STUDIES OF SOME PHONETIC CHARACTERISTICS OF SPEECH ON STAGE

Gunilla Thunberg

Dept of Linguistics, University of Stockholm, Sweden

ABSTRACT

In order to investigate the special techniques for voice production used by actors on stage, recordings have been made of two actresses. Fundamental frequency distribution analysis has shown: firstly, that there are different individual speech production strategies used by different actors; secondly, that a common feature appears to be the conscious exploitation of variability in fundamental frequency in stage speech styles; thirdly, that narrowing the range of F0 distribution appears to be a useful technique for creating intimacy, e.g. in order to give an illusion of whispered speech on stage.

1. INTRODUCTION

Speech as it is produced by actors on stage, before a larger audience and without amplification, requires an extra level of distinctiveness in order to carry a message all the way to the back row of the theatre. This cannot be done simply by raising your voice because that would unable the actor to work with speech nuances and sensitivity in an optimal manner. The actor must use special techniques for speech production, that must not be detected by the audience. These must also allow a range of expression necessary for creating an illusion of real life.

The purpose of the work reported here is to investigate some of the phonetic aspects of speech on stage as compared to other normal speech styles. Two different modes of stage speech have been studied: that of the normal tone of voice as in ordinary dramatic discourse, and that of the lower tone of voice, i.e. the somewhat retracted voice quality used to give an illusion of whispering. Illusion is a key-word in this case since a "real" whisper would not be possible to perceive in most theatrical situations.

This work is the beginning of a series of studies of stage-speech, aimed at determining the relevant phonetic parameters of this kind of speech production. The present report deals with the use of fundamental frequency. Other analyses have been done, including the measurement of acoustic vowel space utilization and long-time average spectrum (LTAS). Results from these analyses will be reported at the XIIth ICPhS in Aix-en-Provence, in August 1991.

2. METHOD

Since the acoustic characteristics of the theatre-room is essential to the choice of strategy for voice production [1], the speech material was recorded on stage, in a small theatre in Stockholm, during a performance specially arranged for this purpose.

Two actresses were recorded, both with professionally trained voices, each performing the same piece of text three times using different speech styles; in turn: No 1 - normal stage speech style, as in ordinary dramatic discourse, No 2 - so called "stage whisper", and No 3 - normal person-to-person conversational speech style.

3. ANALYSIS

Shorter sequences of text, approximately 20 — 25 sec long, were chosen to be analyzed in order to study the acoustic characteristics ot the three speech styles, respectively. Fundamental frequency was extracted and histograms showing F0 distribution were drawn, by means of the computer program SWELL [2].

4. RESULTS

Since the two actresses are using somewhat different production strategies, the data will be presented "within subjects", with comparisons made between the three speech styles for each subject separately. There are, however, in an inter-subject comparison, some common features concerning the ways in which fundamental frequency is distributed. These will be commented on in the concluding remarks.

4.1 F0 distribution within subjects

4.1.1 Subject BA

For style No 1 (fig B1) the histogram shows a total F0 distribution range of roughly 100—390 Hz. Mean value: 222 Hz. Mode: 169 Hz. Standard deviation: 52.9 Hz. The histogram contour forms a neatly gathered figure where the distribution is rather evenly spread mainly between 150 and 290 Hz, and it has a somewhat flatter slope towards the higher frequencies.

In style No 2 "stage whisper" (fig B2) the F0 range is less extended, mainly covering the area between 120 and 360 Hz. Mean: 208 Hz. Mode: 206 Hz. St.dev: 38.9 Hz. This configuration has a triangular shape similar to that of normal speech, with a slightly flatter slope towards the higher frequencies. The mostly favoured frequencies in this style lie between 160 and 260 Hz.

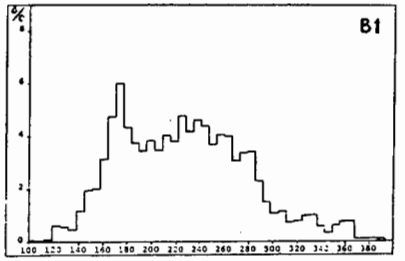

Figure B1. Extracted F0 (in Hz) of normal stage speech (subject BA). Mean: 222 Hz. Mode: 169 Hz. St.dev: 52.9 Hz.

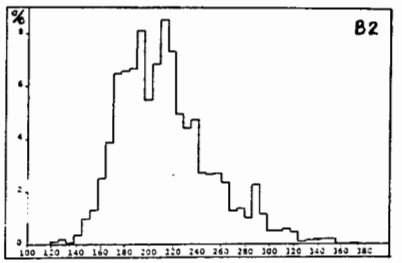

Figure B2. Extracted F0 (in Hz) of stage whisper (subject BA). Mean: 208 Hz. Mode: 206 Hz. St.dev: 38.9 Hz.

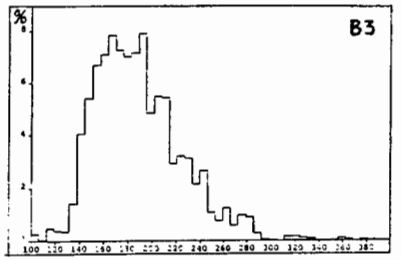

Figure B3. Extracted F0 (in Hz) of normal conversational speech (subject BA). Mean: 185 Hz. Mode: 188 Hz. St.dev: 36.8 Hz.

Style No 3 (fig B3) has a total range of about 100—380 Hz, though it is mainly concentrated to frequencies between 140 and 280 Hz. Mean: 185 Hz. Mode: 188 Hz. St.dev: 36.8 Hz. The pattern of spreading is almost identical to that of the stage whisper (fig B2). The main difference between styles No 2 and 3 lies in the frequency levels being used. This could be described as stage whisper having a frequency downshift of about 20 Hz, compared to normal conversational speech.

4.1.2 Subject GN

For style No 1 (fig G1) the F0 distribution covers a total range of 100—350 Hz but is mainly concentrated to frequencies between 130 and 270 Hz. Mean: 186 Hz. Mode: 155 Hz. St.dev: 45.5 Hz. The histogram displays a tendency towards a bimodal structure where the F0 distribution appears to be divided into two peaks, one around 160 Hz (close to the mode value) and the other around 260 Hz. For this subject, however, there is no evidence of perturbations such as diplophonia or switches between modal and loft registers. The histogram configuration thus presumably demonstrates one impact of an individual speech strategy.

In style No 2 "stage whisper" (fig G2) the F0 range is less extended, roughly covering 100—260 Hz, and with its main distribution concentrated to the area between 130 and 230 Hz. Mean: 173 Hz. Mode: 138 Hz. St.dev: 34 Hz. The contour of this histogram has a very steep slope from around 140 Hz (i.e. about mode value) down to 120 Hz. The slope towards higher frequencies is much flatter.

Style No 3 (fig G3) has a total range of about 100—300 Hz; distribution mainly concentrated between 140 and 260 Hz. Mean: 195 Hz. Mode: 160 Hz. St.dev: 37.3 Hz. In this style, the normal conversational speech, there seems to be a slight tendency towards the same kind of bimodal structure as could be seen in style No 1. This is, however, not as obvious in the normal speech as in the stage version. The appearance of the

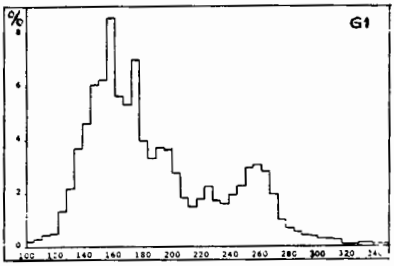

Figure G1. Extracted F0 (in Hz) of normal stage speech (subject GN). Mean: 186 Hz. Mode: 155 Hz. St.dev: 45.5 Hz.

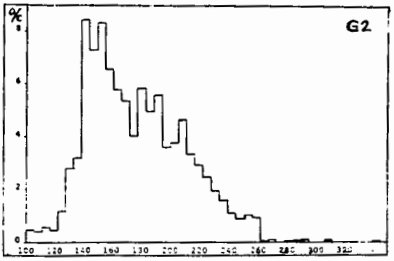

Figure G2. Extracted F0 (in Hz) of stage whisper (subject GN). Mean: 173 Hz. Mode: 138 Hz. St.dev: 34.0 Hz.

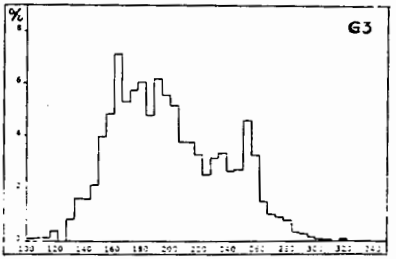

Figure G3. Extracted F0 (in Hz) of normal conversational speech (subject GN). Mean: 195 Hz. Mode: 160 Hz. St.dev: 37.3 Hz.

same distributional pattern in both styles may support the image of the individual production strategy for this subject.

5. DISCUSSION

Subject BA uses a slightly wider total range of fundamental frequency in her normal stage speech but the effectively utilized range in this style is about as wide as that of her normal conversational speech (table BA). For the stage speech, however, F_0 appears to be somewhat higher (+10 Hz) throughout. The mean value here is relatively much higher, and so is the standard deviation which gives evidence of a much greater variability of fundamental frequency in the normal stage speech style.In her whispered style, on the other hand, the effective F_0 range is much narrower. Mean and mode values are almost the same, and standard deviation is much smaller. This also indicates less variability in whispered as opposed to normal stage speech.

Subject GN is consistently using a wider F_0 range in her normal stage speech, totally as well as effectively utilized (table GN). Mean and mode values are somewhat lower in both her stage speech styles than in her normal conversational style. The standard deviation is higher in her normal stage speech, giving evidence of a greater variability in this style. In her whispered style the F_0 range is more compressed, and the mean and mode values are much lower (roughly —20 HZ) compared to her normal conversational speech.

Using a wider range of F_0 usually applies to normal conversational speech as well when the speaker wishes to emphasize or distinguish something in the spoken message. It is therefore not surprising to find that this appears to be systematically used in stage speech.
Decreasing the F_0 range appears to be an effective way of establishing a more intimate speech character, in order to create an illusion of whispered speech. In addition to this, as a recurrent theatrical technique, visual means of conveying the message are being used, such as posture and bodily behaviour, which are crucial elements in stage acting.

Table BA

Style	Mean	Mode	St.dev	Total range	Effect. range
No 1	222	169	52.9	100-390	150-290
No 2	208	206	38.9	120-360	160-260
No 3	185	188	36.8	100-380	140-280

Table GN

Style	Mean	Mode	St.dev	Total range	Effect. range
No 1	186	155	45.5	100-350	130-270
No 2	173	138	34.0	100-260	130-230
No 3	195	160	37.3	100-300	140-260

6. ACKNOWLEDGEMENT

This work has been made possible by the help and support of several of my teachers and colleagues, at the Phonetics dept of the University of Stockholm, and The Royal Institute of Technology, Stockholm, as well as at Folkteatern i Sverige, Södra Teatern, Stockholm. Dr Robert McAllister, University of Stockholm, has been acting as my supervisor. All of them are hereby gratefully acknowledged.

7. REFERENCES

[1] TERNSTRÖM, S. (1989), "Long-time average spectrum characteristics of different choirs in different rooms", *STL-QPSR* 3/89, Dept of Speech Communication and Music Acoustics, Royal Institute of Technology, Stockholm, Sweden.

[2] SWELL, computer program produced by Soundswell Music Acoustics HB, Solna, Sweden.