

Prosodic Characteristics of a Case of Foreign Accent Syndrome

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0. Introduction

Foreign Accent Syndrome (henceforth: FAS) is a speech disorder in which the speech characteristics of patients are such that they result in the perception of a foreign accent by listeners. Although the disorder had been observed on several occasions before (Whitaker, 1982) the disorder was described in considerable detail in Monrad-Krohn (1947), who reported the case of a Norwegian woman who developed a German accent as a result of severe head trauma. One of the most characteristic aspects of her speech were significant deviations in pitch patterns: the lexical tone distinction that is characteristic for Norwegian did no longer exist and sentence intonation was also seriously impaired. Since Monrad-Krohn's report, several cases of Foreign Accent Syndrome have been reported, but the limited number of publications in this area suggests that this speech disorder is relatively rare.

As far as the speech characteristics of FAS are concerned, the impression of foreign accent is generally caused by a combination of segmental and suprasegmental deviations in pronunciation. As far as the articulation of speech segments is concerned, a wide variety of deviant patterns is observed for both consonants and vowels, but research so far has been distinctly unable to provide a coherent picture of any system in the pronunciation errors and consequently in the production processes involved in FAS. We are convinced that this is caused by the lack of a coherent general phonetic framework against which observed pronunciation errors can be described and classified. Since this will be the subject of another paper (Verhoeven & Mariën, forthcoming), this issue will not be further elaborated here.

Apart from segmental pronunciation problems, suprasegmental errors are generally assumed to be an essential characteristic of Foreign Accent Syndrome. Again the impression exists that researchers have identified a wide variety of suprasegmental errors that may be associated with FAS and there seems little system in these mistakes.

The aim of this study is to present a detailed analysis of the suprasegmental characteristics of the speech of a Dutch-speaking female patient with Foreign Accent Syndrome. These characteristics will be compared against what is commonly observed in 'normal' speakers of Dutch. For this purpose, we will rely on an experimental phonetic description developed at the Institute of Perception Research, Eindhoven (The Netherlands) ('t Hart, et al., 1990) which has resulted in a grammar of Dutch intonation (Collier and 't Hart, 1982). The essence of this highly explicit description of Dutch intonation is that pitch contours are described in terms of a small number of characteristic pitch movements which have been shown to be perceptually relevant. Most of these pitch movements are associated with sentence accents. Unlike many other models of intonation, it is assumed that all accents realised in a sentence context get sentence accent status so that the term 'sentence accent' does not only refer to the 'most prominent' accent of the sentence.

1. Patient's medical history

The patient was a 53-year-old woman who acutely developed severe speech problems and paresis of the left hemicorpus. On admission she was well-oriented, alert and fully co-operative. Neurological examination revealed verbal mutism with intact auditory-verbal comprehension, normal spelling and intact written comprehension. A moderate right hemiparesis and central facial nerve palsy was found. The right plantar response was extensor. Sensory examination was normal. On confrontation no visual field defects or spatial neglect phenomena were encountered. Medical history was unremarkable. The patient worked as a technician in a medical laboratory and had an education level of 14 years. For ten out of ten unimanual tasks a strong and consistent right hand preference was indicated and later confirmed by means of the Edinburgh Inventory (Oldfield, 1971) which yielded a Laterality Quotient (LQ) of +90. Family history of left-handedness or ambidexterity was negative. Both parents, siblings and grandparents were dextrals.

On admission a computerized tomography (CT) scan of the brain was normal. A repeat CT-scan of the brain revealed an infarction in the left fronto-parietal region. Magnetic Resonance Imaging (MRI) of the brain was done three weeks after the stroke: it revealed a lesion which involved the inferior frontal gyrus, the precentral gyrus, the anterior insular cortex, the postcentral gyrus and the supramarginal gyrus of the left hemisphere.

A Tc-99m-ECD Single Photon Emission Tomography (SPECT) scan of the brain was done 14 days after the stroke: it revealed a severe left fronto-parietal hypoperfusion

extending to the left temporal and subcortical region. Crossed cerebellar diaschisis was demonstrated as well.

Neuropsychological and neurolinguistic examinations were carried out in the acute (day 11), lesion (day 25) and late phase of the stroke. The neurolinguistic test battery consisted of a selection of tests including the Dutch version of the Aachener Aphasia Test (AAT) (Graetz et al., 1992), the Boston Diagnostic Aphasia Examination (BDAE) (Goodglass and Kaplan, 1983), the Token Test (De Renzi and Vignolo, 1962), the Boston Naming Test (BNT) (Kaplan et al., 1983; Mariën et al., 1998), a phonological and semantic verbal fluency task (unpublished) and subtests of the Dutch version of the Psycholinguistic Assessments of Language Processing in Aphasia (PALPA) (Bastiaanse et al., 1995).

Neuropsychological investigations were based on a selection of standardized tests. These consisted of: the Mini Mental State Examination (MMSE) (Folstein et al., 1975), the Alzheimer's Disease Assessment Scale (ADAS) (Rosen et al., 1984), the Coloured Progressive Matrices (Raven, 1976), the Wechsler Adult Intelligence Scale (WAIS) (Stinissen et al., 1970), the Hierarchic Dementia Scale (HDS) (Cole and Dastoor, 1987), the Wechsler memory scales (WMS and WMS-R) (Wechsler, 1945; Wechsler 1987), Rey's 15 words, the Rey-Osterrieth figure, the Wisconsin Card Sorting Test (Grant and Berg, 1993), the Stroop Colour-Word test (Lezak, 1983), the Right-Left Orientation test, the Visual Form Discrimination test and the Judgment of Line Orientation test (JLO) (Benton, deS Hamsher, Varney, and Spreen, 1983).

1.1. Acute Phase Findings: Neurolinguistic Findings: day 11

Table 1 summarizes the neurolinguistic results obtained 11 days post onset neurological symptoms.

Table 1: AAT test results on day 11 and 25 post-onset neurological symptoms

AACHENER APHASIE TEST	Results day 11/25	Percentile	Max	Mean	± 1SD
Comprehension	120/120	100	120	108.5	10.24
auditory : words	30 / 30	98	30	26.49	3.30
auditory : sentences	30 / 30	98	30	26.79	3.41
total	60/60		60	53.28	6.08

written : words	30 / 30	95	30	28.30	2.29
written : sentences	30 / 30	99	30	26.91	3.39
total	60/60		60	55.21	4.90
Token Test	0 / 0	100	60	55.21	4.90
<i>Spontaneous Speech</i>					
communicative behavior	4 / 4		5	4.63	0.54
articulation and prosody	3 / 3		5	4.63	0.67
automatisms	5 / 5		5	4.59	0.65
semantic structure	5 / 5		5	4.59	0.53
fonematic structure	3 / 3		5	4.54	0.56
syntactic structure	5 / 5		5	4.41	0.55
<i>Imposed Speech</i>					
total repetition	127/149	73/99	150	144.1	8.07
phonemes	26 / 30	50 / 88	30	28.91	2.09
monosyllabic words	27 / 27	52	30	29.22	1.32
loan- & foreign words	25 / 27	52 / 59	30	28.94	2.31
compounds	24 / 25	56 / 76	30	28.45	2.22
sentences	25 / 25	59 / 81	30	28.55	1.90
total naming	120/120	100/100	120	109.3	8.42
simple nouns	30 / 30	97	30	27.92	2.90
color names	30 / 30	98	30	27.69	1.99
composed nouns	30 / 30	99	30	28.04	2.61
sentences	30 / 30	100	30	25.69	3.72
<i>Written Language</i>	90/90	100/100	90	85.52	7.63
reading aloud	30 / 30	96 / 96	30	28.95	1.93
composing	30 / 30	98 / 98	30	28.57	2.75
dictational writing	30 / 30	99 / 99	30	28	3.67
Boston Naming Test (BNT)	- / 56		60	54.5	2.6
PALPA					
Auditory discrimination: test 1	- / 70		72	70.05	1.64
Lexical decision: test 5	- / 159		160	158.2	2.27
Reading: test 8	- / 30		30	29.73	0.67
Repetition: test 8	- / 28		30	29.25	1.3

Eleven days after admission apraxia of speech most markedly characterized the patient's oral-verbal output. Speech was slowly and hesitantly articulated in a slightly hypophonic way. In addition, effortful articulatory struggles, which particularly affected consonant clusters, vowel and consonant lengthenings, decreased stress and a general flattening of voice volume gave the impression that prosody and melody were severely disrupted. As a result, syllables tended to become isochronous and of equal prominence (scanning speech). Though the articulatory distortions affected speech rather inconsistently, errors predominantly consisted of phonemic substitutions. Articulatory groping and struggling which induced sequential errors, and mostly unsuccessful efforts to self-correction alternated at times with 'islands of error-free speech'. Errors increased with word length and were not task dependent. No improvement was found when the patient recited, repeated, cursed or read aloud. Aside from this selective impairment of speech movements, no accompanying aphasic or dysarthric disturbances were found. As demonstrated in Table 1 auditory-verbal and written comprehension, expressive and receptive syntax, word-finding and written confrontational naming, and dictational writing disclosed no structural linguistic deficits.

1.2. Lesion Phase Findings

1.2.1. Neurolinguistic Findings: day 27

Auditory-verbal comprehension and auditory discrimination was, as illustrated by normal test results on PALPA, Token Test and AAT entirely normal (Table 1).

Spontaneous and imposed oral language examinations, as displayed in table 1, yielded entirely normal results. The AAT repetition and visual confrontation naming tests were normal. On the BNT, 56 of the 60 items were named correctly. In comparison with a gender, age and education adjusted mean of 54.5 and a standard deviation of 2.59 this score is entirely normal (Mariën et al., 1998). Qualitative analysis of the naming errors according to a classic neurolinguistic taxonomy, revealed the error profile not being essentially different from the profile encountered in a reference group of 200 healthy elderly. Most naming errors consisted of adequate circumlocutions of the target item. Verbal fluency for one minute semantic categories (animals, transport, vegetables, and clothes) and two minutes phonological categories (phonemes [f], [a] and [s]) matched gender, age and education means (unpublished personal data). All utterances were of normal length and were (morpho)syntactically well-structured.

Though not reflected by the formal test results, apractic speech symptoms intruded oral verbal output. Inconsistent non-sequential substitutions of target phonemes and phonetic alterations such as prolongations and reductions of speech sounds and diphthongizations characterized spontaneous and imposed speech. Since these

articulatory deviations are phonetic distortions of apractogenic origin they were not classified and scored as aphasic errors.

Oral reading, contaminated by phonetic alterations, revealed no errors of aphasic origin. Normal AAT results were found at the grapheme, morpheme and textual level.

Reading comprehension for words, sentences and texts was within entirely normal limits. The patient was also perfectly able to summarize the contents of a short newspaper article accurately.

Dictational writing scored within entirely normal limits on the AAT. The patient obtained a score of 30/30 on dictational writing. Orthography was affected by a residual weakness of the right arm. Tempo was severely reduced and letters were not well-formed.

1.2.2. Neurocognitive findings: day 27 post onset

Formal neuropsychological investigations were carried out on day 27 after onset of neurological symptoms.

Table 2: Neurocognitive test results: lesion phase findings

NEUROCOGNITIVE TESTS	<i>Score / Maximum</i>	<i>Percentile</i>	<i>Mean</i>	<i>±ISD</i>
<i>Mini Mental State Examination</i>	30/30			1.3
<i>Intelligence Tests</i>				
Wechsler Global IQ (GIQ)	120		100	15
Wechsler Verbal IQ (VIQ)	125		100	15
Information	15 / 22	93		
Comprehension	18 / 28	90		
Digit Span	20 / 24	99		
Arithmetic	11 / 16	84		
Similarities	20 / 26	96		
Vocabulary	39 / 60	82		
Wechsler Performance IQ (PIQ)	110		100	15
Digit Symbol	36 / 115	38		
Picture Completion	11 / 20	73		
Block Design	20 / 26	93		
Picture Arrangement	19 / 20	99		

Object Assembly	38 / 82	66		
Progressive Raven Matrices	125		100	15
Memory Tests				
Wechsler Memory Scale-Revised				
Visual Memory Index	>138		100	15
Verbal Memory Index	125		100	15
Delayed Recall Index	>140		100	15
Attention/Concentration Index	112		100	15
Hierarchic Dementia Scale (HDS)				
Memory : Biographic : it. 17	10 / 10		10	0
Rey-Osterrieth Figure: memory	34 / 36		25	3
Frontal Tests				
Wisconsin Card Sorting	normal			
Stroop Colour-Word Test	9		52	10
Praxis Tests				
Rey-Osterrieth Figure	36 / 36		35	3
Praxis : Ideational : it. 5 HDS	10 / 10		9.79	0.17
Praxis : Ideomotor : it. 3 HDS	10 / 10		9.94	0.23
Praxis : Drawing : it. 15 HDS	10 / 10		9.81	0.52
Praxis : Constructional : it. 12 HDS	10 / 10		10	0
Visual Tests				
Right-Left Orientation - Form A	20 / 20		19.3	2.3
Judgment of Line Orientation	28 / 30	22	25.3	
Visual Form Discrimination	30 / 32		29.9	
Facial Recognition Test	52 / 54	33-59		

For ten out of ten unimanual tasks the patient indicated a strong and consistent right hand preference. This manual dominance was later confirmed by means of the Edinburgh Inventory yielding a laterality quotient of +100. As illustrated in Table 2, orientation, gnosis, praxis, problem solving, calculation, concentration and intelligence were above average.

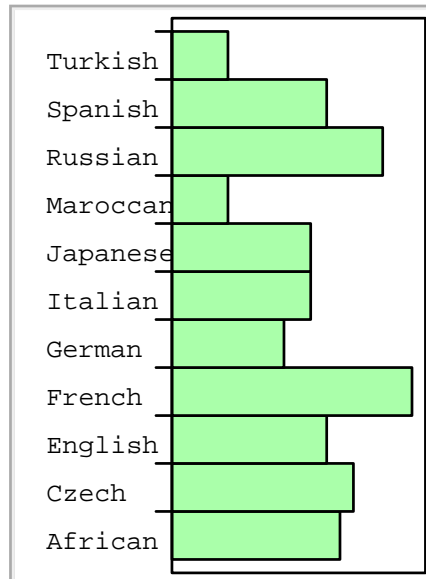
2. Patient's Foreign Accent Syndrome

In order for a speech disorder to qualify as a foreign accent syndrome, Whitaker (1982) mentions that at least four criteria should be met. In the first instance, the accent has to be considered by the patient, by acquaintances and by the investigators to sound foreign. Next, it should be unlike the patient's native speech before the insult. It should further be clearly related to central-nervous-system damage and there should be no evidence in the patient's background of being a speaker of a foreign language. It can be confirmed that this patient fulfilled all the criteria mentioned here: the patient herself as well as her direct acquaintances mentioned that her speech sounded odd as if she had a French accent. The investigators perceived her speech as French in some utterances, as German in others. In addition, comparison of the patient's speech with a recorded sample of her speech before the stroke revealed substantial differences, which are reported in Verhoeven and Mariën (forthcoming). As described above, the disorder is obviously related to ischemic damage of the fronto-parietal region of the language dominant hemisphere. Although the patient was quite fluent in French, she did not use this language on a daily basis.

In order to obtain additional information on the patient's foreign accent, a sample of her speech was presented to 168 native speakers of Dutch from the Antwerp region in Belgium as part of a larger perception experiment in which informants had to assess the degree of foreign accentedness of 14 non-native speakers of Dutch from a variety of linguistic backgrounds. In this experiment, 4 native speakers of Dutch were included as a control group. Besides the degree of accentedness, the informants were also required to rate the speech samples in terms of a number of socio-economic dimensions. For the patient's speech sample to be included in this test, it was asked to read the same text as the other subjects in the experiment. It should be mentioned that this recording was made almost two years after the stroke. This procedure was not ideal, since it can be expected that this speech sample reflects effects of speech therapy and general speech rehabilitation. But it was regarded necessary to have the patient assessed on the same speech sample as that of the other subjects in the test.

The results of the perception experiment show that the patient was assessed as a native speaker of Dutch in 19.58 % of the cases; in 80.42 % she was labelled as a non-native speaker of Dutch. The different accents that were attributed to her speech are summarized in figure 1. From figure 1 it is clear that the judgements do not reflect a clear perception of one or the other accent: rather, the judgements are equally distributed among the different classes with the perception of a French and Russian accent being the most prominent with 14.78 % and 13.04 % judgements in these categories respectively.

Figure 1: different accents that were attributed to the patient's speech.



From these results it is clear that – even after two years- by far the largest majority of listeners perceived the patient's speech as distinctly foreign and this is consistent with our diagnosis of Foreign Accent Syndrome.

Although it is somewhat beyond the scope of this article, it may be interesting to mention that the judges in the perception experiment were also asked to rate the patient's speech in terms of a number of adjective pairs which were assumed to reflect the socio-economic acceptance of her accent. In terms of solidarity, the patient's accent was generally judged positive, while in terms of socio-economic status it was judged negative. Suffice it to say that this result reflects the general trend in the assessments of 'real' foreign accent by native speakers of Dutch.

2. Patient's Prosodic Characteristics

2.1. The Speech Sample

The speech data consisted of 26 spontaneous speech utterances which were recorded in a short conversation with the patient 11 days post-onset neurological symptoms. In this conversation with one of the researchers, the patient was asked to describe the events and emotions following the insult. The speech sample had a total duration of 2 minutes. It was decided to use these data for prosodic analysis since these data do not yet reflect effects of speech therapy.

2.2. Prosodic analysis

The speech sample was digitised on a Macintosh computer at $S_f=16.000$ Hz. All utterances were subsequently analysed acoustically for pitch in PRAAT (Boersma & Weeninck, 2001) using the standard analysis parameters for a female voice. On the basis of visual pitch information as well as auditory information, the pitch contours were stylised in order to discover the perceptually relevant aspects of the intonation contours. In experimental practice, the procedure of stylisation involves the replacement of the actually observed pitch contours by set of straight lines which are perceptually equivalent to the original contours. This procedure does not only filter out microprosodic effects, but also provides an insight into the internal structure of pitch contours in terms of their constituting pitch movements.

This stylisation procedure was applied twice to the data by the same researcher on two different occasions. The time span between the two stylisations was 1 month. Independently of this stylisation procedure, the second researcher transcribed the intonation contours solely on the basis of his perception and labelled the pitch movements in terms of the labelling system developed by the Institute of Perception Research ('t Hart et al., 1990). He labelled the intonation contours on two separate occasions with a time span of one month between the two sessions.

At the end of the analysis procedure, the information in all the transcriptions was compared and it was found that there was disagreement in the transcription in about 25% of the cases. These cases were analysed again by the two researchers and it was attempted to arrive at a consensus transcription. This turned out to be possible in all cases.

Besides the transcription of the pitch contours, speech rate was quantified as the number of syllables per second and as the number of words per second.

2.3. Results

The quantification of speech rate showed an average articulation rate of 1.9 syllables per second. Speech rate in terms of words per minute was 68.4.

The transcription of the pitch contours is presented in appendix 1. The contours that were found in the patient's speech sample are inventorised in table 3.

Table 3: Inventory of pitch contours in the patient's speech sample

Transcription	Summary description	No occurrences
1&A	Accent-lending rise (1) immediately followed by a fall (A) on the same	6

	syllable carrying sentence accent.	
10(5)A	Accent-leading rise (1) on a syllable carrying sentence accent, followed by a stretch of high declination (0) and terminating in an accent-leading fall (A) on a syllable carrying sentence stress. The final fall may be preceded by a small rise (5) to make the accent sound more prominent.	11
10B	Accent-leading rise on a syllable carrying sentence stress (1), followed by a stretch of high declination and ending in a non-prominence leading fall or a pitch reset between syntactic constituents.	35
1(E)A	Combination of an accent-leading rise on a syllable carrying sentence stress (1) and an accent-leading fall (A) on a syllable carrying sentence stress. The two pitch movements are separated by one or more half-falls (E) to realise intervening sentence accents. This gives rise to a terrace intonation contour.	2

3. Discussion

The quantification of articulation rate in terms of the number of syllables per second and speech rate in terms of words per minute indicates that the patient spoke at a very slow speech rate: articulation rate was 1.9 syllables per second and speech rate was 68.4 words per minute. For English the average articulation rate is 5.3 syllables per second and a medium speaking rate is “a little over 200 words per minute” (Laver, 1994: 158). Average articulations rates for Dutch spontaneous speech “varies between 4.8 and 5.3 syllables per second” (Blaauw, 1995). The values found for this patient are substantially below the average values that seem to be typical for normal speech. This finding is consistent with our own initial clinical impressions described earlier and confirms other other case reports in the literature. Graff-Radford (1988) reported excessive pausing at phrase boundaries and ‘unnecessary’ pausing elsewhere in utterances and Kurowsky et

al (1996) describe a FAS patient with generally slower, halting speech. Moen (1990), however, reports a perfectly normal speech tempo.

In addition to this slow speech rate, speech delivery of the patient sounded very much syllable-timed and isochronous, rather than the stress-timed nature of normal Dutch. In addition, the patient's speech sounded quite staccato. This is also consistent with the findings of Ingram et al (1992) who describes the following characteristics: "(...) a tendency towards "syllable timing", away from the normal "stress timed" pattern of English (...) A staccato speech rhythm is often reported, together with the impression of a tense articulatory setting" (Ingram et al. 1992: 458). A similar staccato rhythm is also reported in Moen (1990).

As far as the intonation contours are concerned, the patient uses four intonation contours which are the most basic ones in Dutch. The first one is the so-called pointed-hat contour 1&A. In this contour, a sentence accent is realised by means of an accent-lending rise (1) which is immediately followed by an accent-lending fall on the same syllable. This type of intonation pattern occurs 6 times in the corpus and they are associated with syllables that normally carry word stress.

Variants of this basic intonation contour in Dutch are the 1-0-A contour, in which the rising and falling pitch movements are associated with different accented syllables: the two movements are connected by a stretch of high declination. The distribution of this contour is not free: it is restricted to the two last accented syllables in utterances. The patient uses this pitch contour on 11 occasions and in all cases its occurrence conforms to the distributional restrictions: they all realise the two last sentence accents in utterances.

Another variant of the 1&A contour is one in which the first accent of an utterance is realised by a prominence-lending rise (1) and the last accent is realised by means of a prominence-lending fall (A). The intervening accents are marked by a half fall (E). This creates the impression of a terraced contour. The patient uses this contour twice in her speech and her realisations are perfectly well-formed: all the pitch movements are correctly placed on the syllables that carry word stress and can thus be assigned a sentence accent as well.

The last contour that was observed was the 1-B pattern. In this contour, a sentence accent is realised by means of a prominence-lending rise (1). Subsequently, the pitch stays high and is reset to a lower level at a syntactic boundary. This is the standard 'continuation' contour in Dutch which signals that the speaker has not finished his speaking turn yet. It is quite striking that this contour occurs rather frequently in the patient's speech: 35 pitch contours of this type were identified, i.e. 64.48 % of all pitch contours.

The frequency of occurrence of the contours in our speech sample can be compared to quantitative data for normal Dutch spontaneous and read speech (Blaauw, 1995). She found that the 1A contour occurs most frequently with an average of 32.97%. The next most frequent contour is 1B with an average of only 19.50%. 1E finally only occurred in 8.39 % of the cases. This figures clearly indicate that the 64.8 % for the 1B-contour in this patient's speech is exceptionally high, while an 11% occurrence of 1A is extremely low. The occurrence of 1E with 3.70% is somewhat lower than in Blaauw's data, but this is probably not significant.

Further analysis also shows that the 1B pitch contours are not always used to mark major syntactic breaks, but that words within a bigger syntactic unit may be realised with this pitch contour. This may suggest that the patient uses this contour actively as a device to compensate for her slow speech rate and her halting type of speech: as a result of this she may often feel to be in danger of losing her speaking turn and she may have tried to avoid this by using this continuation contour to signal prosodically that her speaking turn has not finished yet. Although this is essentially not wrong, it adds to the hesitant character of her speech output.

Finally, it should be mentioned that all the accent-lending pitch movements in the pitch contours are located correctly, i.e. on the syllables of words that normally carry word stress. No misplacements of accents were observed. In addition, the patient's pitch contours observe the general more fundamental requirement of the Dutch intonational system that a falling pitch movement always has to be preceded by a rising pitch movement. Unlike some other languages, two falls can never occur in sequences.

On the basis of this analysis, it can be argued that the production of pitch contours of this patient is entirely intact. Not only does the patient use well-formed Dutch intonation contours, but there are also indications that she completes the intended pitch contours irrespective of long pauses, hesitations and segmental articulation difficulties. On a number of occasions, the patient had to repeat a syllable a few times before finally achieving the correct pronunciation. On each of these repetitions, the correct accent-lending rise was already present and this was followed by a well-formed completion of the contour once the segmental pronunciation hurdle had been taken. As a result, there is a clear impression of continuity in sentence intonation. These observations are consistent with Kurowsky et al (1996):

Despite these long pauses, the fundamental frequency patterns of the sentences appeared to be normal. There were appropriate continuation rises at the ends of phrases within the sentence as well as appropriate terminal falling contours. The overall global prosody was appropriate across sentence types. Even in the

presence of a long delay, there was an overall continuity of the fundamental frequency contour, indicating that the speaker maintained the overall prosodic contour of the sentence and continued the pitch contour after the pause (Kurwosky et al, 1996: 19).

It can even be argued that the patient actively uses the Dutch continuation contour to compensate for her quite slow speech rate in order not to lose her speaking turn.

4. Conclusion

This paper examined the prosodic characteristics of a patient with an uncontested Foreign Accent Syndrome. It was found that the patient's speech rate was extremely slow in comparison to normal speakers and that her speech sounded syllable-timed rather than stress-timed. A detailed analysis of the patient's pitch contours revealed perfectly well-formed pitch configurations that obeyed to all the phonological specifications of normal Dutch. The only striking feature was the very frequent occurrence of the continuation contour. This was accounted for in terms of an active attempt on the part of the patient to stay in control of her speaking turn in view of her extremely low speech rate. These findings clearly indicate that disturbances at the intonational level are not a necessary characteristic of foreign accent syndrome and this rejects earlier claims of the contrary.

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Appendix: transcription of intonation contours.

In the transcription, the syllables with sentence accents have been underlined. The pitch movements have been coded according to the following conventions:

1	Rising pitch movement early in the syllable. This movement is prominence-lending.
5	Rising pitch movement preceding a prominence-lending fall to make it even more prominent.
A	Falling pitch movement late in the syllable. This movement is prominence-lending
B	Falling pitch movement between two syllables. This movement is not prominence lending. It can be regarded as a reset of the pitch to the lower declination level.
E	Half fall.
0	Lower declination pitch level.
Ø	Higher declination pitch level.

Ik heb twee weken geleden een CVA gedaan en sindsdien ben ik gedeeltelijk verlamd
 0 0 1&B 1 Ø B 0 1 B 0 00 1 Ø Ø B 0 0 1 B 0 0 0 1 Ø Ø A
 (Two weeks ago I did a CVA and since I have been partially paralysed)

Da's gebeurd ja.
 1 Ø A 0
 (That's happened yes)

Nee, ik heb niks gevoeld
 1&A Ø Ø 1 Ø A
 (No, I didn't feel anything)

Ik zat op de WC en ik voelde mij evens mij niet goed ...
 Ø1&AØ 1 Ø B Ø Ø 1 B Ø 1 B Ø Ø 2
 (I was on the toilet and all of a sudden I didn't feel well)

Maar ik had helemaal geen pijn en ik viel zo naar rechts ...

Ø Ø Ø 1 B Ø 1B Ø 1 E E E A

(But I did not feel any pain and I fell towards the right)

En dan later ben ik op de grond gevallen

Ø Ø 1 B Ø Ø Ø 1 5A Ø Ø Ø

(And later I fell on the ground)

En toen heeft mijn man mij gevonden.

Ø 1 E E E E A Ø

(And then my husband found me)

Hij heeft toen een dokter gebeld

Ø Ø Ø Ø 1 B Ø 1 B

(And then he phoned the doctor)

En die heeft dan de ziekenwagen besteld.

Ø 1B Ø Ø Ø 1&AØ Ø Ø Ø Ø

(And he phoned the ambulance)

(not transcribable) ... en den doctor nog ...

Ø Ø 1 0 0 B

(... and the doctor then ...)

enne ... die hebben mij toen (not transcribable)

Ø Ø 1B Ø Ø Ø 1 B

(and ... they have me then ...)

en dan euh ... is hebben ze mij weggevoerd en ...ook nog ... euh ... zuurstof gekregen.

Ø Ø Ø 1 1 Ø Ø Ø 1 Ø Ø Ø 1 B Ø 1 0 0 AØ

(and then euh ... is did they bring me away and ... also ... euh ... got oxegyn)

En die hebben me toen naar Herentals gebracht

Ø 1B Ø Ø Ø 1B Ø 1&AØØ Ø Ø

(And they drove me to Herentals)

En daar hebben ze dan een EKG gemaakt en een scanner

Ø 1B Ø Ø Ø Ø Ø ØØ1 0 0 B Ø Ø 1 0 B

(And there they made an ECG and a scan)

En ... en ... euh bloed genomen en dan ben ik naar de instensieve gegaan.

Ø Ø Ø 1 Ø Ø ØBØ 1&AØ Ø Ø ØØ Ø 1&A Ø Ø

(and ... and ... euh they took blood and then I was brought to the intensive care unit)

Na een drietal dagen zo

Ø Ø 1&A Ø Ø Ø

(After approximately three days)

(...) ik nog kon wat ja en nee

1BØ 1B Ø 1B Ø 1B

(I only could yes and no)

da'k een vreemd accent heb

1B Ø 1 0 0 A

(That I have a strange accent)

zo op ... op z'n Frans

Ø Ø 1 0 A

(A bit like French)

Ja ik hoor dat ook dat het ans ... anders is dan vroeger

Ø Ø 1 BØ 1 B Ø Ø 1B 1 0 0 0 A Ø

(Yes, I also hear that it is different from before)

Maar ik weet niet ... ik heb al gezegd dat ik het de het Grobbendonkse ... dialect

Ø Ø 1 0 B Ø Ø Ø Ø 1 BØ Ø Ø Ø Ø 1 0 0 0B ØØ1

(But I don't know ... I already mentioned that I ... the Grobbendonk dialect)

nog zal moeten leren leren.

0 0 0 0 0 5AØ

(will have to learn)

Ja ik ken het nog ... ik kan het nu niet zeggen nee.

Ø Ø 1 0 0B Ø Ø Ø 1 0 0 0 0 B

(Yes I still know ... I can't say it now, no)

(...) gaat bijna niet

1 0 0 A

(Almost doesn't go)

Ja-nee wij spraken euh dit di-ja-lect

Ø Ø Ø Ø Ø Ø Ø 1 0 A

(Yes, no we spoke this dialect)