SPEECH RHYTHM OF A WOMAN WITH FOREIGN ACCENT SYNDROME (FAS)

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ABSTRACT

This paper reports a case of FAS, a rare speech disorder, in a native German speaking woman who presented a Russian accent as a sequel of a left-hemisphere stroke. Acoustic analyses focussed on the patient's prosody while reading aloud, especially on the temporal structure of her utterances (speech rate and speech rhythm), in comparison to a native Russian and a German speaker. Some similarities between the patient and the native Russian speaker with respect to the organization of prosodic phrases could be detected. However, the patient's speech lacked several of the most typical features of native Russian foreign accent, and more pronounced commonalities between the Russian and the native German speaker could be observed.

Keywords: FAS-Syndrome, Russian foreign accent in German, speech rate, speech rhythm

1. CASE REPORT

A right-handed 35-year-old female German native speaker (AL) had suffered from an ischemic infarction within the area of blood supply of the left middle cerebral artery two years prior to this investigation. Formal language assessment revealed moderate Broca's aphasia, but no alexia, no speech apraxia, and no dysarthric deficits. Auditory and reading comprehension were found to be unimpaired, but mild problems in text reading aloud and minor word-finding difficulties could be noted. Neurological findings included a mild right-sided hemiparesis. To her relatives, friends, and speech therapists, AL sounded like a person speaking with a Russian accent. However, AL is a monolingual native German speaker who has been living in a German-speaking environment for her whole life. She was born and still lives in northern Saxony-Anhalt, Germany. At school, AL learned some basic Russian, but she did not speak or understand Russian even at the level of a simple conversation. AL started to recognise herself as sounding 'foreign' due to comments of family members and friends. AL suffers from her foreign accent: She described difficulties in daily communications with strangers, e.g. she dislikes shopping in the stores because she does not want to be identified as a foreigner. And she reported to experience the FAS as a loss of part of her identity.

2. FOREIGN ACCENT SYNDROME

2.1. Definition problems

FAS refers to a rare speech disorder. usually a sequel of a stroke, characterized by a foreign sounding speech production. Among others, an inability to produce normal phonetic and phonological contrasts of native accents can be observed. FAS is phenomenologically different from other speech disorders, particularly from the segmental and prosodic impairments that typically accompany Broca's aphasia, and from syndromes of aprosodia, i.e., pure prosody disorders [5].

2.2. Prosodic problems

Since Monrad-Krohn [9] suggested that the primarily responsible factor for the perceived 'foreignness' of FAS was 'dysprosody' (particularly, abnormalities in stress, melody, timing and rhythm of speech utterances), several studies have addressed the issue of changes in prosody associated with FAS. Although some authors considered segmental changes found in FAS to be of minor importance only [e.g. 6, 3, 11], other authors assumed that prosodic features are affected to a much lesser extent than segmental phonetic features [e.g. 7, 5, 8].

Due to the wide range of phonetic realisations, it is difficult to determine the characteristic

phonetic features in FAS. Nevertheless, the available studies show some similarities across different cases. Concerning speech rhythm, e.g., a tendency towards syllable-timed instead of stress-timed patterns, more equalized syllable durations and a non-reduction of unstressed vowels, an occasional misplacement of lexical stress, a reduced intensity for stress, intermittent occurrence of a long pausing time, an occurrence of epenthetic vowels giving rise to a change in syllable structure, and a more general reduction of prosodic contrasts were reported [7, 5, 3, 8].

2.3. Perception problems

So far, no precise perceptual criteria of a foreign accent have been established [7]. Some authors conclude that the identification of FAS depends upon the listener rather than the speaker [e.g. 1]. Conceivably, segmental and prosodic abnormalities, in the presence of only mild problems at the level of articulation, grammar and lexicon, give rise to the perception of a non-native accent and not simply of an impaired speech output [2, 7]. Different listeners judge the same accent as being related to different foreign languages [6]. Accents heard are those within the experience of the listeners, the real speakers of a language do not recognize this accent as theirs [1].

3. PHONETIC RUSSIAN - GERMAN CONTRASTS

Phoneticians who investigated German-learning Russians [e.g. 10, 12] assume the following prosodic abnormalities to contribute to a perceived foreign accent: smaller prosodic phrases, more phrase accents at shorter distances (in reading Russian on average every 4 syllables, in German: every 6 syllables), temporal-melodic realization of accents with great vowel prolongation (German: increase of intensity but hardly sound lengthening), melodic contrasts - legato (German: dynamic contrasts - staccato - with great contrasts between stressed and unstressed syllables). However, as a result of phonetic courses in German an exaggerated realization of German staccato character has also been found.

4. MATERIAL AND METHODS

4.1. Material

Audiotapes were made of AL's speech, in the presence of a speech therapist, while reading aloud word lists and a text in a quiet room at a local rehabilitation clinic. No recordings of the patient's speech prior to the infarct were available. The following analyses focus on a German text (fairy tale, 718 syllables), read aloud by AL, by a healthy German native speaker (GS) and by a Russian student of the German language (RS) with a characteristic foreign accent (both females).

4.2. Listener experiments

A total of 22 German native speaker-students and 4 Russian native speaker-phoneticians who had not been informed about the purpose of this study were asked to describe the characteristics of AL's reading of the text. They were not given any indication of the foreign accent.

4.3. Phonetic analyses

In addition to an impressionistic phonetic description, we concentrated on the prosodic analysis, especially on aspects of timing and rhythm. Rhythm is a key feature of prosody and German listeners have the impression of foreignness particularly by transferring of foreign rhythmic structure [e.g. 12]. In ritualized texts (like fairy tales), linguistic rhythmic structures emerge more clearly than in spontaneous speech [12]. The following temporal characteristics were analysed by two professional phoneticians: with regard to the structure of prosodic phrases (through prosodic boundaries like pauses or melodic, temporal, and dynamic contrasts), speech rate (total speaking rate in syllables per second – incl. time of pauses and articulation rate – excl. time of pauses; articulation rate variation across phrases), number and position of accents, speech rhythm (as perceived regularity of prominent units of speech, e.g. a regular alteration of stressed and unstressed syllables).

5. RESULTS

5.1. Listener experiments

The evaluation of AL’s speech elicited a strong irritation among both the German and Russian listeners: After hearing the first three sentences, 14 of the 22 students estimated the patient's speech as

foreign sounding (but only 8 characterized it as Russian). However, the impression of a Russian accent diminished with closer auditory analysis. After hearing the full text, only 5 students agreed that there is a foreign sounding accent. The others suspected speech or reading disorders or mental problems. As expected, 2 of the 4 Russian phoneticians did not identify the speaker as a Russian native speaker. Surprisingly, however, the other two Russian phoneticians considered it as possible because of the exaggerated realization of some features of German phonetics like staccato-rhythm (as specially learned in phonetic courses).

5.2. Impressionistic prosodic analysis

Auditory-perceptual phonetic evaluation revealed atypical phrase structuring, rhythmic timing and sentence stress, a mild dysfluency, strong monotony, very slowly speech rate, inappropriate inter- and intraword pauses, mild inconsistency in articulation, mild struggle with word initials and self corrections.

5.3. Detailed analysis of temporal structure

5.3.1. Structuring of prosodic phrases

Table 1: total text (718 syllables)

	AL	RS	GS
syllables ∑	760	725	712
prosodic phrases ∑	179	109	77
syllables per phrase x̄	4.30	6.84	9.30
speaking rate (incl. pauses) [slb/s] x̄	1.88	3.56	3.01

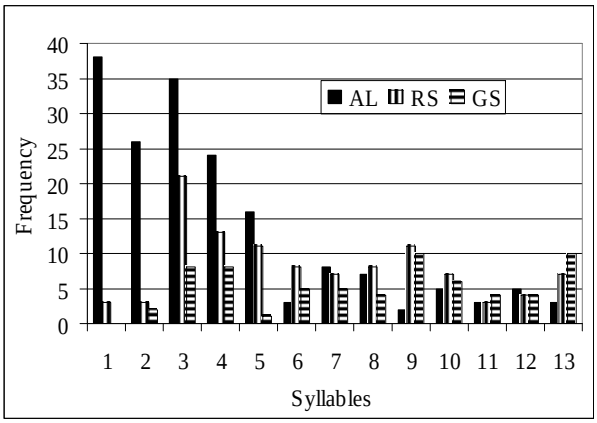
AL added to the text 42 syllables because of false starts, word repetitions, slips of the tongue – accompanied by hesitation pauses. Probably, these abnormalities elicited the impression of dysfluency.

AL structured the text much more (179 prosodic phrases; mean length 4.30 slb) than RS and GS ($p<0.001$). As shown in Figure 1, most prosodic phrases of AL encompassed 1 to 5 syllables (for comparison: RS 3 to 10 slb, GS 3 to 13 slb). GS often varied between long and short prosodic phrases (RS too but not so often), and AL nearly not. Probably, the impression of monotony of AL's speech reflected these rare shifts in prosodic phrases' length.

The lengths of the prosodic phrases of AL and RS were more similar (in the 3 to 5 syllabic phrases) than those of RS and GS.

However, prosodic phrases of AL were more 1- and 2-syllabic than these of RS.

Figure 1: Length of phrases (total text, 1 to 13 syllables)



Corresponding to phonetic literature [12] RS structured the total text more than GS ($p<0.001$), though AL structured much more than RS ($p<0.001$).

5.3.2. Speech rate

Speaking rate measurements (incl. pauses; s. Table 1) revealed that AL produced the text more slowely (1.88 slb/s) than RS and GS, caused particularly but not only by many and long pauses.

For a selected part of the text (90 slb) we measured the articulation rate of the three speakers (excl. pauses; s. Table 2) and its variation across prosodic phrases. Both measures showed some features of abnormality in AL's reading: While GS and RS were similar, AL's mean articulation rate was slower (2.96 slb/s), and her mean articulation rate variation was the smallest (3.18 slb/s).

Table 2: selected part of text (90 slb)

	AL	RS	GS
articul. rate (excl. pauses) [slb/s] x̄	2.96	4.99	5.71
articul. rate - variation [slb/s] x̄	3.18	5.41	6.20
accents ∑	42	23	23
distance of accents [slb] x̄	2.19	3.87	4.00

This may cause the listeners' impression of temporal monotony. Monotony, this may reflect the problems which AL has with articulation (s. 5.2.1.), and accurate lexical stress. She often produced stressed syllables as unstressed syllables. That has consequences for the timing of her speech. Thus AL's problems in articulation of unstressed syllables (no reduction) interfere with

her rhythmic production. This has been found to be an effect of schwa insertion.

5.3.3. Accents and rhythm

As displayed in Table 2, there was a common tendency in accents' distance of AL and RS. But the distance between AL and RS was enlarged as compared to RS and GS: AL accentuated very often, twice as much (42; every 2.19 slb), while RS and GS were close together. Obviously, GS and RS structured the text reading more intentionally, whereas AL's speech units came above from her articulation problems. Her reading aloud did not correspond with the expected rhythmic structure for German fairy tales: typical sequences of 6-7 (+/-2) syllables with a clear final tendency of phrase accent's position (cf. [12]). Instead, AL's prosodic phrases were much shorter, and there was a strong tendency towards a metrical rhythm with a regular alternation 'stressed and unstressed syllable', irrespectively of the phrases' length. This tendency is illustrated by the rhythmic pattern in a short text part of 55 syllables (cf. Table 4 and attached listening examples). AL realized this part with 58 syllables in 14 phrases (RS 5, GS 3 phrases). Such metrical patterns were not found in the readings of RS and GS.

Table 4: Rhythmic patterns of AL (text part of 55 slb)

AL: 14 phrases	acc. pattern	art. rate [slb/s]
Die Türen	x **X** x	3.19
der Geschir-	**X** x **X**	2.28
der	**X**	3.85
Geschäfte	x **X** x	3.51
sprangen auf:	**X** x **X**	2.53
Zuerst kamen	x **X** **X** x	3.24
die	**X**	3.05
Kakao-	x **X**	2.68
-päckchen,	**X** x	2.55
die Schokoladen	x x x **X** x	4.56
und *die* Pralinen	**X** x x **X** x	3.27
in	**X**	1.79
ihren	**X** x	2.79
Weihnachtsverkleidungen.	**X** x x **X** x x	2.81

6. DISCUSSION AND CONCLUSION

The analyses show that AL had a clear problem with rhythmic speech production. The speech rhythm of AL did not reflect the typical structure of German, and it was not a characteristic Russian rhythmic pattern. It is too early to explain why German native speakers had the impression that AL did not know the German language or pronunciation very well and sounded Russian. We consider that this impression resulted from both segmental and prosodic errors. But it is necessary to investigate the principles of perception of the foreignness in a more sophisticated way and to analyze the relations between prosodic and segmental characteristics, since rhythmic disturbances can be caused by segmental changes or can lead to segmental changes (e.g. in vowel duration).

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