic tasks, first in a semi-standardised interview, then in a narration task and in a special elicitation task. In the latter, the future and past tenses and the subjunctive are elicited. The findings – made after a study of German-speaking patients, are compared with similar tasks done with “regular” aphasics after stroke. From the analysis of the data it could be argued that the aphasia displayed in PPA should be considered different from “classic” aphasia after stroke in terms of linguistic features.*

From the corpus gathered from the German-speaking patients under study, several different patterns of tense usage could be found. It seems that, unlike “regular” aphasics, PPA-patients are able to build the necessary constructions for the different tenses, but have problems accessing the right verb form.

Keywords: primary progressive aphasia, tense, aphasia, agrammatism, paragrammatism.

Resumen: *Esta conferencia se centra en la capacidad de las personas que sufren afasia progrediente progresiva (APP) de utilizar los tiempos verbales en diversos contextos lingüísticos, es decir, en diversas situaciones. Al inicio de nuestra exposición enfocamos la capacidad de utilizar tiempos verbales en entrevistas semi-estandarizadas, después verificaremos la capacidad de adecuar los tiempos en narraciones y en ejercicios específicos de prontitud lingüística en situaciones de diálogo, de interacción comunicativa. En este sentido, creamos situaciones que les obliguen a utilizar el futuro, tiempos del pasado tanto como el subjuntivo. Las conclusiones de la observación de pacientes hablantes del alemán se comparan con los resultados obtenidos con pacientes que sufren de las afasias llamadas « tradicionales », aquellas que son el resultado de una hemorragia cerebral. Comparados los resultados se verifica la necesidad de distinguir entre las afasias tradicionales y la afasia progrediente progresiva, debido a las distintas consecuencias en el nivel lingüístico.*

El estudio del corpus elaborado con pacientes alemanes permite observar modelos distintos de utilización de los tiempos verbales. Al contrario de lo que se verifica con los pacientes víctimas de las afasias tradicionales, los pacientes de APP son capaces de formar las estructuras necesarias para los diversos tiempos verbales, pero tienen dificultades en acceder a los formas correctas de los verbos.

Palabras-clave: afasia progrediente progresiva, tiempo, afasia, agramaticalidad, paragramaticalidad.

1. Introduction

This paper presents a linguistic evaluation of features produced by patients of a rare disease called primary progressive aphasia (PPA). The topic is situated at the intersection of three major areas of research: Linguistics, Aphasiology and Neurology (especially the research of dementias). The major focus here is the use of different tenses in aphasia. Patients with this special, rare kind of aphasia, i.e. primary progressive aphasia (PPA), are examined in the light of their use of tenses. The linguistic data used was collected by means of a semi-standard interview, a narration task and an elicitation task. The results are compared with the findings of B. SEEWALD (1996), who examined the use of tense in “regular” aphasics after stroke. The aim of this study is to show that PPA has to be viewed differently from classic aphasia.

2. The relation between aphasia, dementia and primary progressive aphasia

Aphasia is a general term used to refer to an acquired language disorder. It generally affects all linguistic abilities namely, verbal expression, understanding of language, reading and writing. Normally, aphasia can occur after a stroke, but also after head injury, infections of the brain and could also be caused by neurodegenerative diseases, e.g. dementia of the Alzheimer type. Since the disease under study, PPA, is a certain rare form of dementia, it would be necessary to define dementia first. Dementia is a syndrome caused by a neurodegenerative disease, in which brain cells die over time, causing a progressive decline in various neuropsychological skills. Dementia can take one of several forms. The most common type of dementia is progressive memory loss that affects individuals over the age of 65 years and is caused by Alzheimer's neuropathology. Symptoms consist of a gradual, often initially unnoticed decline in the individual's customary mental abilities and/or personality. The symptoms progress and worsen over time. Eventually, assistance is required even in routine activities of daily living like running errands, cooking, or personal hygiene.

In many types of dementia, memory is affected first. In mild stages the patient can show forgetfulness, in later stages he or she may have "forgotten" close family members. Other skills like logical thinking, orientation, visual skills, learning capacity, judgement and behaviour are affected too. In some dementias, language deficits can also be observed in later stages of the disease, although never present as more severely than other mental disorders. In Alzheimer's disease, for instance, language deficits such as word-finding problems, among other things, are common. PPA is, however, another, more rare form of dementia. The term "primary progressive aphasia" was first coined by MARSEL MESULAM in 1982. He was intrigued by a group of patients who showed a progressive decline of their language skills without the accompanying decline of other mental abilities or a change of personality. After 1982 a growing number of medical papers were published in which the neurological examination of PPA-patients is described. M. MESULAM (2003: 1536) outlines the criteria for diagnosis of PPA:

- There is an insidious onset and gradual but progressive impairment of word finding, object naming, syntax, or word comprehension.
- All major limitations in activities of daily living can be attributed to the language impairment for at least two years after onset.
- Premorbid language function is known to be intact.
- Prominent apathy, disinhibition, loss of memory of recent events, visuospatial impairment, visual-recognition deficits, and sensory-motor dysfunction are absent during the initial two years of illness, as indicated by the history, evaluation of activities of daily living, or neuropsychological testing.
- Acalculia (inability to perform simple mathematical calculations) and ideomotor apraxia (inability to pantomime movement as instructed by an examiner) can be present even in the first two years of illness, and deficits in copying simple drawings and perseveration may also be noted, but neither visuospatial deficits nor behavioral disinhibition substantially limits activities of daily living.
- Other cognitive functions may be affected after the first two years of illness, but language remains the most impaired function throughout the course of the illness and deteriorates faster than other affected functions.
- Specific causes of aphasia, such as stroke or tumor, as ascertained by neuroimaging, are absent.

In most of the research on PPA the linguistic symptoms are listed unsystematically since the studies are fundamentally anchored in clinical or neurological approaches. Purely linguistic approaches to PPA are still rare although, as M. MESULAM *et al.* (2003: S11) explain, it affects very elaborately the human language mechanism.

As in the case of cerebrovascular disease, the clinical features of the aphasia in PPA vary from patient to patient. Some patients cannot find the right words to express thoughts; others cannot understand the meaning of spoken or written words; still others cannot name objects they are

shown. The language impairment can be fluent (that is, with normal articulation, flow, and number of words per utterance) and non-fluent.

3. Categorization of PPA

Basically there are two types of PPA, the fluent and non-fluent, determined by the fluency of spontaneous speech produced by PPA patients. The non-fluent type, also called *progressive non-fluent aphasia (PNFA)*, is characterized by non-fluent "labored" speech, word-finding and naming problems, phonemic paraphasias (e.g. "track" for "truck"), and sometimes agrammatism. Interestingly, the patients' comprehension skills are relatively preserved (M. MESULAM 2003, M. GORNO-TEMPINI *et al.* 2004). PNFA-patients show a general reduction of their speech, and they usually get logopenic (taciturn). In the later stages the symptoms can lead to mutism. The fluent type is called *semantic dementia (SD)*. While displaying normal speech flow, SD-patients have a severe naming disorder and produce semantic paraphasias (e.g. "school" for "work"). SD-patients are said to have a "breakdown" of semantic knowledge, which manifests itself through severe disorders in single word comprehension, presented either verbally or in written form (J. SNOWDEN *et al.* 1989, J. KNIBB & J. HODGES 2005). The syntactic comprehension, though, is relatively preserved (M. GORNO-TEMPINI *et al.* 2004). A rather interesting feature of SD is the *multimodal agnosia* (A. KERTESZ *et al.* 2003: 711), which manifests itself through a gradual loss of object meaning, i.e. SD-patients are not able to recognise objects. The recognition disorder is not only visual but multimodal, so even a tactile or sound stimulus cannot be identified. There is also a mixed type of PPA – *progressive mixed aphasia*, consisting of some features of both PNFA and SD (see M. GROSSMAN & S. ASH 2004)

4. Pathology of PPA

A physician may diagnose primary progressive aphasia based on a patient's medical history, a neurological exam, tests of language skills and brain imaging studies. The brain imaging of a PPA-patient shows a focal atrophy (decomposition of brain tissue) in a defined area in the frontotemporal region of the left side of the brain (see fig.1a and b), the area in which language is processed. In almost all right-handed and in the majority of left-handed people, the cortical area, identified with language, is situated in the left hemisphere of the brain (language dominance of the left hemisphere). There is still no answer as to why the atrophy is restricted to that particular area. Even though other areas of the brain may also be in decomposition, the language area usually undergoes the greatest and most progressive atrophy.

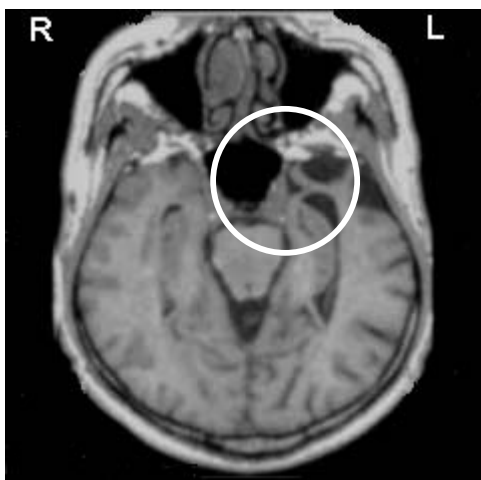


Fig.1a

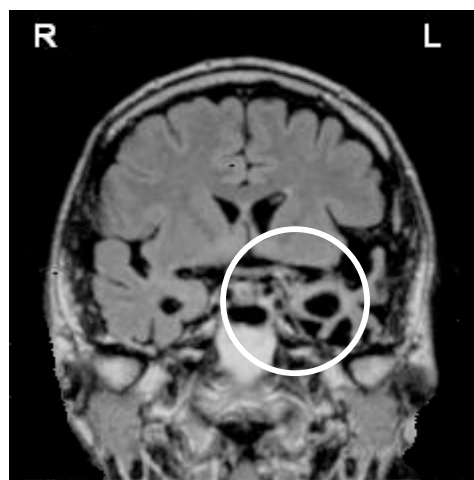


Fig 1b

Figures 1a and 1b show magnet resonance imaging of a 60-year old PPA-patient with a five year history of PPA and severe disorders in both speech production and comprehension. The area of focal atrophy (mainly the region of the left temporal pole) corresponds to the language area.

5. Why should PPA be considered different from aphasia?

Aphasiology is one of the main fields of clinical linguistics and neurolinguistics. A lot of research has been done on aphasics after stroke or after head injuries. In such cases the onset of the language disorder is always sudden, whereas for PPA, the onset is always insidious or subtle. Due to the slowly progressive nature of PPA, knowledge about the course of language dissolution can be gained. In "classic" aphasia (sudden onset) the feature of speech fluency also forms two general subcategories: Broca's aphasia – characterized by reduced output, labored speech and agrammatism, and Wernicke's aphasia – characterized by fluent speech, semantic paraphasias and comprehension deficits.¹ To draw parallels between Broca/Wernicke and PNFA/SD would be easy to do. It is true that the "classic" aphasia and the progressive aphasia types share some characteristics, but to put them on an equal footing would be rash, because "there are limitations in the analogy between these two types of progressive aphasia and the classic syndromes of Broca's and Wernicke's aphasia." (GLENN-CLARK *et al.* 2005: 55). Agrammatism is a feature that does not occur regularly in PNFA whereas it is considered a key feature in Broca's aphasia. Patients with Broca-style agrammatism tend to avoid/omit grammatical words and inflections. Thus, they often display the so-called telegraphic style, in which mostly content words are uttered. The speech of Wernicke's aphasics also shows a phenomenon called *paragrammatism*,² which is not identified in SD but is viewed as a key feature in Wernicke's aphasia. Paragrammatism stands in opposition to agrammatism. Patients with paragrammatism produce very complex grammar with very little content and they are not able to choose the right sentence structures. Here grammatical words and inflections are not omitted but substituted. Wernicke's aphasics also do not show a multimodal agnosia. Profound linguistic tests used for categorizing aphasic symptoms into the classic aphasia-types revealed that the symptoms of SD did not resemble Wernicke's aphasia but rather *transcortical sensory aphasia*, a rarer type of the classic aphasias (A. KERTESZ & J. ORANGE, 2000: 118). Another argument for the differentiation of classic aphasia and PPA is the fact that in PPA there are also mixed PNFA/SD-types (progressive mixed aphasia), which hold some features of both PPA-subtypes (M. GROSSMAN & S. ASH, 2004). In classic aphasia, a mixture of fluent and non-fluent features (Broca's and Wernicke's aphasia) would be most uncommon. If both brain regions (Broca's and Wernicke's area) were affected by a stroke, the patients would rather get a *global aphasia*, the most severe kind of classic aphasia, with a severe impairment of both verbal expression and comprehension.

An additional important differentiating feature, especially from the patients' point of view, is the prognosis of the disorders. Classic aphasias usually have a good prognosis for improvement. Classic aphasia is worst at the point of onset, e.g. the actual stroke event. As the patient recuperates from the stroke and follows treatment with speech therapy the aphasic symptoms often diminish. In the case of PPA, the aphasic symptoms worsen over time. Due to the fact that brain tissue is disintegrating, there is hardly a chance that lost abilities could be regained.³ This poses interesting challenges to PPA-speech therapy. Speech therapy with PPA-patients could have a positive effect (L. MURRAY 1998), although it is important to define realistic goals. Primarily, the status quo has to be preserved and certain strategies have to be found to compensate for the language disorder, instead of trying to relearn what has already been lost.

The points listed above lead to the suggestion that PPA has to be viewed differently from classic aphasia. This fact makes it necessary to compare the linguistic performance of "regular" aphasics with PPA-patients to further strengthen this conclusion and maybe to find new approaches to speech therapy. The linguistic data used in this paper was collected using a semi-

standardized interview, a narration task, and an elicitation task administered on two German-speaking PPA-patients. The tests were aimed at testing their ability to use tense properly. The data is compared qualitatively with a study done in 1998 by B. SEEWALD, who collected linguistic data on two German-speaking Broca's aphasics using the same method.

6. Tense in aphasia

The general question that this study seeks to answer is: Do PPA-patients differ in terms of language usage from aphasics after stroke? To properly answer the question, one aspect of language usage, tense, has been chosen for investigation. Linguistic data, as said above, is from two PNFA-patients, coded here as R.N. (male) and W.P. (female). There is as yet a very negligible amount of literature on the use of tense in PPA. Classic aphasics though, have been examined, for instance, B. SEEWALD (1998) carries out a study on linguistic features of two patients with Broca's aphasia after stroke. Both aphasics had an agrammatism, a typical key feature of Broca's aphasia. Agrammatism is characterized by the following criteria: reduced sentence length, simple syntactic structures, problems with the production of morpho-syntactic elements (although with relatively preserved content elements), deficits in grammatical skills, especially omission of grammatical morphemes, deficits in syntactic variability, rare use of subordinate clauses (B. SEEWALD 1998:63). From her findings, the present tense was used the most often whereas past-forms were used rarely and future tense was not produced at all. Her study also revealed an occurrence of incorrect infinitive forms in which the infinitive form of the verb is used instead of a conjugated form, i.e. without any inflected auxiliary verb. The patients also tended to avoid inflection in past-forms, using only the past participle – i.e. German *Partizip II*.

7. Method

The two PPA-patients under study in this paper were given three linguistic tasks. First, they had to take part in a semi-standard interview (INT). The questions asked referred to past, present, future and potential events. The use of the subjunctive was included in the form of hypothetical questions ("What would you do if ..."). The topics were from three general categories: Home/Family, Hobbies/Profession, and Hopes/Wishes.

Second, they had to do a narration task (NAR) and third, an elicitation task (ELIZ). These two tasks required the use of visual stimulus material. The material used here consisted of 20 sets of chronological event pictures (three pictures per event), e.g. three pictures corresponding to: 1) *She will set the table*; 2) *She is setting the table*; 3) *She has set the table*. Of the 20 sets of pictures, 10 had singular subjects while the remaining 10 sets had plural subjects (see example in Fig. 2). In the narration task (NAR) the patients were asked to describe the pictures they were shown. In the elicitation task (ELIZ) only one picture (either the first or the third) of the set was presented to the patients. When the first picture of the set was presented, the stimulus question was "What will happen?" (German: "Was wird passieren?"). In his or her answer, the patient was expected to refer to a future event (ELIZ/FUT/). When the third picture of each set was presented, the stimulus question was "What was before?" (German: "Was war vorher los?"). Here, the patient had to refer to a past event (ELIZ/PAST/) in his or her answer. To avoid a training effect, the stimulus question and the stimulus picture, were changed regularly after three items.

The elicitation of the subjunctive (ELIZ/SUBJ/) was done with pictures of problematic situations, e.g. a boy falling from a bridge into a river with a girl witnessing the accident. The stimulus question in this elicitation task is "What would you do?" (German: "Was würden Sie tun?"). In this task the patients were expected to refer to a hypothetic event in their responses.

8. Patients – case studies

Two PPA-patients of the non-fluent type, W.P. and R.N., took part in the interview, narration and elicitation tasks. W.P., a 78 year old woman, started displaying aphasic symptoms four years before. Neuropsychological testing revealed that her memory and orientation were unaffected. Her spontaneous speech was slow, effortful and reduced and was characterized by word-finding problems (anomia). She also produced few phonemic paraphasias. Certain agrammatic features were also noticed in her speech. Further diagnoses revealed that W.P. had the agrammatic variant of non-fluent progressive aphasia (PNFA).

R.N. is a 65 year old man. His symptoms started approximately three years ago when it was noticed that he could not rightly state his own date of birth. Initially, he confused colour names and numbers. He was logopenic, his speech was non-fluent, reduced and characterized by many semantic paraphasias and a word-finding disorder. He also developed a reading and writing disorder (dyslexia and dysgraphia). A few months after the testing it was noticed that R.N. was unable to understand syntactic and morphological structures, for instance, question words like *how*, *why*, *what*, *where* and low-frequency content words. He also displayed echolalia – the repetition of perceived phrases. However, three years into this illness R.N. was still able to drive his car and work part-time as a caretaker. R.N. was diagnosed as having the mixed form of PPA with features of both PNFA (reduced, non-fluent speech) and SD (comprehension deficits, semantic paraphasias).

9. Results

The three tests performed on these patients revealed interesting results not only about their use of language but also the classification of PPA as a different and particular form of aphasia. In the following paragraphs, the results of the analysis of the data are presented. Attention is paid to the use of tenses in references to future events (/FUT/), past events (/PAST/), and the use of the subjunctive (/SUBJ/).

9.1. Reference to /FUT/

Reference to future events was most problematic for the PPA-patients. There was a strong tendency to use the infinitive form of the verb, although not always correctly, for future events. In cases where the patients did not use the infinitive, they fell back to one of the present tenses. This was mostly the case in the interview. Here, the future tense was substituted by present tense and auxiliary + infinitive (AUX + INF) almost every time.

In the narration and elicitation tasks the patients were encouraged to refer to the future tense in a more "conscious" way.⁴ Here, the future was correctly constructed at several points in the task, with *werden* + *Infinitiv*, similar to the *will-future* construction in English. The patients often replaced the German *werden* (English, *will*) by an auxiliary verb like *müssen* (*must*) or *wollen* (*want*)(example 1). Generally, both patients had a strong tendency to use infinitive constructions with an inflected auxiliary verb. In one case an inflected full verb in the present tense was used as part of an infinitive construction (example 2); in another case the inflected verb was omitted altogether (example 3). The omission of an inflected verb, however, occurred only once. R.N., for instance, tended to use DO + INF to refer to a future event in /NAR/ (example 4). Through this strategy he was able to grammatically differentiate the future reference from the actual event in the present tense (example 5), although TUN + INF (DO + INF) is a colloquial German structure that actually refers to the present, too.

- (1) W.P. (ELIZ/FUT/)
Die wollen den Stuhl blau streichen.
They want (AUX) the chair blue paint (INF)
They want to paint the chair blue.
- (2) W.P. (ELIZ/FUT/)
**Er fönt den Fön gebrauchen.*

- He dries (3.PERS. SING.) the dryer to use (INF)
**He dries to use the dryer.*
- (3) W.P. (NAR/FUT/)
**Die Haare fönen.*
 The hair dries (INF)
** Dry the hair.*
- (4) N.R. (NAR/FUT/)
Da tun sie trinken.
 There do they drink (INF)
There they do drink.
- (5) N.R. (NAR/PRES/)
Da trinken sie es aus.
 There drink (3.PERS. PL.) they it up
Here they drink up.

There is also sometimes a mix-up between /FUT/ and /PAST/ constructions (examples 6 and 7). In one case even the infinitive part of the future tense was substituted for an inflected verb in the past tense (example 8).

- (6) W.P. (ELIZ/FUT)
Da war...ist der Abschied
 Ther was (PAST)...is (PRES) the good-bye.
There was...is the good-bye
- (7) R.N. (ELIZ/FUT)⁵
Da ist passiert, dass die Haare gewaschen werden
 There has happened (/PAST/) that the hair is washed (/PRES/).
It has happened that the hair is washed.
- (8) W.P. (ELIZ/FUT)
**Da werden sie die Eis auslöffeln*
 * There will (FUT) they ate (PAST) the ice-cream
**There they will ate the ice-cream.*

R.N., especially, had problems moving from one tense to another in the narration and elicitation tasks, so he often used negation (NEG) as a strategy to construct different time references without changing the grammatical structure (example 9b and 10).

- (9a) R.N. (ELIZ/FUT)
Da haben sie den Stuhl gestrichen,
 There have they the chair painted (PAST),
They have painted the chair
- (9b) *nein, da haben sie den Stuhl nicht gestrichen*
 no there have they the chair not painted (NEG PAST).
no, they haven't painted the chair (yet).
- (10) R.N. (NAR/FUT)
*Das Bild ist nicht *gemalen (incorrect inflection of participleII)*
 The picture is not painted (NEG PAST)
The picture is not painted (yet) (instead of target sentence: He will paint the picture)

9.2. Reference to /PAST/

In referring to past events R.N. and W.P. showed a strong tendency to use the past participle – the German *Partizip II*. There were no general problems in the construction of past tenses in the interview but the patients still faced difficulties in activating the right tense in the narration and elicitation tasks. In these tasks R.N. generally tends to “stick” to a certain tense, usually present perfect or simple present. When he used present tense in reference to /PAST/, he fell back on negating the sentence, so the utterance is correct from a pragmatic point of view

(example 11). In the /ELIZ/ task R.N. preferred to use *Partizip II*, mostly embedded in present perfect tense, even when referring to /FUT/, so there weren't many problems in the /PAST/ elicitations.

(11) R.N. (NAR/PAST)

Hier spielen sie nicht.

Here play (3.PERS.PL) they NEG

Here they don't play (any more). (instead of: they have played chess)

W.P., though, had some problems with accessing the /PAST/ structures. Like R.N., she had difficulties changing tenses and accessing the right tense. Her strategy consisted of the Auxiliary *want* + *infinitive* (German: *wollen* + *INF*) (example 12). Since she used this construction in the present tense to refer to /FUT/ she only had to transfer the inflected verb into simple past to successfully make the reference to /PAST/ (example 13).

(12) W.P. (ELIZ/FUT/)

Die Jungs wollen die Anzüge anziehen.

The boys want (PRES) the suits put on (INF)

The boys want to put on the suits. (target sentence: They will put on clothes)

(13) W.P. (ELIZ/PAST/)

Die wollten das anziehen.

They wanted (PAST) this put on (INF)

They wanted to put this on. (target sentence: They have put on clothes)

In spite of this strategy, the tenses were sometimes still confused. In example 14 W.P. had to refer to a past event "*they have painted the (previously white) chair (blue)*". Here she made an attempt at a correction although she didn't correct the tense per se but uttered an additional phrase to set the sentence into /PAST/ reference.

(14) W.P. (ELIZ/PAST/)

Die wollen den Stuhl streichen...der war weiss.

They want (PRES) the chair paint (INF)...it was (PAST) white

They want to paint the chair...it was white.

9.3. Use of the subjunctive

The subjunctive was rarely produced in all tasks. In the interview and the elicitation task, both patients reacted to the questions with elliptic structures (example 15), that did not require the actual production of *would* (German: *würden*). R.N. sometimes substituted the subjunctive with simple present (example 16), but he was able to produce it correctly in some other cases (example 17). W.P. did not display any problems with the subjunctive (example 18).

(15) R.N. (ELIZ/SUBJ)

Stimulus question: "What would you do" (German: "Was würden Sie tun?")

Den rausziehen.

Him pull out (INF)

Pull him out.

(16) R.N. (ELIZ/SUBJ)

Stimulus question: "What would you do" (German: "Was würden Sie tun?")

Den schlag ich.

Him hit (PRES) I

I hit him.

(17) R.N. (INT)

Dann würde ich mir das Geld auf die Seite tun.

Then would I (REFL) the money on the side put (INF)

Then I would save the money.

(18) W.P. (INT)

Dann würde ich es den Kindern geben.

Then would (SUBJ) I it to the children give (INF)

Then I would give it to the children.

10. Discussion of the results

What is striking at first, is that both patients were able to produce the grammatical structure of the different tenses. The problem lies in deficits accessing the *right* structure. This fact stands in opposition to the findings of B. SEEWALD (1998), whose aphasics were much more limited in their production of tenses. They also did not mix up tenses like the PPA-patients (see examples 2, 7, 8). The PPA-patients also have a greater variety of tense construction, and they never produce incomplete tense structures like regular aphasics do. The only example of an incomplete tense structure (example 3) was produced by W.P., who on the other hand was also able to produce very complex tenses (example 19). An agrammatic Broca's aphasic would not be able to produce a sentence like in example 19.

(19) W.P. (INT/FUT)

Lange werde ich mir das nicht leisten können.

In the long run will I (REFL) that (NEG) afford able to

I won't be able to afford this in the long run.

These two examples are a strong argument for the conclusion that PPA impairs only the ability to access the right sentence structure. The two patients studied still have the ability to produce tenses and to build the necessary structures albeit the wrong ones. The ability to produce grammatical elements e.g. tense, the often incorrect choice of tense, and the confusion of certain elements within a tense structure are all strong indicators of paragrammatism rather than of agrammatism. It could be argued that the grammatical disorder in non-fluent PPA (PNFA) resembles paragrammatism rather than agrammatism. This would set PNFA clearly apart from the classic Broca's aphasia since Broca's aphasia is the non-fluent form of classic aphasia with agrammatism as key feature. In terms of grammatical performance PNFA-patient would rather correspond to Wernicke's aphasics, since Wernicke's aphasia has paragrammatism as important key feature. However, Wernicke's aphasia is the fluent form of classic aphasia and thus can't correspond fully to PNFA. Considering this fact it could be argued that there should be different categorization parameters for PPA and classic aphasia and that PPA symptoms (PNFA, semantic dementia, primary progressive mixed aphasia) can't be equated with syndromes of classic aphasia (Broca's aphasia, Wernicke's aphasia, global aphasia). On the other hand, there is a chance that paragrammatism could progress to agrammatism in the course of the disease. For a deeper understanding of the issue, further research on the linguistic abilities of PNFA-patients, especially in longitudinal studies, is necessary.

Notes

¹ Broca's and Wernicke's aphasia are named after the researchers who located the language regions in the brain: Broca-area (expression) and Wernicke-area (comprehension). A lesion in those areas leads to the corresponding aphasic symptoms.

² The term *paragrammatism* was coined by K. KLEIST (1934)

³ The human brain possesses a certain neural flexibility, so that it could be argued that unaffected areas of the brain can overtake the functions of the affected regions. Unfortunately this flexibility is highest at a young age where the synapses and neural networks are still growing. After that stage the ability for neural plasticity gets lost with age.

⁴ In the narration task the patients had to differentiate verbally between the actual event, and what happens before and after, so the use of the present tense is already accounted for in the actual event. In the

elicitation task the patients were literally forced to refer to a certain tense following the type of stimulus question posed.

⁵ Please note: The stimulus question is still "What will happen?"

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