

FOREIGN ACCENT SYNDROME: AN ITALIAN CASE STUDY.

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0. Studies of patients affected by Foreign Accent Syndrome are few and not well documented, often anecdotal. Many of the possible cases have been eliminated, since their clinical deficit is explicable in other terms [for overview cf.3: for first systematic studies see 4]. Here we report an Italian case meriting in-depth study, where the patient developed a supposedly strong "English" accent following head trauma: her performance has been studied acoustically against a normal Italian control case and a native English speaker.

1. *Clinical case study.* MCF, a right-handed woman, Ph.D. in geology, at 28 years of age had a climbing accident with severe head trauma. A CT scan showed presence of a left-frontal contusion. Three months later she was assessed neuropsychologically: initially completely aphonic, then dysphonic/dysprosodic, with a tendency to use ingressive airflow in speech, she had a supposedly foreign accent labelled "English" by most. She was neither aphasic nor apraxic and her general neurological exam showed minimal right hemiparesis. Because of the persistent "foreign" accent she was re-assessed a year later. An MR was performed showing bilateral hypodensity of the frontal white matter.

2. 0 *General linguistic correlates.* The following parameters were used: A. prosody (concept / realization of F₀ declination); B. vowel quality / length; C. consonant length (Italian fatto vs. fato, palla vs. pala); D. consonant with vowel / sonant coarticulation; E. abnormal consonant / sonant realizations (not length or VOT); F. reductions of syllable structure; G. vowel bleaching vs. non-bleaching; H. VOT.

2.1 *Evaluation methods.* The patient's speech production was first analyzed (a. reading tests: Little Red Riding Hood; b. spontaneous résumé of the same; c. natural conversation; d. word lists) and then compared with her female cousin's identical production (only a + b), lastly

with similar tests done with a native female speaker of English with no knowledge of Italian (trained to reproduce the same text: only level a). Our report deals only with the level a tests. Vowel parameters, except for F₀, were measured with a Kay 5500 and ONO SOKKI 930, F₀ with appropriate software (Signalize by E.Keller). Statistics were elaborated with conventional software (Phonetics Lab. Univ. Calabria).

3.0 *Analysis.* First hypothesis advanced [5] was that FAS mainly involved significant F₀ alterations and NOT other parameters mentioned (B-G). Later research pinpointed the equally meaningful role played by segmental phenomena vs. prosody or combinations of both [10;4;3]. All the phenomena evinced [5] are typical of SOME natural language unlike those in aphasia and other pathologies, the probable reason why medical researchers have labelled it with its current name (FAS). We have so far investigated all parameters given in the a test: VOT alteration (G), bleaching (F) and some aspects of (D,E) will not be reported on here. Our results thus concern: A, B, C, D (only stop-sonant sequences [pr, br, tr, dr, gr]), E (only stop lenition and strengthening, aspiration and glottalization of stops / continuants, continuant affrication), F (vowel / syllable reduction). Though many phenomena present in the patient's speech occur in SOME natural languages, their sum does not characterize any SINGLE one. Some are conflicting (stop lenition vs. strengthening). Sometimes in the same utterance we find phenomena typical of both stress-timed and syllable-timed languages (most Italian varieties are syllable-timed).

3.1 *Results.* Prosodic analysis used 4 complex sentences: "Vado a trovare la mia nonna e le porto una focaccia e un vasetto di burro, preparati per lei dalla mamma" / "Il lupo non ci mise molto ad arrivare alla casa della nonna" / "Cappuccetto rosso tirò il chiavistello e la

porta si aprì" / "Il lupo tirò il chiavistello e la porta si aprì", comparing F₀ contours for the patient, her cousin and the English speaker. First impressions do not favour an absence of intonation contour hypothesis in the patient's case. A declination line is observable in the last 3 cases and a clear fall-rise pattern strategy corresponds to major syntactic breaks (patient + cousin). In the first the patient has a series of F₀ peaks which do not tie in with any syntactic foci. After a false start (F₀ = 262 Hz) a new peak is begun and followed by 4 peaks higher or as high as the initial one [Pi = 280 Hz trovarE, 275 Hz portO, 290 Hz focacciaA, 280 Hz burrO, 278 Hz lel]. All fall on unstressed vowels, contrary to expectations and are examples of overshooting, as in sentence 2 Pi = 320 Hz lupO, sentence 4 Pi = 280 Hz. lupO. Sentence 1 is anomalous resetting due to sentence length / complexity, while 3 sentences out of 4 show obvious overshooting: four cases are noted in sentence 1 (cf. figs.1, 2 in that order: sentence 1 for patient + cousin). Since the literature claims overshooting to be due to imperfect synchronizing of laryngeal muscular tension and subglottal pressure, there are obvious neurophysiological problems to be looked into. Furthermore, in the patient's case there is no biunique correspondence between amplitude peaks and stressed vowels, as would, instead, be expected in Italian, where stress correlates not only with segment length but also with intensity and pitch [2; for different combinations in different regional varieties cf. 7]. The cousin presents increased intensity and amplitude corresponding to vowels that carry dynamic sentence stress.

The patient and her cousin differ little in the length of vowels with dynamic stress: CLOSED SYLLABLE Patient \bar{x} = 86 ms (N=77, σ =17), Cousin \bar{x} = 88 ms (N=49, σ =13); OPEN SYLLABLE Patient \bar{x} = 132 ms (N=56, σ =27), Cousin \bar{x} = 144 ms (N=34, σ =22). Using a two-tailed t-test we find length differences significant at the 98% level in open but not in closed syllables. The patient, nonetheless, observes the general trend, her behaviour matches that of numerous normal speakers tested for

Italian syllable-timing. Vowel realizations, however, are meaningfully different. The cousin's 7 vowel areas have been plotted in terms of F1- F2 (areas correspond better to Tuscan use of acoustic space than that of Veneto and Campania speakers, cf. relevant areas in 9). The patient's values superimposed (see fig.3 with cousin's vowel areas and patient's values superimposed) show serious overlaps between /i/ and /e/, /e/ and /a/, /o/ and /ɔ/. Dispersion in terms of

σ values is extremely high: 'maximal perceptual contrast' and 'maximal dispersion in vowel space' are here meaningless concepts. High-Low or Back-Front dimensions are not exploited for maximal contrast: we even have minor overlaps between /i/ and /u/, major ones for /e/ and /a/. F1-F2 target space is insufficiently mastered; perhaps there is a neurological problem to be investigated. The problem seems both phonological (programming vowel contrasts) and phonetic (controlling articulatory movements). Though consonant length is phonological, most Northerners variably shorten [social determinants]. Large Veneto populations show shortening: Males \bar{x} = 46.07% (pop.N=93, σ =15),

Females \bar{x} = 35.3% (pop.N=27, σ =14); compare with Patient's 21.43% (non-sonorants 24 /112), Cousin's 31.75% (id. 40 /126). We have calculated shortening with merger when duration of a long consonant is < 100 ms, since long consonants have length variation with range 105-200 ms, short consonants 60-95 ms. The cousin enters into known variability ranges, the patient is significantly more accurate, an accuracy linked with the excessive number of pauses she makes: tendentially her story style = word-list style. The cousin has no problems with [pr,br,tr,dr,gr] stop + sonant groups. Loose Romance coarticulation seems to present a problem for our patient, who sometimes substitutes with close coarticulation of the Germanic type: in the case of [pr] we have instances of vowel insertion [pʁ̥i], [pʁ̥r] or r-simplification [pw] (4/13), [br] shows approximant assimilation as [bu] (2/2), [tr] close Germanic coarticulation [tʰr̥] (1/9), as does [dr] > [tʰr̥] (1/3), the [gr] cluster simplification as [ʔr], [ʎ] (4/6).

Many such problems are being investigated.

Here we only list consonant realizations different from usual Italian ones and which characterize the patient but not her cousin. For usual Northern intervocalic / / intersyllabic lenition of the type /b/ > [β], /d/ > [ð, δ], /g/ > [ɣ, ɰ] we have North-Eastern female pop. (pop. N=27) /b/ \bar{x} = 10% (σ =7), /d/ \bar{x} = 29% (σ =13), /g/ \bar{x} = 43% (σ =21); our patient has /b/=11%, /d/=5%, /g/=29%, her cousin /b/=47%, /d/= 13%, /g/= 18%. In the case of the most frequent voiced stop /d/ our patient is the most accurate female speaker. Cases of non- intervocalic anomalous lenition and strengthening in the patient's speech also noted were: Case 1 /p/ > [p̥, f] 7 / 94=7%, /t/ > [θ] 7 / 94 =7%, /k/ > [h, x] 7 / 111=6%, μ = 7%; Case 2 /p/ > [p̥] 3 / 94= 3%, /t/ > [d] 4 / 94= 4%, /k/ > [g] 3 / 111=3%, μ =3%; Case 3 /b/ > [β], [p] 9 / 31= 29%, /d/ > [d̥], [t] 21 / 86 = 24%, /g/ > [g̥], [k] 3 / 14 = 21%, μ =25%. Cases 1-2 have percentages not significantly different from 0% at the 99% confidence level, while the same intervall for Case 3 ($x \pm 2.57 \sigma$) is significantly so (min. 15%, max. 35%). This and other problems connected with voicing and VOT in the production of voiced segments tend to represent an overall "Germanic" effect for Romance speakers. Other problems regard the glottalization of /k, g/ as [ʔ], laryngealization of words or entire phrases ("un tantino la voce", "nella foresta", "spaventata"), aspirating fricatives /f, s/, preconsonantal loss of white noise components in /s/ > [θ], [h], word-initial voicing or affrication of /s/, i.e. "sotto" [tsɔ:tɔ], "Sissignore" [zizi'noɾe], /r/ produced as a large variety of approximants or even fricative [ʒ], /l/ realized as [d], [ð], [δ], [l], [ʎ], though the more complex /ʎ/ is always [ʎ].

Vowel / syllable erosion occurs as if Italian were stress- timed, e.g. p(a)reva, v(e)stita, ch(e) (a)veva (a)ppena, (a)bbraacciarti, (a)bitava, p(e)ric(o)loso, repeated examples of f(o)caccia. Post-stress cancellation is rarer but present

(sure cases are sub(i)to, stav(a)no). There are cases of badly executed consonant clusters with apparently cancelled segments and occasional stress shifts which drastically modify stress patterns in phrases ("si mise a correre" > "si mise a correre", "la piccina seguiva l'altra" > "la piccina seguiva l'altra").

There is still a major problem to be investigated: the patient's use of pauses as compared with that of normal speakers (cousin). This has to be reconsidered from the viewpoint of intonation contours. At the moment it suffices to say that the patient presents ca. 50% more pauses in the same text than her cousin (78 vs. 53): such pauses are, on average, considerably longer (average 598 ms vs. 449 ms for her cousin) and in some cases they even break up MINOR syntactic constituents.

4. *First conclusions.* From the point of view of her basic units the patient does not seem to have lost elements of her linguistic SYSTEM, her intonation contours seem to correspond to major syntactic constituents dealt with by usual strategies, though in CERTAIN respects she is more accurate than normal speakers. In other words, her native competence is not impaired: the English speaker, instead, shows NO competence of Italian prosodic strategies, with both UNNATURAL prosodic and syntactic breaks. The patient seems to be segmenting in terms of very small units at all levels of her linguistic organization, with a resulting overaccuracy in a number of phenomena (lenition, close coarticulation of certain segments in clusters: some general anti-Romance trends), while widely missing her targets in other cases. From this latter point of view she presents serious production disturbances: too frequent pauses, inability to exercise a consistent control of physical parameters over long periods or wherever there is linguistic complexity. She has obvious respiration and timing problems; variations in subglottal pressure during performance ought also to be measured, since this may be related to F0 alteration, overshooting and resetting.

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