CONTRASTIVE ACOUSTIC ANALYSIS OF VOWEL PHONEMES, PRONOUNCED BY SOME NORTH GERMAN AND SOUTH SWEDISH HIGH SCHOOL PUPILS

(A summary)

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PURPOSE OF THE INVESTIGATION

There are great similarities between the standard Swedish and the German vowel systems. When teaching a foreign language, one must, however, start from the local native dialect of the pupils. One of the characteristics of the Malmö dialect is the pervading diphtongization of the long vowels. The purpose of the present study is to investigate how this dialect influences the pronunciation of the German vowels, spoken by some Malmö pupils.

INFORMANTS

The informants were 107 boys and girls, age 16-21, from a Malmö high school, all representing the Malmö dialect. As a control group the German utterances were recorded by 22 boys of corresponding age at a high school at Lübeck.

MATERIAL

The following 15 vowel phonemes were investigated: /i:, ɪ, e:, ɛ:, ɛ, a:, a, y:, ʏ, ø:, œ, u, ʊ, o:, ɔ./ The test vowels were surrounded by voiceless stops. For the test words, se appendix. The test words were preceded by German: "Das Wort ist..." or Swedish: "Ordet är...". The Swedish pupils read the German sentences first, then the Swedish.

EQUIPMENT

The Swedish material was recorded in an anechoic chamber on a Telefunken M24, and the German in a language laboratory on a Philips RK 65, all at 19.5 cms/sec. The utterances of the male informants were analyzed with a Kay Electric Sona-Graph at the University of Lund. About 1900 spectrograms were made (filter 300 cps, frequency scale 4800 cps).

RESULTS

The median frequencies of the vowel formants for each phoneme and the duration are given in the appendix. Three questions are considered – the frequency of the vowel formants, the duration of the vowels and the centralizing tendency. The last point is related to a quality difference between long tense vowels and the corresponding short lax ones. A perceptual analysis of all informants, including the females, is in progress.

DISCUSSION

1. The frequency of the vowel formants

In spite of the pervading diphthongization of chiefly the long vowels in the Malmö dialect, only few pupils diphthongized the German test vowels. As mentioned above, diphthongization is the main characteristic of the Malmö dialect, and the pupils, well aware of it, avoided diphthongizing the vowels of the target language. Other differences in the pronunciation of the vowels in the Malmö dialect and German are seldom noticed by the pupils or by the teachers of German. The values of the formant frequencies point to the fact that, as a rule, the Malmö informants used their habitual articulatory model when pronouncing the short German vowels. The articulation of the front rounded vowels differed most conspicuously from that of

the German informants. Because of the weak labialization of the Malmö dialect, F2 and F3 were higher in the German vowels pronounced by the Malmö informants than in the same vowels articulated by Germans. In the back vowels, the weaker labialization gave a higher F2 in the Swedish pronunciation. Further, the Malmö pupils have too close an /I/ in "kicken", the same pronunciation as they use in the Swedish word "kicka". /ɛ/ is pronounced closer and /ɛ:/ more open than in the native German articulation. All these phenomena might be regarded as interference from the native on the target language.

2. The duration of the vowels

Most of the German vowels are lengthened in the articulation of the Swedish informants. This characteristic alone might bear witness to a foreign pronunciation, even if the frequency of the vowel formants could be representative of German vowels. While the Malmö pupils avoided diphthongizing the tense German vowels, as mentioned above, they appear to lengthen them instead. The Scanian realization of the long Swedish vowels is mainly characterized by two phenomena: diphthongization and lengthening. Of these two features, the Malmö informants only transferred the extra duration to the target language German. As was the case with the formant frequencies, the durations of the Swedish articulations of the German vowels were intermediate between the Swedish pronunciation of the Swedish vowels and the German pronunciation of the German vowels.

3. Centralizing tendency

With centralizing is meant the fact that the tongue hump approaches a neutral mean position in the mouth for the short lax vowels as compared to

the more extreme position for the long tense vowels. There is also an acoustic counterpart to the articulatory centralization. The acoustic neutral position is represented by a higher F1 and lower F2 for the short lax front vowels than for the corresponding tense ones. The back rounded lax vowels, however, have higher F2 values than the corresponding tense ones. The present study examines how this acoustic difference is observed by the different informant groups. In almost all cases the frequency difference in F1 between long and short vowels was greater in the German than in the Swedish pronunciations. F1 of the long vowels was generally lower in the German than in the Swedish pronunciation. For the short German vowels, however, the relation is reversed: here F1 is higher in the German than in the Swedish pronunciation. As to the front vowels, the centralizing tendency sometimes is seen in F2 sometimes in F3 in the German articulation. The back vowels /u: - ʊ / and /o: - ɔ / both show greater difference in F2 in the German than in the Swedish pronunciation. The present investigation has proved that the centralizing tencency was not sufficiently observed by the Malmö informants. They seem to have neglected the German quality difference. As the quantity generally is distincitive in Swedish and the quality is regarded as allophonic, there is a natural tendency to carry over this relationship to a foreign language. This case too might be regarded as a kind of interference.

PEDAGOGIC CONCLUSIONS

Some conclusions which could be applied in the teaching of German as a foreign language in southern Sweden could be drawn from the acoustic results presented above:

1. The characteristic strong labialization of the rounded German vowels is important for a good German pronunciation.

2. The pupils should not exaggerate the vowel length.

3. The teacher of German should stress the quality difference between /i: - I, y: - Y, ø: - œ/ and so on and point to the fact that it is not only a question of a quantity difference.

MEDIAN AND RANGE OF VARIATION OF THE FORMANT FREQUENCIES

The numbers in parenthesis indicate the number of informants. Recordings have sometimes been rejected because of reading mistakes, difficulty in measuring spectrograms etc. The number of informants varies therefore from phoneme to phoneme. "sv." = the pronunciation of the Swedes, "ty." = the pronunciation of the Germans. "m." = the vowel in the Swedish word pronounced as a monophthong by the number of informants indicated in parenthesis, "d."= as a diphthong.

	F1	var.bredd	F2	var.bredd	F3	var.bredd
piepen sv. /i:/	325(47)	275–400	2225(47)	1925–2700	2900(46)	2525–3575
pipa	d.(46) m.(4)					
piepen ty.	300(22)	250–350	2200(21)	1950–2500	2863(22)	2650–3150
kicken /I/ sv.	350(49)	300–400	2200(49)	1950–2650	2813(48)	2325–3225
kicka	350(50)	300–400	2238(50)	2000–2725	2875(49)	2575–3225
kicken ty.	350(21)	325–400	2125(21)	1850–2375	2550(21)	2350–2725
Theke* /e:/ sv.	400(49)	300–475	2125(49)	1925–2625	2750(49)	2400–3175
tekopp d.(41)m.	425(9)	400–500	2075(9)	1850–2650	2775(9)	2525–3175
Theke ty.	375(21)	325–450	2150(21)	2025–2425	2700(21)	2550–3000
Täter* /ɛ:/ sv.	550(50)	400–650	1788(50)	1450–2300	2663(50)	2350–3325
täta d.(13)m.	550(37)	450–625	1700(37)	1475–2200	2700(37)	2550–3075
Täter /ɛ:/ ty.	563(3)		1900(3)		2562(3)	
Täter /e:/ ty.	375(19)	300–475	2175(19)	2025–2375	2700(19)	2475–2900
tätscheln* /ɛ/ sv.	500(50)	375–675	1900(50)	1600–2200	2650(50)	2375–3075
tätting d.(35)m.	500(14)	450–550	2000(14)	1625–2450	2675(14)	2550–3125
tätscheln ty.	575(22)	475–625	1863(22)	1625–2050	2575(22)	2350–2850
Pate* /a:/ sv.	700(50)	550–900	1350(50)	1225–1575		
pater /ɑ:/ d.(20)m.	575(26)	450–750	1050(26)	775–1400		
Pate ty.	725(21)	625–850	1200(21)	1050–1300		
packen /a/ sv.	650(50)	500–900	1500(50)	1275–1700		
packa	675(48)	425–875	1500(48)	1250–1700		
packen ty.	750(22)	550–900	1400(22)	1200–1550		
Typus /y:/ sv.	325(48)	275–425	2000(47)	1700–2625	2525(47)	2275–3025
typ	d.(48)m.(2)					
Typus ty.	300(20)	250–350	1738(20)	1500–1950	2200(20)	1900–2375
Stück /Y/ sv.	375(50)	300–425	1925(50)	1575–2250	2500(50)	2225–2900
styck	350(49)	300–425	1925(49)	1500–2175	2550(49)	2325–3075
Stück ty.	375(20)	350–475	1500(20)	1375–1625	2200(20)	1925–2500
Spöke* /ø:/ sv.	450(50)	350–575	1575(50)	1375–2125	2488(48)	2225–2975
spöke d.(22)m.	463(28)	400–575	1500(28)	1300–1900	2625(28)	2325–2925
Spöke ty.	400(20)	350–475	1425(20)	1300–1600	2125(19)	1925–2375
Stöpsel /œ/ sv.	500(49)	425–625	1550(49)	1350–1850	2575(49)	2300–2900
stöppla	475(50)	400–575	1525(50)	1300–1850	2638(48)	2400–3050
Stöpsel ty.	550(22)	400–650	1425(22)	1300–1550	2338(22)	1900–2600

* The following table divides the informants into two groups, according to their pronunciation of the Swedish test word. One group diphthongizes the Swedish test vowel, the other group does not.

Appendix 6

Kuhkalb /u:/ sv.	325(44)	300–450	850(44)	675–1125
kok	d.(49)m.(1)			
Kuhkalb ty.	300(22)	250–350	688(22)	575–950
Butter /ʊ/ sv.	350(50)	300–450	950(50)	775–1250
bott	350(48)	300–450	913(46)	600–1250
Butter ty.	425(21)	325–450	875(21)	750–1050
tot /o:/ sv.	425(50)	350–500	850(50)	700–1100
tåt	d.(48) m.(2)			
tot ty.	375(21)	300–450	725(21)	550–800
Pocke /ɔ/ sv.	475(50)	400–600	975(50)	800–1125
pocka	450(50)	325–575	913(50)	700–1125
Pocke ty.	550(20)	475–650	963(20)	850–1075

MEDIAN FORMANT FREQUENCIES AND MEDIAN DURATION OF SOME GERMAN VOWELS DIVIDED ACCORDING TO THE DIPHTHONGIZATION OF THE CORRESPONDING SWEDISH VOWELS

Svenskt testord		Tyskt testord	F1	F2	F3	Duration i msec.
tekopp	monoftong (9)	Theke /e:/	400	2100	2750	158
	diftong (40)		400	2125	2725	158
täta	monoftong (37)	Täter /ɛ:/	525	1800	2650	158
	diftong (13)		550	1750	2700	150
tätting	monoftong (14)	tätscheln /ɛ/	500	1925	2650	90
	diftong (35)		500	1900	2650	98
pater	monoftong (26)	Pate /a:/	700	1350		158
	diftong (20)		700	1325		165
spöke	monoftong (28)	Spöke /ø:/	450	1575	2525	162
	diftong (22)		450	1563	2450	162

/i:/ in "pipa" is pronounced as a monophthong by 4 Swedish informants
/y:/ in "typ" " " " " " " 2 " "
/o:/ in "tåt" " " " " " " 1 " informant.

A division on the basis of these test vowels has not been made because of the very small number of informants pronuncing the Swedish test vowel as a monophthong.

MEDIAN AND RANGE OF VARIATION OF THE VOWEL DURATION IN MSEC

The number in parenthesis indicates the number of informants. Recordings have sometimes been rejected because of reading mistakes, difficulty in measuring spectrograms etc. The number of informants varies therefore from phoneme to phoneme. "sv." = the Swedish pronunciation of the German word, "ty." = the German pronunciation of the German word, "m." = the vowel in the Swedish word pronounced as a monophthong, "d." = as a diphthong.

piepen	/i:/	sv.	150	msec.	(47)	var.	bredd.	105–218	msec.
pipa		d.	165	"	(46)	"	"	113–225	"
piepen		ty.	83	"	(22)	"	"	53–128	"
kicken	/I/	sv.	90	"	(50)	"	"	45–135	"
kicka			105	"	(50)	"	"	53–150	"
kicken		ty.	60	"	(21)	"	"	30– 90	"
Theke	/e:/	sv.	158	"	(49)	"	"	105–210	"
tekopp		m.	150	"	(9)	"	"	105–195	"
tekopp		d.	150	"	(41)	"	"	120–225	"
Theke		ty.	120	"	(21)	"	"	98–158	"
Täter	/ɛ:/	sv.	158	"	(50)	"	"	90–233	"
täta		m.	158	"	(37)	"	"	188–195	"
täta		d.	165	"	(13)	"	"	135–225	"
Täter	/e:/	ty.	113	"	(19)	"	"	83–150	"
tätscheln	/ɛ/	sv.	94	"	(50)	"	"	68–180	"
tätting		m.	98	"	(14)	"	"	68–135	"
tätting		d.	113	"	(36)	"	"	68–158	"
tätscheln		ty.	68	"	(22)	"	"	53– 90	"
Pate	/a:/	sv.	158	"	(50)	"	"	105–203	"
pater	/ɑ:/	m.	158	"	(26)	"	"	113–188	"
pater		d.	173	"	(19)	"	"	120–218	"
Pate		ty.	150	"	(22)	"	"	128–188	"
packen	/a/	sv.	105	"	(50)	"	"	68–173	"
packa			120	"	(50)	"	"	68–195	"
packen		ty.	68	"	(22)	"	"	53–105	"
Typus	/y:/	sv.	135	"	(49)	"	"	83–210	"
typ		d.	188	"	(48)	"	"	120–248	"
Typus		ty.	60	"	(21)	"	"	45–98	"
Stück	/Y/	sv.	120	"	(50)	"	"	75–165	"
styck			143	"	(49)	"	"	90–203	"
Stück		ty.	90	"	(20)	"	"	68–143	"
Spöke	/ø:/	sv.	162	"	(50)	"	"	113–210	"
spöke		m.	173	"	(28)	"	"	128–210	"
spöke		d.	188	"	(22)	"	"	135–225	"
Spöke		ty.	132	"	(20)	"	"	105–158	"
Stöpsel	/œ/	sv.	98	"	(49)	"	"	60–128	"
stöppla			120	"	(50)	"	"	75–150	"
Stöpsel		ty.	71	"	(22)	"	"	53– 90	"

Appendix 8

Kuhkalb	/u:/	sv.	120	msec.	(49)	var.	bredd.	75–225	msec.
kok		d.	188	"	(49)	"	"	105–233	"
Kuhkalb		ty.	79	"	(22)	"	"	53–120	"
Butter	/ʊ/	sv.	113	"	(50)	"	"	53–158	"
bott			150	"	(48)	"	"	105–203	"
Butter		ty.	75	"	(21)	"	"	45–105	"
tot	/o:/	sv.	188	"	(50)	"	"	120–278	"
tåt		d.	195	"	(48)	"	"	128–255	"
tot		ty.	173	"	(21)	"	"	135–218	"
Pocke	/ɔ/	sv.	94	"	(50)	"	"	30–135	"
pocka			98	"	(50)	"	"	53–135	"
Pocke		ty.	64	"	(20)	"	"	45– 90	"