LUND UNIVERSITY

Impersonation: a phonetic case study of the imitation of a voice

Zetterholm, Elisabeth

1997

Link to publication

Citation for published version (APA):
Zetterholm, E. (1997). *Impersonation: a phonetic case study of the imitation of a voice*. (Working Papers, Lund University, Dept. of Linguistics; Vol. 46). http://www.ling.lu.se/disseminations/pdf/46/Zetterholm.pdf

Total number of authors:
1

General rights
Unless other specific re-use rights are stated the following general rights apply:
Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.
• Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
• You may not further distribute the material or use it for any profit-making activity or commercial gain
• You may freely distribute the URL identifying the publication in the public portal

Read more about Creative commons licenses: https://creativecommons.org/licenses/

Take down policy
If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

LUND UNIVERSITY

PO Box 117
221 00 Lund
+46 46-222 00 00

Lund University, Dept. of Linguistics
Working Papers 46 (1997), 269–287

Impersonation: a phonetic case study of the imitation of a voice

Elisabeth Zetterholm

1. Introduction

In language acquisition it is important to imitate the native speakers of the language. For the young child it is natural to imitate both the language and the behaviour of the culture. Imitation, or adaptation (Markham 1997), is also useful in second language acquisition to learn how to pronounce the words and to learn the prosody of the language. For most people it is difficult to learn to speak a second language in a native-like way after puberty (Larsen-Freeman & Long 1991). The normal young child does not fail in its acquisition and some people seem to have that ability even after puberty. Imitation can also be used for entertainment. Following Markham 1997, I call this type of imitation, when a speaker reproduces another speaker's voice and speech characteristics, impersonation. For the impersonator it is necessary to be aware of the target speaker's speech behaviour and characteristic features.

Some experiments have been done with animals, birds, and monkeys, in trying to teach these animals a human language by imitating (Klatt & Stefanski 1974; Linell 1978). These experiments have not been completely successful, probably depending on the anatomy of the vocal tract of the animals and since the human brain is much more complex. However Klatt & Stefanski have done some analysis with an Indian mynah bird. They observe that the imitation made by the bird was quite good in the speechlike utterances as evidenced by the acoustic analysis.

2. The present study

This paper present a phonetic case study of impersonation, focusing on the imitation of the voice and the speech behaviour. Only *one* impersonator and how he works with *one* of his impersonations has been studied. The study is restricted to phonetic aspects and ignores other aspects such as non-verbal, extra-linguistic features, e.g. body language. The aim of the study is to

ascertain what particular aspects of the impersonator's voice and speech behaviour are being manipulated during an act of impersonation. Is it, for instance, important to be close to the voice quality of the target speaker? Is it possible to hear the impersonator's own voice? Is the impersonation really close to the original voice acoustically or does the impersonator trick his audience when he exaggerates the target speaker's speech behaviour? Is it enough to imitate a few typical qualities and neglect others to succeed with the impersonation? If so, it might be said that although 'bull's-eyes' are necessary for a successful impersonation some 'undershoots' and some 'overshoots' can exist.

For this analysis, the impersonator Göran Gabrielsson made recordings of speeches by three well-known persons. Recordings of the original voices were taken from public appearances, and Gabrielsson recorded the same speech material twice, with his own voice, and as an impersonation. These recordings were made in Gabrielsson's own studio.

In this paper the analysis is limited to the recording of Carl Bildt, a well-known politician. This impersonation was the best one and requires a very critical listening to detect the impersonation, depending on speech style, the voice and speech behaviour changes. Two recordings of Carl Bildt were used for the analysis, an interview and a political speech. The texts were chosen by Gabrielsson. Each recording lasts about 30 seconds.

Usually, when the impersonator works with his impersonations he does not always use exactly the same words as the target speaker. His imitation resembles a caricature of the target speaker's voice and speech behaviour. But for this analysis, to compare the three recordings, it was important to use exactly the same words and not just the same topic as the target speaker.

These recordings have been analysed using both an auditory and an acoustic analysis. In the auditory analysis I have described the phonetic differences between the three recordings. Using the SoundScope program I made an acoustic analysis in which I studied selected aspects of F_0, duration and sound spectrum in the three different recordings and compared them to each other. Those things which I found to be distinctive in the auditory analysis were followed up in the acoustic analysis.

There are obvious differences in the two speakers' voices and speech. Gabrielsson and Bildt have different dialects. The original (Bildt) uses a dialect from the southwest of Sweden, but he now lives in Stockholm and his dialect is affected by the dialect of the latter area. The impersonator lives in

Norrköping and represents a more central Swedish dialect. He is a professional impersonator.

2.1 The Swedish texts

’The interview’

> Dom vill vara med i den Europeiska Unionen. Därför att dom vet att där kan dom få hjälpen att lösa miljöproblemen. Och i och med att dom får hjälpen där, ja, då blir ju vår miljö också bättre. Och därför tycker jag det är så underligt att miljöpartiet, eller kanske det inte är underligt, men det är värt att konstatera i alla fall, att där vill miljöpartiet bromsa deras möjligheter att komma med, och därmed bromsa de möjligheterna att lösa ett av dom allra allvarligaste miljöproblemen vi har i Europa överhuvudtaget. Det är illa och det är fel.

’The political speech’

> Det allra främsta politiska hotet mot att nu rejält få fart på ekonomin under kommande år, få fram dom nya jobben, och bryta arbetslösheten, ligger, faktiskt i den felaktiga politik som socialdemokraterna företräder. Och det är värt att notera och det är värt att dra slutsatser av att räntorna går upp och börsen går ner så fort som det finns tecken på att regeringens möjligheter, att i denna kammare, få gehör för sin politik försvagas.

3. Results

3.1 Auditory analysis

Prosody. Carl Bildt’s speech behaviour is different in the two recordings. In the interview he sounds relaxed but he has a very special speech rhythm. In the political speech he speaks louder, the pitch is higher and many words are focused. The impersonation is very close to the target speaker’s prosody, both with regard to the speech rhythm and the stressed words. In the recordings of Gabrielsson’s own voice one gets the impression that he is influenced by the prosody of the original material.

Rhythm. One of Bildt’s characteristic features is his prosody, his speech rhythm, and his acceleration on focal words. He speaks at a lower tempo before the focal word and then he accelerates considerably. He varies the tempo often, even in shorter speech sequences. There is more variation in the interview than in the political speech.

In the political speech, Bildt stresses many words by making a short pause before the most important word and then accentuating the word. Gabrielsson succeeds with this in his impersonation, both in the interview and in the political speech, and it is possible to find the same behaviour in the recordings with his own voice.

Voice quality. To succeed with the impersonation it seems to be important to imitate the voice quality. In the auditory analysis Bildt's voice seems to be thinner and not as sonorous as Gabrielsson's own voice. The average pitch level is higher for Bildt except at the end of a phrase, when his voice is creaky.

There are some differences in the voice quality between the two recordings of Bildt. In the political speech his voice sounds tenser and louder than in the interview. The same differences can be found in Gabrielsson's impersonation, but not in the recordings with Gabrielsson's own voice.

Gabrielsson is very close to the voice quality of Bildt. Sometimes it is possible to hear the impersonator's own voice in the interview, but in the political speech it sounds more similar to the target speaker. Of course the impersonator tries to trick the listeners when he exaggerates some characteristic features, but he really does change his articulatory settings, the supralaryngeal settings as well as the phonatory settings (Honikman 1964; Laver 1980). The imitation of the prosody is so good that the undershoots in the voice quality seem unimportant for the audience.

Pitch level. In the auditory analysis it is obvious that Bildt has a higher pitch level than Gabrielsson, especially in the political speech. Gabrielsson changes his own voice to get a higher pitch in the impersonations.

Dialect. The two dialects, which Bildt and Gabrielsson represent, are quite different; especially the different allophones of /r/ and the vowels. Bildt's dialect is influenced by the dialect in central Sweden where he lives. He does not speak with the intonation which is typical for the dialects of the southwest of Sweden. Gabrielsson and Bildt both speak with intonation which represents the dialects in central Sweden (see Bruce & Gårding 1978 for the prosody of Swedish dialects).

The /r/ segments. In the dialect of central Sweden, /r/ is an alveolar trill and in the dialect of southwestern Sweden, where Bildt comes from, /r/ is a uvular trill or fricative (Bruce & Gårding 1978, Elert 1991, Sjöstedt 1936). In this dialect, /r/ may be vocalised when it occurs before another consonant or is in word-final position (Sjöstedt 1936). In words ending in *-er*, like *ligger*, *tycker* and in words like *börs* the /r/ becomes vocalised.

The vocalisation of /r/ is clear in the recordings of Bildt and the impersonation, but sometimes the /r/ is not realised at all. In words like *bättre* and *kammare* there are some differences in the recordings. In the

impersonation, the last vowel is shortened and the /r/ is vocalized. Gabrielsson pronounces all the syllables and Bildt shortens the last syllable in *bättre*, but pronounces the whole word in *kammare*. The vocalisation of /r/ is somewhat exaggerated, but makes the impersonation clearer.

The uvular trilled /r/ is clear on focal words particulary before a stressed vowel in both the recording of Bildt and in the impersonation. The uvular [ʀ] is one of the most important characteristic features of the target speaker. This is also important for a successful impersonation. The impersonator exaggerates the [ʀ] in words like *bromsa* and *allra*.

Vowel quality. Bildt and Gabrielsson do not pronounce the vowels in the same way. The vowels [ɛ] and [ø] in expressions like *komma med* and *lösa* are more open in Gabrielsson's pronunciation than in Bildt's. The vowels are shortened both in the recordings of Bildt and the impersonation, for example, in words like *värt* and *fort* the vowels are short and not as open as they often are.

3.2 Acoustic analysis

Voice quality. In the auditory analysis it is clear that Gabrielsson changes his own voice quality in order to imitate Bildt. I expected to find some differences in the acoustic analysis, in the spectral slope for instance, but the differences were insignificant, as was also the case for jitter and shimmer.

Pauses. The pauses are longer in Bildt's recordings than in Gabrielsson's. The impersonations and the recordings of Gabrielsson's own voice are similar to each other in this respect. There are some differences in the position of the pauses, but that is unimportant for the impersonation as a whole. The pause durations are not so clearly perceived in the auditory analysis but are obvious in the acoustic analysis.

F_0. The average and standard deviation of F_0 for the full length, about 30 seconds, of the recordings were obtained from the analysis program SoundScope. The results are shown in tables 1 and 2.

The F_0 average is higher for Bildt than for Gabrielsson's own voice, but it is even higher in the impersonations. The differences are very small in the interview, but greater in the political speech. It is likely that correct imitation of the pitch is necessary for a successful impersonation.

The prosody of focal words. The typical intonation patterns for focal words with accent I and accent II in central Swedish dialects, with one and two peaks respectively, are present in the recordings.

One of Bildt's characteristic features is his prosody on focal words. The acceleration was already found in the auditory analysis. The last syllable of a phrase is cut off, the duration shortened and the pitch does not go to the bottom at the end of the syllable. Some typical examples are *unionen* and *miljöproblemen*. Gabrielsson succeeds in imitating the acceleration on focal words, but not with Bildt's pattern of cutting the end off the last syllable. The pitch goes to the bottom at the end of the syllable in the impersonation, and in the recording of Gabrielsson's own voice Bildt's pattern of cutting the end off the syllable is not used (see figures 1-3).

Table 3 shows the duration of the last syllable, including the previous consonant, in focal words. The durations are shorter in the impersonation than in Gabrielsson's own voice, but longer than in the target speaker. There is an interesting difference between words with accent II, e.g. *bromsa*, *lösa* and *(överhuvud)taget*, and words with accent I. Bildt has longer durations than the other versions in words with accent II and the shortest duration in other words.

The /r/ segments. The spectrograms show that in stressed words, the /r/ segments are longer in the impersonation than in the recording of the target speaker. It is possible to see the exaggeration in the impersonation in the word *bromsa*. The word is stressed even in the recording with Gabrielsson's own voice, but the /r/ segment is not as long as in the impersonation (see figures 4-6). Gabrielsson speaks with the alveolar [r], but in the impersonation he uses a uvular [ʀ] like Bildt.

The /s/ segments. The average values for the lower limit of the frequencies of /s/ sounds are different. The recordings of Bildt have lower frequencies than the other recordings, but the impersonation is really close to Bildt's values. Tables 4-5 show the average value for the lower limit of the frequencies. There are 10 occurrences of [s] in the interview and 18 in the political speech. Words like *börsen*, which are pronounced with a retroflex in central Swedish, are not represented.

Vowels. To find out if there were any important differences in the stressed vowels the formant frequencies, F1, F2 and F3 have been measured in the spectra in the recordings of the interview. Generally the formant frequencies are higher in the recording of Gabrielsson's own voice. There are 39 stressed vowels and 21 of these have a higher formant frequency and 6 have a lower F3 in the recordings with Gabrielsson's own voice than in the impersonation. F2 is higher for 22 of the vowels and lower for 5 vowels in the recording of Gabrielsson's own voice. The duration of the stressed vowels are longer for 19 vowels and shorter for 8 of the 39 vowels in the recording of the impersonation compared with Gabrielsson's own voice. The acoustic values of the impersonation are closer to the values of Bildt's voice than to the impersonator's own voice. See tables 6 and 7.

Voiced plosives. The voiced plosives at the beginning of a word are lengthened in the impersonation and this is an overshoot in the impersonation. To compare the three recordings of the interview, the duration of the occlusion and the VOT of [b] and [d] has been measured. See table 8. There are no [g] in the beginning of the words in the interview.

Aspiration in voiceless plosives. There are some differences in aspiration in voiceless plosives before stressed vowels in the recordings. The target speaker (Bildt) pronounces the voiceless plosives in an unusual way and it is difficult to measure any aspiration in his utterances. In the interview there are just a few utterances with aspiration for Bildt, some more in the impersonation and the most pronounced aspiration can be found in the recording of Gabrielsson's own voice. The impersonation is between the other two recordings and that is a kind of undershoot. The duration of the aspiration in voiceless plosives before stressed vowels is shown in table 9.

4. Discussion

The analysis shows that there are both bull's-eyes, undershoots and overshoots in these impersonations. In the first listening, the characteristic features of the dialect are apparent. The allophones of /r/ are exaggerated in the impersonation and is a kind of overshoot. The impersonator has changed his voice quality and the pitch so that he is close to the target speaker. The listener is prepared for listening to Bildt and the undershoots in the impersonation are probably unimportant. In the auditory analysis the undershoots are not as obvious as they are in the acoustic analysis.

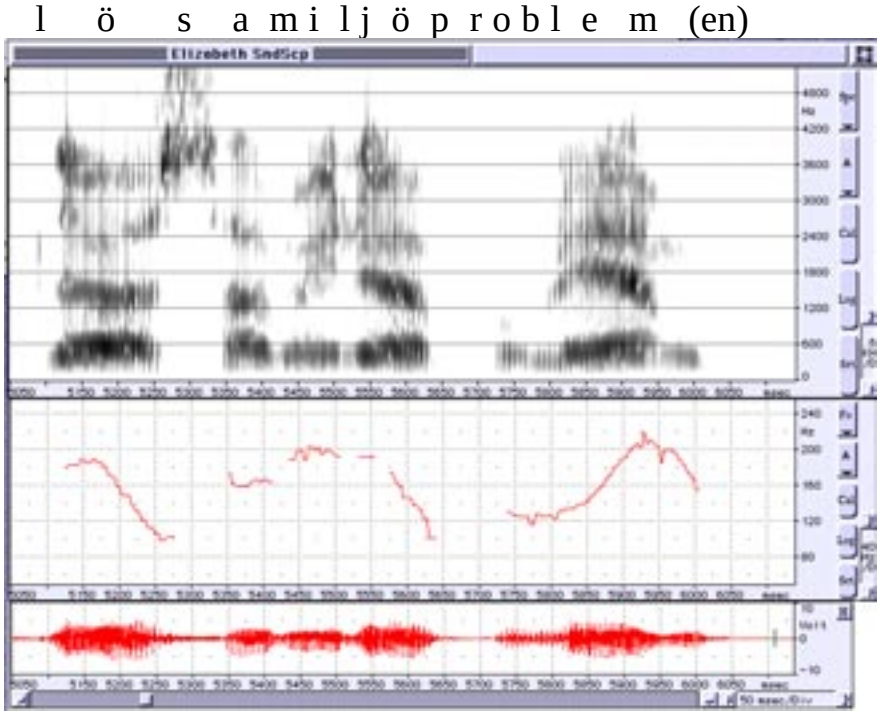

Figure 1. Example utterance. From top to bottom: sound spectrogram, F_0 contour and waveform. Bildt: *lösa miljöproblemen*.

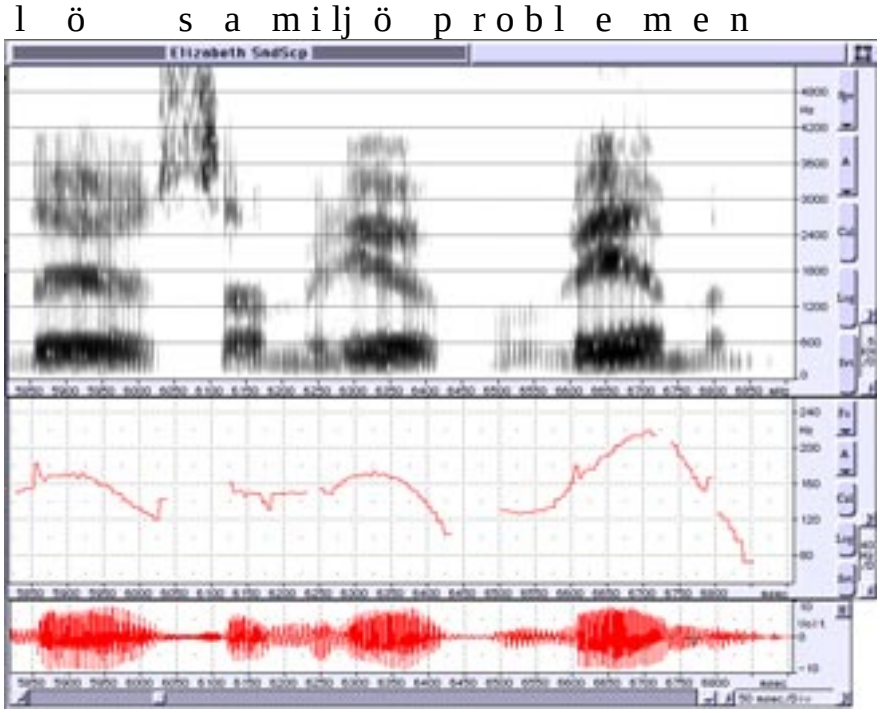

Figure 2. Example utterance. From top to bottom: sound spectrogram, F_0 contour and waveform. Impersonation: *lösa miljöproblemen*.

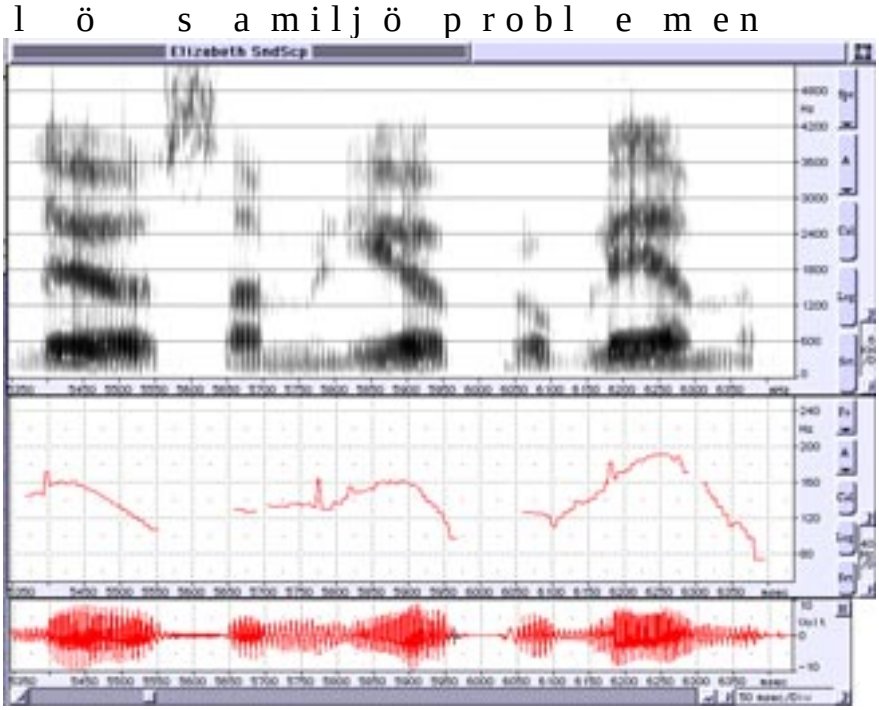

Figure 3. Example utterance. From top to bottom: sound spectrogram, F_0 contour and waveform. Gabrielsson: *lösa miljöproblemen*.

Prosody, rhythm, and voice quality seem to be important for the success with the impersonation. Phonetic habits are a part of the personal style and are important for identification of the target speaker (Laver 1994). It is important for the impersonator to realise how to change his own pitch level and to become familiar with the target speaker's intonation and placement of focus.

4.1 Prosody

The prosody of the language is important for human linguistic communication. The young child learns the prosody before the segments of the language (Söderbergh 1979, Waterson 1991). The suprasegmental features are important for the personality and for social identity (Bruce 1977).

For the impersonator it is important to imitate the prosody of the target speaker. He can exaggerate the characteristic features and the personality in the prosody to make clear who the target speaker is. The prosody is sometimes more important than the voice quality to make the impersonation similar to a caricature and entertain the audience. In a political speech, even the rhythm and variations in the pitch level are of importance.

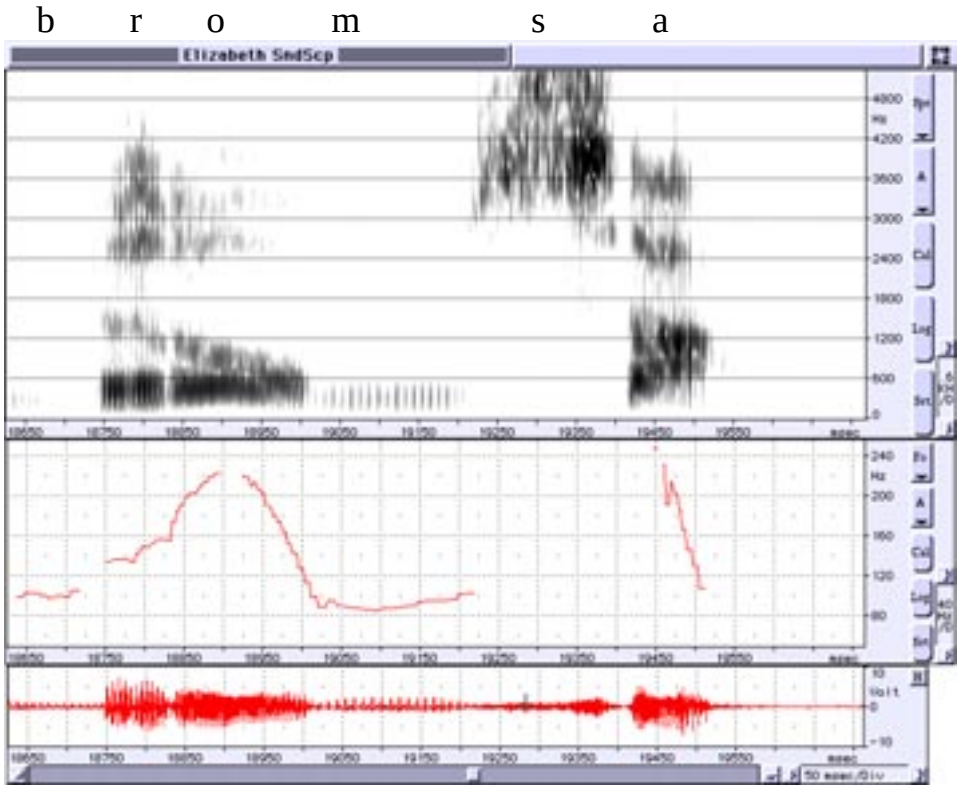

Figure 4. Example the /r/ segment. Sound spectrogram. Bildt: *bromsa*.

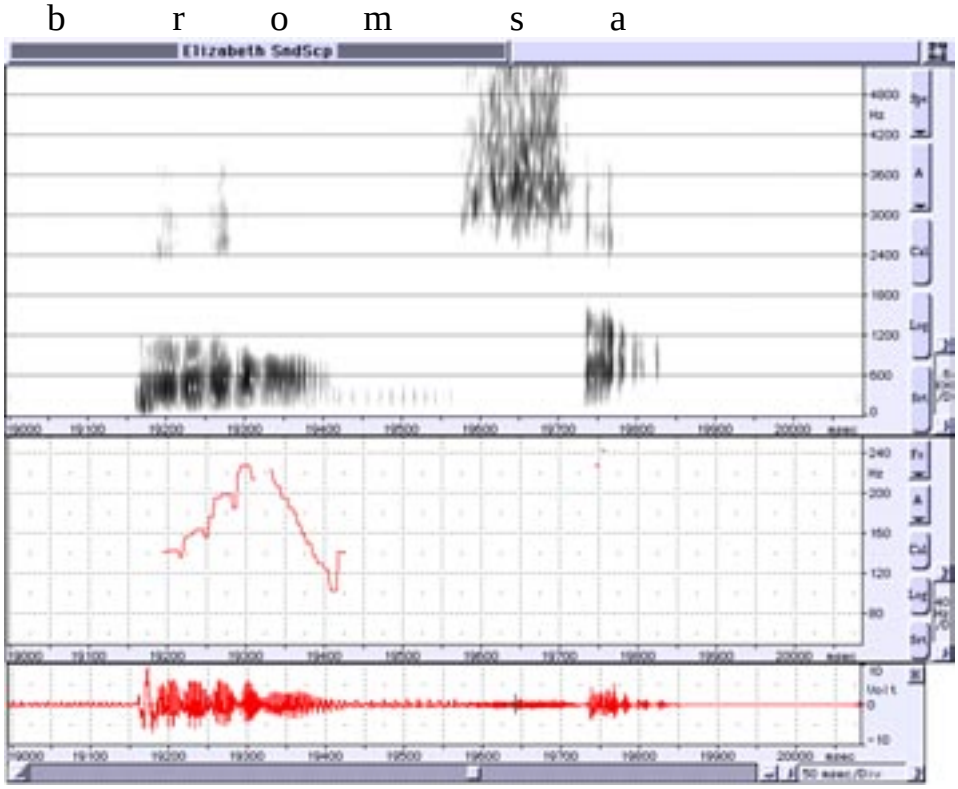

Figure 5. Example the /r/ segment. Sound spectrogram. Impersonation: *bromsa*.

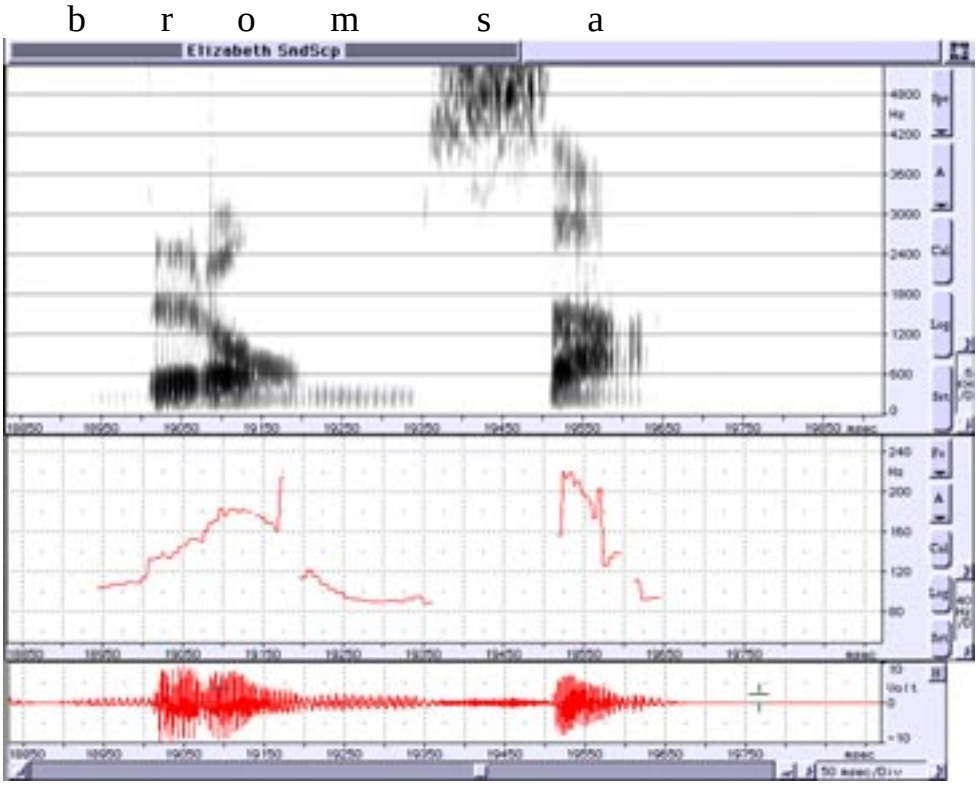

Figure 6. Example the /r/ segment. Sound spectrogram. Gabrielsson: *bromsa*.

In order to convince, the impersonator has to select individual and characteristic features of the target speaker's prosody in his impersonation.

4.2 Rhythm

In classical rhetoric, the rhythm was very important when one wanted to stress something. A regular rhythm is not allowed in rhetorical speech, but variation in the rhythm is necessary to hold the attention of the audience (Rydstedt 1993). Knowledge of such things is useful when making a political speech.

The impersonator imitates the rhythm pattern very well and he is close to the target speaker. He uses a staccato-like rhythm in the interview and pauses like Bildt in both recordings. The placement and duration of pauses are not exactly the same, but that is irrelevant for the general impression. The total length is almost the same for the three recordings of each speech.

The speech tempo and pauses are different in spontaneous speech such as a conversation, as opposed to read speech, for example a political speech (Gårding 1967). The recordings of Bildt are good examples of these differences. For the impersonations Gabrielsson has memorised the texts and the suprasegmental parts. It is possible that this process has affected his recordings, resulting in less pitch variation compared with the recordings of Bildt.

4.3 Voice quality

It is possible to change the voice by changing the phonetic settings (Laver 1994). There are, of course, some anatomical difficulties, which are almost impossible to overcome when attempting to imitate the opposite sex. Such components of voice quality are innate and outside the speaker's control (Abercrombie 1967). One can have a theory of how other people use their voices and try to imitate. A good impersonator has to know how to change his voice to imitate the target speaker, according to his own and the audience's perception of the target speaker's voice.

In these analysed recordings the impersonator succeeds with his impersonations, with the prosody as well as with the voice quality. There are some differences between the interview and the political speech. Sometimes it is possible to hear Gabrielsson's own voice in the impersonation of the interview. It is possible that it is easier to exaggerate an imitation with more emphasis and a loud voice, like the political speech.

It is hard to describe voice quality, especially the variations of a modal voice, so it is hard to know exactly what the impersonator really does to change his voice. Maybe he raises the larynx to get the timbre and the raised pitch. To lower the formant frequencies of the vowels, labial protrusion and lip-rounding, or lowering of the larynx, is necessary (Lindblad 1992).

4.4 Perceptual expectation

To what extent are we influenced by our perceptual expectation? If Gabrielsson had tried to imitate Bildt, but had talked about another subject, not politics, would the audience know who the target speaker was? I think so, if he sounds like he does in these recordings because he is so close to the voice quality and the prosody of Bildt.

Even a good impersonator has limits when it comes to changing the articulatory settings. To convince and entertain the audience it is possible that the impersonator has to exaggerate characteristic features like the dialect, the prosody and the speech behaviour of the target speaker. If the impersonator appears on stage he can also use body language to make the impersonation clearer.

When people listen to impersonations of famous people they expect to hear the characteristic features of that person and it is also possible to 'hear' features you expect to hear. Therefore it is possible that the undershoots are unimportant for the general impression. The impersonator wants to entertain

and make something like a caricature of the target speaker and that is possible if he exaggerates some features.

4.5 Segments

In the acoustic analysis we found that Gabrielsson really changes his own voice in the impersonations. He lowers the frequencies of /s/, but it is difficult to know if he is aware of how to do this.

Gabrielsson lowers his upper formant frequencies and changes the duration in the impersonations. The duration of the voiced segments is longer in the impersonations than in the recordings of Bildt's and Gabrielsson's own voices, and that may be a kind of overshoot.

5. Conclusions

There are obvious differences between the speech of Gabrielsson and Bildt: the dialects with different pronunciations of /r/, the open vowels, and the pitch level, which is higher for Bildt, especially in the political speech. There are differences in both impersonations with more exaggerations in the political speech. The imitation of the dialect is the same in both recordings.

Some of Carl Bildt's characteristic features are his prosody, his acceleration on focal words and his way of cutting the end off the last syllable. The impersonator's way of speaking with a special rhythm, exaggerating the dialect with the special sound of /r/, and the acceleration of focal words makes the impersonation convincing. He also succeeds in accentuating the same words as the target speaker.

There are differences between the two speakers in things like pauses, but they are, however, not so important for the general impression. The differences in segments like /s/ and voiced plosives, with both overshoots and undershoots are also likely to be unimportant for the audience.

In the acoustic analysis, I found that the impersonator actually does change the pitch level, the /s/ segments and the vocal formant frequencies of his own voice as well as the segmental durations. The acoustic values of the impersonation are closer to the values of the target speaker's voice than to the impersonator's own voice.

The conclusion of this analysis is that Gabrielsson has some overshoots (the allophones of /r/), some bull's-eyes (the rhythm) and some undershoots (the end of focal words).

It is possible that it is easier to impersonate someone who has a very special voice with characteristic features, such as a creaky or nasal voice or falsetto. Is

it necessary to change the voice quality to convince the audience or is it sufficient to exaggerate some characteristic features of the target speaker? The results of this analysis suggest that for a good impersonation it is important that the impersonator succeeds in imitating, and even exaggerating, several typical features of the target speaker, and also that voice similarity is of significance in convincing a critical audience.

Tables

Table 1. F_0 average and standard deviation in the interview.

	Bildt	*Impersonation*	*Gabrielsson*
F_0 average	132 Hz	134 Hz	128 Hz
Std deviation	32 Hz	28 Hz	29 Hz

Table 2. F_0 average and standard deviation in the political speech.

	Bildt	*Impersonation*	*Gabrielsson*
F_0 average	168 Hz	177 Hz	150 Hz
Std deviation	29 Hz	26 Hz	26 Hz

Table 3. Duration, in ms, of the last syllable including the previous consonant on focal words.

	Bildt	*Impersonation*	*Gabrielsson*
unionen	80	150	200
miljö-problemen	120	150	180
bättre	50	100	150
miljö-partiet	280	420	450
bromsa	380	280	300
komma med	200	350	300
lösa	350	250	270
överhuvudtaget	130	100	120
fel	280	300	320

Table 4. The average value (in Hz) for the lower limit of the frequencies of /s/ in the interview.

[s] occurence	*Bildt*	*Impersonation*	*Gabrielsson*
europeiska	3300	3900	4300
lösa	2700	2900	3000
också	2700	3200	3200
så	3300	3300	3600
konstatera	3300	3300	3800
bromsa	3000	3200	3900
deras	3600	3000	3900
bromsa	2700	3100	3300
lösa	2700	3200	3500
allvarligaste	2700	3400	3700

Table 5. The average value for the lower limit of the frequencies of /s/ in the political speech.

[s] occurence	*Bildt*	*Impersonation*	*Gabrielsson*
främsta	3900	3900	3900
politiska	3800	3900	4100
arbets-	3000	2900	3300
lösheten	2800	3300	3600
faktiskt	3700	3600	4200
som	2600	3300	3100
socialdemokrat.	2800/2600	2800/2800	3100/3100
slut-	2700	3300	3600
satser	3500/3700	3300/3300	3900/3900
så	2700	3000	3300
som	3200	3200	2400
finns	3400	3600	3900
regeringens	3300	3000	3800
sin	2700	2800	2400
försvagas	2700/3600	2700/3200	2400/4200

Table 6. The duration, in ms, of the stressed vowels in the intervie.

Vowel duration	*Bildt*	*Impersonation*	*Gabrielsson*
-partiet	120	150	100
-partiet	100	100	80
illa	130	120	120
europeiska	180	220	170
vet	100	150	80
-problemen	100	120	110
konstatera	100	100	120
deras	100	100	80
-problemen	100	80	100
fel	100	120	120
lösa	150	170	150
miljö-problemen	80	80	70
miljö	100	100	100
miljö-partiet	100	80	80
miljö-partiet	100	80	80
möjligheter	80	80	70
möjligheterna	100	80	80
lösa	200	200	220
miljö-problemen	80	80	80
underligt	120	100	120
underligt	50	120	120
med	100	150	150
med	120	280	200
där	100	150	170
hjälpen	50	70	50
hjälpen	50	80	50
där	150	200	170
bättre	100	100	80
där	100	120	100
allra	200	200	150
allvarligaste	150/100	250/100	120/100
har	70	100	150
överhuvudtaget	150	150	150
bromsa	150	100	80
bromsa	50	80	80
vår	150	180	120
unionen	100	120	130
Europa	100	80	150

Table 7. The formant frequencies of the stressed vowels, in Hz, in the interview.

	Bildt			*Impersonation*			*Gabrielsson*		
Formants	F1	F2	F3	F1	F2	F3	F1	F2	F3
m-partiet	400	2000	2900	300	1800	2900	400	2100	3000
m-partiet	400	2100	2700	300	2000	3100	300	2300	3100
illa	400	2400	2700	400	2500	3100	300	2600	3200
europeiska	400	2200	2600	400	1800	2900	400	2200	2900
vet	400	1800	2500	400	2200	2700	500	1800	2700
-problemen	500	1600	2400	400	1900	2600	500	2000	2600
konstatera	500	1900	2500	400	2100	2500	400	2100	2600
deras	500	1900	2600	400	2200	2600	500	2000	2600
-problemen	500	1700	2400	400	1800	2500	500	1800	2600
fel	300	2200	2600	300	2500	2800	300	2600	3000
lösa	500	1400	2400	500	1700	2600	500	1600	2500
miljö-probl.	500	1500	2300	500	1600	2400	500	1500	2400
miljö	400	1400	2300	500	1400	2300	500	1600	2300
miljö-part.	500	1500	2300	500	1600	2400	500	1600	2500
miljö-part.	400	1400	2400	500	1400	2400	500	1500	2500
möjligheter	500	1500	2300	500	1200	2500	600	1500	2600
möjlighetema	400	1400	2300	500	1400	2500	500	1700	2600
lösa	500	1400	2200	500	1600	2500	500	1800	2500
miljö-probl.	500	1500	2400	500	1500	2400	500	1600	2500
underligt	400	1200	2500	400	1000	2600	400	1000	2500
underligt	500	1100	2400	400	1000	2600	400	1100	2600
med	500	2000	2600	400	2400	2800	500	2400	2900
med	600	1600	2300	500	2000	2700	600	2000	2800
där	600	1500	2400	600	1600	2500	700	1700	2600
hjälpa	500	1500	2400	600	1700	2600	500	1800	2700
hjälpen	500	1600	2300	600	1700	2500	600	1700	2400
där	600	1600	2500	700	1400	2600	700	1700	2700
bättre	400	1500	2400	600	1700	2500	600	1900	2500
där	600	1500	2600	600	1500	2600	600	1800	2700
allra	700	1100	2600	800	1200	2700	800	1200	2800
allvarligaste	700	1100	2500	700	1100	2700	900	1300	2600
allvarligaste	500	1100	2300	600	900	2400	500	900	2500
har	500	800	2600	600	800	2500	600	1000	2600
ö-taget	600	900	2600	600	900	2600	600	900	2600
bromsa	400	900	2600	400	800	2600	600	900	2500
bromsa	500	900	2400	500	800	2500	600	900	2700
vår	400	800	2600	400	600	2600	300	600	2700
unionen	400	800	2400	400	800	2500	400	800	2500
Europa	400	900	2300	400	1000	2500	300	800	2400

Table 8. The duration, in ms, of voiced plosives in the interview.

	Bildt	*Impersonation*	*Gabrielsson*
dom	50	300	20
den	50	50	30
därför	50	200	30
dom	50	200	80
där	60	150	150
dom	20	100	140
där	30	20	30
då	30	200	80
blir	100	50	80
bättre	40	70	50
därför	50	50	40
där	50	30	20
bromsa	120	50	120
deras	30	100	50
därmed	50	80	50
bromsa	130	50	40
de	50	100	50

Table 9. The duration, in ms, of the aspiration in voiceless plosives before stressed vowels in the interview.

	Bildt	*Impersonation*	*Gabrielsson*
Europeiska	0	0	20
miljöpartiet	0/0	0/20	20/50
konstatera	30	20	20
miljöpartiet	0/0	0/30	0/30
överhuvudtaget	40	20	30

References

Abercrombie, D. 1967. *Elements of general phonetics.* Edinburgh: Edinburgh University Press.

Bruce, G. 1977. *Swedish word accents in sentence perspective*. Lund: CWK Gleerup.

Bruce, G. & E. Gårding. 1978. ‘A prosodic typology for Swedish dialects’. In E. Gårding, G. Bruce & R. Bannert (eds.), *Nordic Prosody: Papers from a symposium*, 219-228. Lund: Department of Linguistics.

Elert, C.-C. 1991. *Allmän och svensk fonetik*. Stockholm: Norstedts.

Gårding, E. 1967. ‘Prosodiska drag i spontant och uppläst tal’. In G. Holm (ed.), *Svenskt talspråk*, 40-85. Stockholm: Almqvist & Wiksell.

Honikman, B. 1964. ‘Articulatory settings’. In D. Abercrombie et al. (eds.), *In honour of Daniel Jones*, 73-84. London: Longmans.

Klatt, D. H. & R. A. Stefanski. 1974. ‘How does a mynah bird imitate human speech?’ *The Journal of the Acoustical society of America* 55, 822-32.

Larsen-Freeman, D. & M. H. Long. 1991. *An Introduction to second language acquisition research*. New York: Longman.

Laver, J. 1980. *The phonetic description of voice quality*. Cambridge: Cambridge University Press.

Laver, J. 1994. *Principles of phonetics*. Cambridge: Cambridge University Press.

Lindblad, P. 1992. *Rösten*. Lund: Studentlitteratur.

Linell, P. 1978. *Människans språk: En orientering om språk, tänkande och kommunikation*. Lund: Liber Läromedel.

Markham, D. 1997. *Phonetic imitation, accent and the learner*. Lund: Lund University Press.

Rydstedt, R. 1993. *Retorik*. Lund: Studentlitteratur.

Sjöstedt, G. 1936. *Studier över r-ljuden i sydskandinaviska mål*. Lund: Landsmålsarkivet i Lund.

Söderbergh, R. 1979. *Barnets tidiga språkutveckling*. Lund: Liber Läromedel

Waterson, N. 1991. *Nursery rhymes: have they a role in language development/Barnrimmets betydelse för språkutvecklingen*. Lund: Child Language Research Institute.