ACOUSTIC-PERCEPTUAL CREDIBILITY CORRELATES OF NEWS READING BY NATIVE AND CHINESE SPEAKERS OF ITALIAN

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ABSTRACT

This study addresses the relationship between foreign accent and credibility. Three hundred native Italian listeners, after hearing a set of 12 news uttered in Italian by two native speakers of Italian and two native speakers of Chinese, were asked to assess the truthfulness of each news item. There was no evidence of a correlation between degree of accent and credibility, while results revealed the relevance of other factors such as tonal range and duration of silent pauses. Results of spectro-acoustic analysis were experimentally verified through perceptual tests conducted on artificially modified speech administered to 120 native Italian listeners.

These findings may have implications for the selection of speech modalities in order to improve credibility of news delivered to native listeners by either native or non-native speakers.

Keywords: foreign accent, prosody, speech perception, credibility

1. INTRODUCTION

According to Lev-Ari and Keysar [4], foreign accent makes non-native speakers less truthful to listeners, not just because of prejudice towards foreigners [2, 5, 10], but rather because of the characteristics of the voice signal, that would cause difficulty in processing. This assumption, based on the socio-psychological concept of "processing fluency", a feeling of ease associated with a cognitive operation, that may affect the way stimuli are judged [7, 9], takes for granted the acoustic-perceptual characteristics of non-native speech signal as acoustically harder to process. The authors demonstrate that heavy accented speech is harder to believe, basing their observation on a corpus of trivia statements read by various non-native speakers of American-English, without paying close attention to the influence on the foreign accent of the different mother languages and the different level of L2 competence of the subjects involved in the research.

Since the topic is socially very relevant, we decided to conduct a study employing a rigorous methodology for evaluating and assessing the acoustic credibility correlates - segmental and/or suprasegmental - in perception of native and non-native speech [1, 3, 6, 11].

This paper reports on two experiments, using natural speech (Experiment 1) and modified natural speech (Experiment 2) based on the same corpus of 12 news read by two native speakers of Italian and two native speakers of Chinese. Listening tests were administered to groups of Italian subjects.

2. EXPERIMENT 1

2.1. Participants

Participants were 4 speakers, both male and female, two native speakers (NSs) of Italian and two NSs of Chinese, and 300 native Italian listeners. Native Italian speakers and listeners, with an age range 19-21 years, were university students living in Southern Italy; the two Chinese, mean age 25 years, were advanced learners of L2 Italian (C1 level of CEFR), and differed in length of stay in Italy (6 vs. 3 years). Non-native speakers (NNSs) were chosen on the basis of a global foreign accentness rating test, administered to 70 male and female native Italian listeners, all from Southern Italy, who ranged in age between 18 and 60 years. Listeners evaluated the degree of foreign accentness they perceived in read speech samples using a 4-point rating scale (0 = native speaker; 3 = very strong foreign accent) [8]. The results allowed to select, among six Chinese advanced learners of Italian, one speaker with a strong foreign accent, female voice, and one with a mild foreign accent, male voice.

2.2. Materials and methods

Twelve bizarre-but-true news from around the world read in Italian by the two native Italian and the two Chinese speakers were presented to four groups of listeners in form of radio news magazines, each combining the four voices reading different news, same news sequences but random voice order, pretending to administer a survey on media reliability, in order to avoid to focus the attention on foreign voices. All audio recordings were made in the University WebRadio recording studios. The test was administered to 300 native Italian listeners (4 homogenous groups), who were requested to indicate on a form if each news item was true or not.

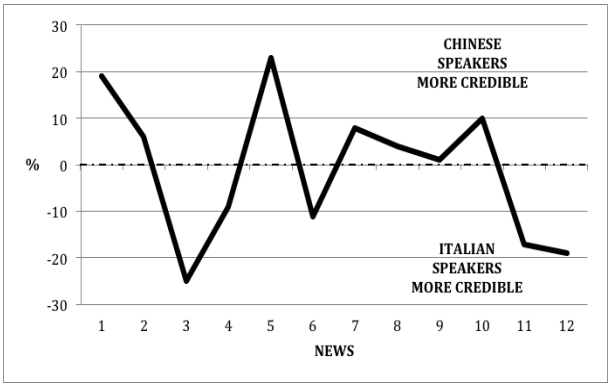
2.3. Data analysis

Table 1 shows percentage of speaker's credibility on the total number of news. Credibility levels are overall not high in this study (mean value 54% false vs. 46% true), and it is evident that there is no foreign accent effect for a target audience of native listeners also comparing credibility results of the two NSs with the two NNSs on each news item (Fig. 1).

Table 1: Percentage of credibility for speaker on total news (IT = native Italian, CH = native Chinese, m = male, f = female).

Speaker	IT_m	IT_f	CH_m	CH_f
TRUE	44	48	43	46
FALSE	56	52	56	53

Figure 1: Differences of credibility between Chinese and Italian speakers (percentage values) on single news.



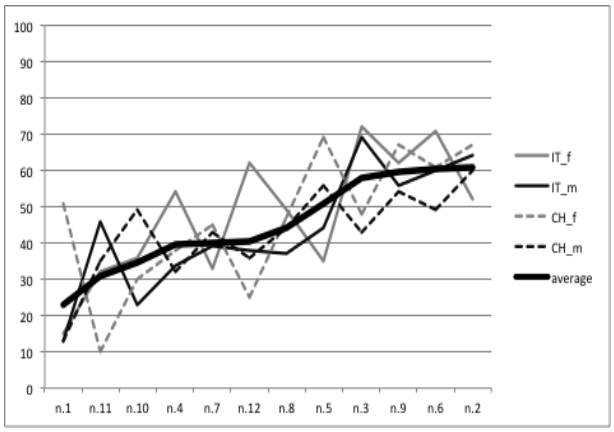
Each single piece of news has its own degree of credibility, probably depending on the textual content of the message. As a consequence the same listeners rated some news items as very low on credibility scale (e.g. news n. 1, 10, 11) and other items as more credible (e.g. news n. 6, 2) (Table 2).

Table 2: Percentage of credibility for single piece of news.

news	credibility
1	23
2	60,75
3	58
4	39,5
5	51
6	60,25
7	40
8	44,25
9	59,75
10	34,5
11	30,75
12	40,25

Nevertheless, results show that, within the same text, ratings are significantly different (up to ± 37%) depending on the speaker (Fig. 2).

Figure 2: Percentage value of speakers'credibility on single news.



Since NSs and NNSs achieved both high and low scores on the test, whereas phonological inventories and communication situation (i.e. formally, hyperarticulated, read speech) were unmodified, we excluded segmental level impact on utterance credibility.

Speech analysis was conducted on rhythmic-prosodic features using Wave Surfer software [12]. First, we measured speech chains duration, number of syllables per speech chain, silent pauses duration, disfluencies duration (vocalization, nasalization, corrections, etc.), maximum and minimum f_0 per speech chain. Next, values were calculated for articulation rate (syl/s), speech rate (syl/s), fluency (syl/number of speech chains), mean duration of silences (s), percentage of silence, tonal range (in semitones).

Articulation rate (AR) and speech rate (SR) variations do not justify differences in credibility, as they are basically stable, with obviously higher average values for native Italian (AR 6.7; SR 6)

compared to Chinese speakers (AR 5.3; SR 4.7). Data derived from analysis of tonal range, and duration of silences appear to be more significant. A comparison of different news delivered by the same speaker with different rhythmic-prosodic features shows that credibility increases when the speaker restricts the tonal range, avoiding marked tonal peaks, and increases the duration of silent pauses (Table 3).

Table 3: Percentage of credibility for same speaker on different news (↑higher credibility – ↓lower credibility).

CH_f		
	↑ News 1	↓ News 11
mean duration of silent pauses	0.530	0.376
tonal range	8.4	18.8
IT_m		
	↑ News 11	↓ News 10
mean duration of silent pauses	0.334	0.115
tonal range	9.65	18.16

Data of different speakers uttering the same news either with different rhythmic-prosodic features or with similar ones confirm a strong connection between credibility and low tonal range (Tab. 4, news 5), while long silent pauses seem to play a minor role (Tab. 4, news 6).

Table 4: Percentage of credibility for same news delivered by different speakers (↑higher credibility – ↓lower credibility, →same credibility).

NEWS 5		
	↑ CH_f	↓ IT_f
mean duration of silent pauses	0.302	0.185
tonal range	9.8	12.2
NEWS 6		
	→ CH_f	→ IT_m
mean duration of pauses	0.258	0.407
tonal range	7.5	7.6

3. EXPERIMENT 2

3.1. Materials and methods

In order to validate the data obtained in the first experiment we carried out a second perceptual test based on modified natural speech. Tonal range and silent pauses were artificially increased and decreased of about 50% and 70%, respectively through a new version of WinPitch software [13], with a set of functions that allow for automatic morphing of fundamental frequency curves and rhythmic patterns. We applied these modifications to the 8 news that in the previous test obtained maximum and minimum credibility values.

Modified items of news were used to create two radio news magazines, administered to 120 native Italian listeners (2 homogenous groups), university students, mean age 20, who had to indicate on a form if the heard news was true or not.

3.2. Data analysis

Results of the perceptive tests confirm that wider tonal range and shorter silent pauses correlate with lower credibility values, while restricted tonal range and longer silences increase listeners' trust (Table 5).

Table 5: Percentage values of credibility of original and modified speech: (a) tonal range, (b) silent pauses, (c) both.

News/ Speaker	ORIGINAL	DECREASED	INCREASED
(a) TONAL RANGE			
1/CH_f	51%		45%
3/CH_m	43%	56%	
5/IT_f	35%	58%	
6/IT_m	60%		41%
10/IT_m	23%	44%	
11/CH_f	10%	32%	
(b) SILENT PAUSES			
1/CH_f	51%	42%	
2/IT_f	52%		57%
3/CH_m	43%		58%
5/IT-f	35%		38%
6/IT_m	60%	50%	
11/CH_f	10%		17%
(c) TONAL RANGE DECREASED & SILENT PAUSES INCREASED			
News/ Speaker	ORIGINAL	MODIFIED	
8/IT_m	37%	57%	

4. CONCLUSIONS

The findings of this study reveal that there is no correlation between foreign accent and credibility, while suprasegmental features of the utterance are strictly linked to credibility rate. In particular, there is evidence that a reduced tonal range and longer silent pauses determine a significant increase of listener trust.

These results may have implications in media communication for the selection of speech modalities. In order to give a higher standard of

credibility to the news delivered to native Italian listeners by either native or non-native speakers, further research is needed involving also speakers of mother languages other than Chinese.

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