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IDENTIFICATION TEST CONCERNING ISOLATED DISYLLABIC SWEDISH ACCENT 1 AND ACCENT 2 WORDS

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INTRODUCTION

A characteristic feature of the prosody of Swedish (and other Scandinavian languages) is the word accent (word tone, toneme), giving an opposition between words with acute accent (accent 1) and grave accent (accent 2). The opposition is limited to polysyllabic words. The distribution rules are fairly uniform in all Scandinavian languages. In generative descriptions of Norwegian and Swedish accent 2 is considered to be marked and accent 1 is treated as stress. From a communicative viewpoint the constructive function of accent 2 is the most important, as it signals connection between syllables within the same word (Elert, 1970).

The word tones are manifested phonetically as a difference in the fundamental frequency curve of the syllable sequence. Perceptually this is the most important cue for word accent distinction (Malmberg, 1955). In minimal pairs the tone curve is the only distinctive factor within one and the same dialect (e.g. ´anden, "the duck", accent 1 and `anden, "the spirit", accent 2).

The accent opposition exists with a few exceptions in all Swedish dialects. The phonetic realizations of the accents display a great variety of pitch patterns for different dialects. This has been shown in several investigations. On the basis of Meyer's (1937, 1954) material of bisyllables in statement intonation Gårding and Lindblad (1973) set up a tentative tonal typology for Swedish dialects (Table 1). Many listening tests have been carried out to test the intelligibility of the word accents in isolated words within and between dialects (Hadding 1961; Johansson 1970; Fintoft 1970). In all these investigations the listening groups made the highest identification score when they listened to their own dialect, which is taken

to confirm the assumption that a listener's own fundamental frequency patterns are perceptually important.

The different dialect manifestations of the word accents in Table 1 have also been reported by other researchers than Meyer. There are several collections of accent data from southern Swedish (1A) and Stockholm Swedish (2A), e.g. Malmberg (1955), Hadding (1961), Gårding and Lindblad (1973) (Fig. 1). The available accent data from the island of Gotland (1B) (Klintberg 1884; Pettersson 1953; Gårding and Lindblad 1973) shows one peak each for the two accents. Klintberg's descriptions were based on purely auditory observation. (Cf. also below.)

THE PRESENT INVESTIGATION

Purpose

The present investigation uses listeners speaking the dialect of Gotland (1B) in a listening test with isolated disyllabic accent 1 and accent 2 words. The purpose of the investigation is to test the validity of earlier results in similar tests and to try to answer a few questions regarding the typology mentioned above, where Swedish dialects are divided into two main groups according to the pitch curve of accent 2.

As mentioned, the listener seems to be dependent on his own fundamental frequency pattern when identifying isolated accent 1 and 2 words. We cannot interpret acoustic data in perceptual terms (there is no one-to-one correspondence between the levels) but Table 1 raises several interesting questions. The dialects of Skåne and Gotland have pitch curves of a similar type, i.e. one peak in each accent. How will that affect the listener's identification ability? According to Table 1 the position of the pitch peak is the same in accent 2 of 1A (Skåne) as in accent 1 of 1B (Gotland). What effect will this resemblance have on the results of a listening test? What is the perceptual relationship like between the dialect of Gotland and those in the other groups? Both Hadding (1961) and Johansson (1970)

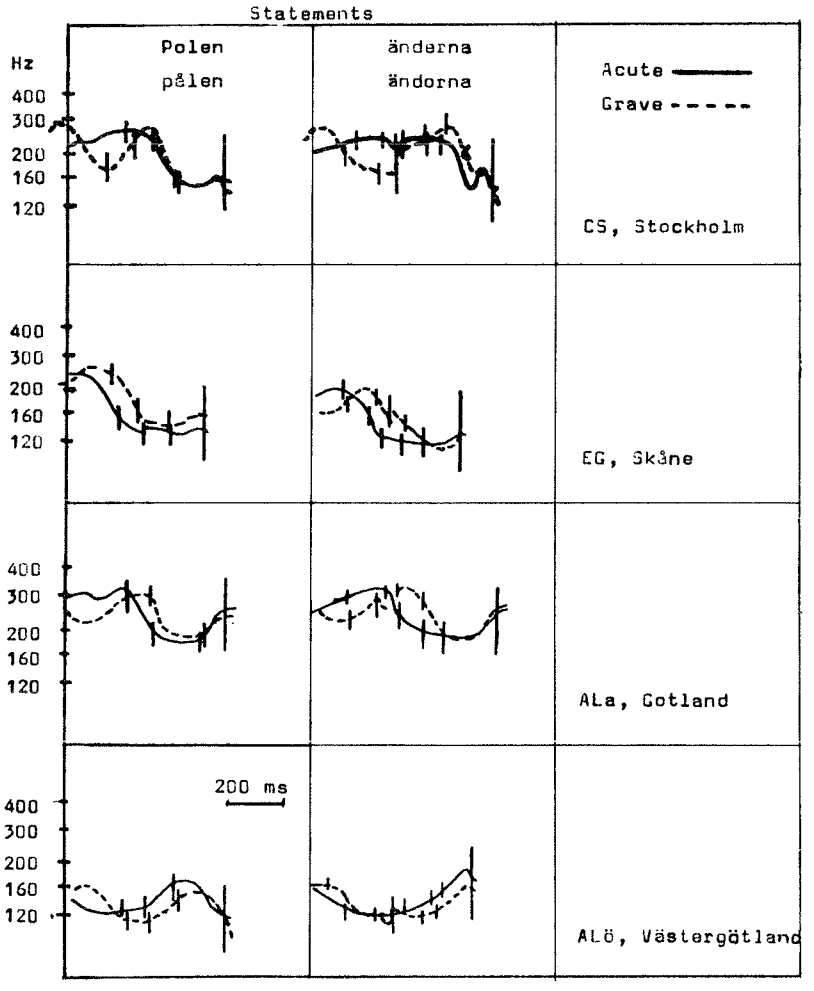

Fig. 1. Dialect variation of accents in statements.
From Gårding and Lindblad (1973).

	Accent 1	Accent 2	Region
Type 0	One peak In the stressed syllable	One peak In the stressed syllable	Isolated marginal cases in the far north and in Finland
	No distinctive difference		
Type 1	One peak	One peak	
Type 1A	Early in the stressed syllable	Late in the stressed syllable	South (former Danish provinces)
Type 1B	Late in the stressed syllable	Early in the post-tonic syllable	Gotland (in the Baltic), Dalecarlia
Type 2	One peak	Two peaks	
Type 2A	In the stressed syllable	One in each syllable	Central Sweden (Svea dialects)
Type 2B	In the post-tonic syllable	One in each syllable	Between southern and central Sweden (Göta dialects)

Table 1. Tentative tonal typology for accent in Swedish dialects. From Gårding and Lindblad (1973).

reported more correct responses to the accent 2 words. Will the proportions be similar in this test? If so - how can this be explained? Furthermore, are there any perceptual differences between listeners from different parts of the island? Does recognition of a dialect improve a listener's ability to identify isolated accent 1 and accent 2 words?

The test words

A listening test was designed with accent 1 and accent 2 words (minimal pairs) from the four dialect areas mentioned above (Skåne, Gotland, Stockholm and Västergötland). The words were presented in random order and the listeners were asked to give the meaning of each word (forced choice). Essentially the same method was used by Kloster-Jensen (1961), Hadding (1961), Johansson (1970) and Fintoft (1970).

Considering the purpose and procedure of the investigation the selection of disyllabic test words was made with the following points in mind:

1. Their segmental differences should not vary too much between the dialects[1].

2. The minimal pairs selected should have different vowel manifestations in the stressed syllables.

3. The meaning of the words should be unambiguous and easily understood.

4. The words should be natural and common to the listeners.

5. It must be possible to visualize the meaning of each word by drawing a simple picture.

The following pairs were chosen:

accent 1	accent 2
´vaken "the hole in the ice"	`vaken "awake"
´skotten "the shots"	`skotten "the Scot"
´anden "the duck"	`anden "the spirit"

The test words were read in the sentence frame jag såg ... där (I saw ... there)[2].

The relationship between the word tones and the sentence intonation has been studied by Hadding (1961). She found that accent distinctions are preserved in different intonation patterns, even in rapid speech. In a comment on Fintoft (1970), Witting(1972, p. 41) says that the sentence intonation may affect the accent of a word in final position of an utterance. He thinks it is unfortunate that Fintoft has chosen to present the test words at the end of a carrier sentence. The frame jag såg ... där was used by Gårding and Lindblad (1973), where the speaker was asked to pronounce the sentences as neutral pieces of information. The same procedure was used in this test. All the words are recorded with the intonation pattern of a neutral statement[3].

The speakers

Speakers were selected according to the typology in Table 1. They were all considered to be typical representatives of their respective dialect.

Information about the speakers:

1A (Skåne): M, male, age 33. Grew up in Malmö. Parents from Skåne.

1B (Gotland): W, male, age 38. Grew up in Visby. Parents from Gotland.

2A (Stockholm): B, male, age 27. Grew up in Stockholm. Parents from Stockholm.

2B (Västergötland): L, male, age 39. Grew up in Västergötland. Parents from Västergötland.

Before the recording sessions the speakers read the sentences aloud and the meaning of each test word was discussed. The recordings were made in the language laboratory (learning studio) at the high school in Visby (Säveskolan) with the following recording equipment:

Beocord tape recorder, type 4132
Microphone AGK D 190 C
Agfa-Geavaert tape PE 21 LP (tape speed 19 cm/s)

The speakers listened to their speech afterwards and checked the recordings.

The listeners

Listeners were taken from the high school in Visby. The selection was made at random and was dependent on the availability of pupils at the time the studio was free. Fintoft (1970, p. 53) also used pupils at secondary schools and says that since linguistic habits "are more or less fixed after the age of about 15, it is the region where the subjects lived during these first years of their life that matters when the regional homogenety of the population is under consideration".

Number of listeners	Sex	Age	
4	male	16	
11	female		
16	male	17	
17	female		Total number
2	male	18	
15	female		of listeners
2	female	19	
1	female	20	68

Table 2. Distribution of listeners according to age and sex.

Table 2 shows the distribution of the listeners according to age and sex.

The listening test

The method of presenting the stimuli to the listeners has varied in other listening tests concerning isolated accent 1 and accent 2 words. Hadding (1961) used pictures for the identification. In Johansson's perceptual experiments (1970) the listeners (beginning students of phonetics) were instructed to mark each stimulus word "1" or "2". Fintoft (1970) used minimal pairs which were orthographically different. The listener's task was to identify the words as belonging to one of two specified phrases. Fintoft mentions that there may be some problems in identifying the phonemes when hearing short segments. In the present test both text and pictures were used, so that the listeners knew which segments they would hear before the actual identification (Fig. 2).

After the test words had been isolated from the frame sentence the material was transferred to another tape (two Beocord type 4132 tape recorders were used, tape speed 19 cm/s). The six test words appeared on the listening tape three times per speaker and were

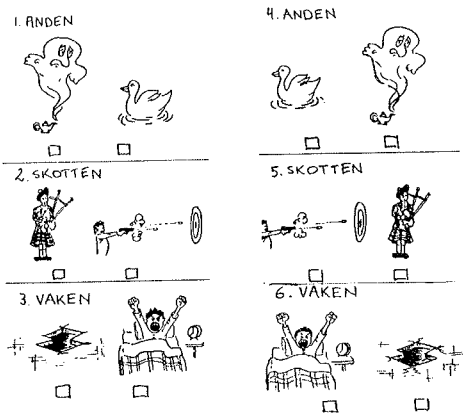

Fig. 2. Example of answer sheet.

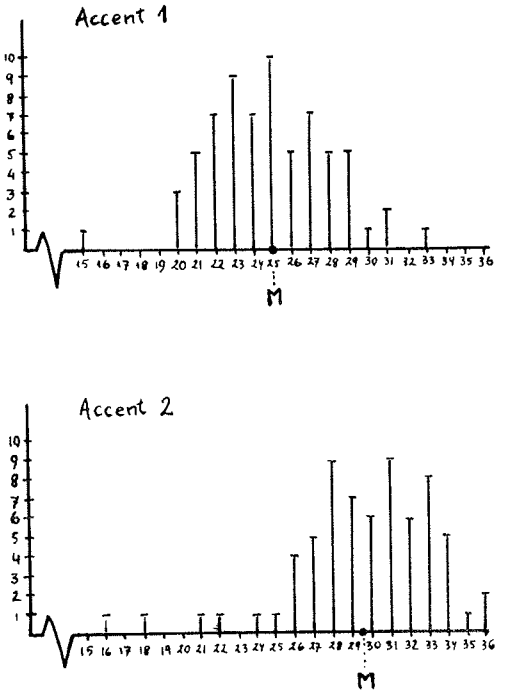

Fig. 3. Number of listeners (on the y axis) per correctly identified stimuli (on the x axis) and mean values (M) for accent 1 and 2.

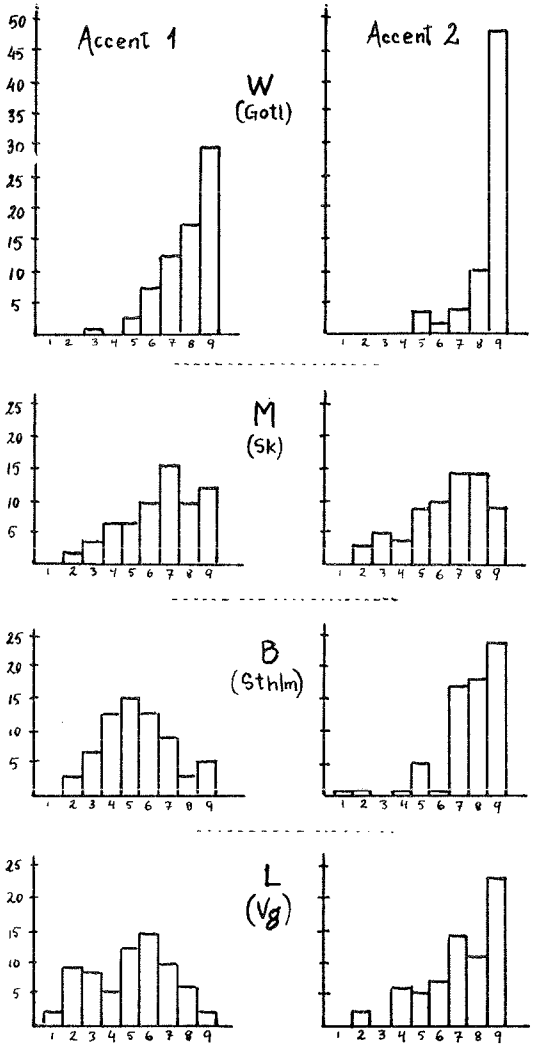

Fig. 4. Number of correct responses (on the y axis) per stimuli (on the x axis) for the accents of the speakers.

presented to the listeners in random order. Between words there was an interval of about 5 seconds and just before each word a ring was heard. After every tenth word a longer pause was made (10 seconds).

Before the test started the listeners were asked for personal data. They also wrote where they lived now and where they and their parents had grown up. In addition they read the following instruction: "You will hear a number of words. Before every word you will hear a ring. Give the meaning of each word by marking a cross in the appropriate square under each picture".

The listening test - with four testing sessions - took place in December 1974 in the language laboratory at Säveskolan, Visby. The tape recorder was the same as the one used when the material was recorded. Earphones: Primo Dynamic Head Phone, DH-843 L. After the test, which required nearly 15 minutes to complete, the listeners were asked to name the dialects they had recognized.

RESULTS

77 subjects took part in the listening test. 68 of these had grown up on Gotland and with few exceptions had parents from the island. The other 9 had grown up in other parts of Sweden and their results were left out. This gave 4896 judgments, 72 per listener. The total number of correct responses was 3700, 1688 (68.9 %) for accent 1 and 2012 (82.1 %) for accent 2 (see histogram in Fig. 3). It has been mentioned that Hadding (1961) and Johansson (1970) reported higher scores for the accent 2 words. The same observation can be made from the present investigation. Table 3 and Fig. 4 show the distribution of correct responses for the different speakers.

In Hadding's (1961) investigation the identification scores depended on the listener's dialect and on his familiarity with the dialect of the test words. Johansson(1970) also found that the identification of isolated accents was dependent on the listener's own dialect pattern. Fintoft (1970) reported that listeners identified the word accents of their own dialects significantly correctly. The same can

	1A M (Sk)			1B W (Gotl)		
accent	1	2	1+2	1	2	1+2
correct responses	446	433	879	536	572	1108
%	72.9	70.8	71.8	87.6	93.5	90.5

	2A B (Sthlm)			2B L (Vg)		
accent	1	2	1+2	1	2	1+2
correct responses	362	517	879	344	490	834
%	59.2	84.5	71.8	56.2	80.1	68.0

Table 3. Number of correct responses per accent and speaker

be said of the present investigation. Speaker W (Gotland, 1B) received the highest recognition score, 90.5%. It should also be noted that 6 listeners were responsible 30% of theincorrect responses for W.

The figures for M (Skåne, 1A) show that M's accent 2 words did not get as high recognition scores as those of the other speakers. The relation between the scores for M's accent 1 and accent 2 words is more even than for the other speakers. As we have seen the pitch curves of Skåne and Gotland both have one peak in the two accent types. If the fundamental frequency pattern of one's own dialect is perceptually important this resemblance has obviously both helped and confused the listeners. The relatively high value for M's accent 1 indicates some degree of certainty. On the other hand the resemblance between the accent 2 pitch curve of Skåne and the accent 1 pitch curve of Gotland has made the listeners hesitate about M's accent 2 words compared to those of B and L.

Other factors are also perceptually important, at least concerning the present material. This is evident from the number of correct responses per word and from the scores for the accent 1 words of B (2A)-Stockholm. There is a certain resemblance between the accent 1 pitch curve of type 1B (share by the listeners) and that of type 2A

(Stockholm), and one would expect high scores, which is also the case for the word ´vaken (accent 1 - see below). Furthermore, the pitch contour of accent 1, type 2B, resembles that of accent 2, type 1B (the listeners' own). The scores for L's accent 1 words are consequently low (56.2%) but the listeners have not consistently interpreted stimuli as accent 2. The fact that the fundamental is an important cue for recognizing the accents does not imply that it is the only factor involved in interdialectal perception. Malmberg (1959) points at the functional similarity and mentions that a native Sweidish listener meeds only hear a few sentences in an unfamiliar dialect before he can identify the accents. Fintoft (1970, p. 70) assumes that "listeners use different reference patterns for each dialect, which implies that listeners do not match the fundamental frequency patterns in other dialects with the patterns in their own. The assumption further implies that listeners estimate the dialect and match the fundamental frequency in a stimulus with the corresponding reference patterns. Sound quality differences between the dialects, and probably the frequency patterns in the complete words, may contribute to identify the dialects. Tonemes in dialects which are little known or unknown to the listeners seem to be interpreted according to the fundamental frequency patterns in the listeners' dialects. Responses to synthetic speech confirm this assumption".

In Fintoft's investigation many listeners obtained higher scores at the end of the test than at the beginning. In the present investigation 55 of the 68 listeners said they recognized dialect type 1B (Gotland - the listeners' own dialect), 48 type 1A (Skåne), 19 type 2A (Stockholm) and 5 type 2B (Västergötland)[4]. However, these groups have not made higher average identification scores than the others for the recognized dialects. According to Fintoft, most misinterpreted stimuli would occur at the beginning of the test, before the dialect had been recognized. But the mistakes are evenly spread over the whole test for all listeners.

The scores for accent 2 of each speaker are high compared to those for accent 1 (the only exception is M - 1A): W (1B) 93.5%, B (2A)

84.5%, L (2B) 80.1%, M (1A) 70.8% . Hadding (1961, p.71) tested a tentative assumption that the accent 2 of different Swedish dialects has some characteristics in common and found that "most unanimous correct responses were noted for Accent-2 words in all dialects". In a separate report of the test, Hadding (1962, p.637) writes that she found "an evident similarity between the tonal patterns of the stressed syllable of the Accent-2 words of the five dialects, viz., a distinct high, while the tonal patterns of Accent 1 were much vaguer and seemed to have no stable characteristics, except in southern Swedish".

Johansson (1970, p. 54) also noticed "a tendency to higher scores for the grave words. ... The grave accent is, however, generally considered to be marked, and in a number of perceptual experiments I have noticed that listeners tend to favour the marked member of an opposition, when a stimulus is felt to be somewhat 'strange'".

Malmberg (1962, p. 473) pointed out the relationship between the levels: "après avoir constaté le manque de correspondance entre la courbe de fréquence enregistrée et la forme mélodique perçue je me suis demandé si, malgré tout, il ne serait pas possible de trouver un point commun entre, disons, l'accent à Stockholm et le même accent dans le sud. ... Dans les deux dialectes, l'accent 1 est le type neutre (plus simple, moins spécifique), l'accent 2 le type caractérisé - le terme positif de l'opposition. C'est l'accent 2 qui est marqué ("merkmalhaftig"), l'accent 1 qui est non-marqué ("merkmallos"), ce qui est en parfait accord avec les faits fonctionnels".

Fintoft (1970, p. 276), discussed the concept of complexity and said that "it seems possible to regard the two tonemes as simple as opposed to complex. ... We may assume that the judgments of simple versus complex may differ somewhat from one dialect to another. The different potential cues may be more or less important to the different listener groups. We may also assume that one cue may override the effect of another. The judgement of simple versus complex is thus presumably based on the combination of all the

potential cues ... it seems as if there is some preference for toneme 2 when the frequency pattern may be characterized as complex".[5]

In the present investigation the listeners' identification score for accent 2 seems to be related to this complexity. The unknown dialects with an accent 2 pattern with two peaks have received the largest number of correct responses. All the listeners can be said to have experience of the dialect, type 2A (Stockholm), and to know it well enough from TV and radio speakers, teachers, visiting lecturers, friends who have moved from the region, travelling etc. Familiarity with the dialect cannot alone count for the high scores. In that case the number of correct responses for accent 1, type 2A, would have been larger. Instead, the listeners seem to identify the pitch pattern of each word by comparing it simultaneously to their own pattern and to their experience and knowledge of the dialect in question. The complex curves of accent 2 (two peaks) differ very much from accent 1 and from those of the listeners' group and are easily recognized. These remarks can also be applied to the result for L (2B).

The scores for M (1A) can be interpreted on this basis, too. There is a similarity between the fundamental frequency patterns of type 1A and type 1B (the listeners') and the scores suggest hesitation on the listeners' part. They have not known the pitch pattern of dialect 1A well enough (segmental differences may have helped them to recognize the dialect) and isolated words have been identified according to the listeners' own fundamental frequency pattern[6].

No perceptually related difference was found between male and female listeners. Nor was there any difference between the results of the 28 listeners from Visby compared to those of the 40 listeners from other parts of the island.

Table 4 gives the identification scores in per cent for each word and speaker.

The scores for M (1A) show a strikingly small difference between the correct responses of the accents within each minimal pair (in no case over 2%). Another conspicuous feature is the relatively high values

	M(1A)	W(1B)	B(2A)	L(2B)
´vaken 1	60.7	73.5	85.7	71.0
`vaken 2	59.8	90.1	78.4	78.4
´skotten 1	89.2	97.5	49.0	54.4
`skotten 2	90.6	95.0	84.3	88.7
´anden 1	66.6	91.1	42.1	41.6
`anden 2	64.7	96.0	91.6	72.5

Table 4. Number of correct responses per stimulus and speaker (%)

of ´skotten (1) and `skotten (2) for speaker M and for speaker W (the listeners' own dialect). The discussion above about the relationship between the listeners and their ability of accent identification is best illustrated with the scores of skotten (1 and 2) for all speakers: Accent 2 of B (2A) and L (2B) - complexity - obtains high scores (84.3 and 88.7%, respectively), whereas their accent 1 gets low scores (49 and 54.4%, respectively). The scores of anden (1 and 2) for B and L are similar, though the score for L's accent 2 is considerably lower (72.5). The listeners have, on the other hand, reacted differently to vaken (1 and 2). The scores for accent 1 are high (B 85.7% and L 71.0%). A reasonable explanation could be that the pitch curve of the long vowel was more easily perceived and related to a pattern (B (2A) - Stockholm) already known to the listeners.[7]

The figures of Table 4 may also indicate a connection between the degree of intelligibility of a word and its segmental phonetic manifestation. Fintoft (1970, p. 312) mentions this question: "It is reasonable to assume that potential cues such as duration and intensity variations and vowel quality, in some cases, may point in a direction other than the frequency cue, as these cues seem to be less stable than the f_0 patterns. Particularly when listening to another dialect, it seems reasonable that some of these cues may override the f_0 cue. The different features, not only the f_0 patterns, seem to be different in the various dialects. Each dialect has apparently different rules for the assignment of the toneme pattern."

Fig. 5. Spectrograms of the test words vaken and anden (both accents).

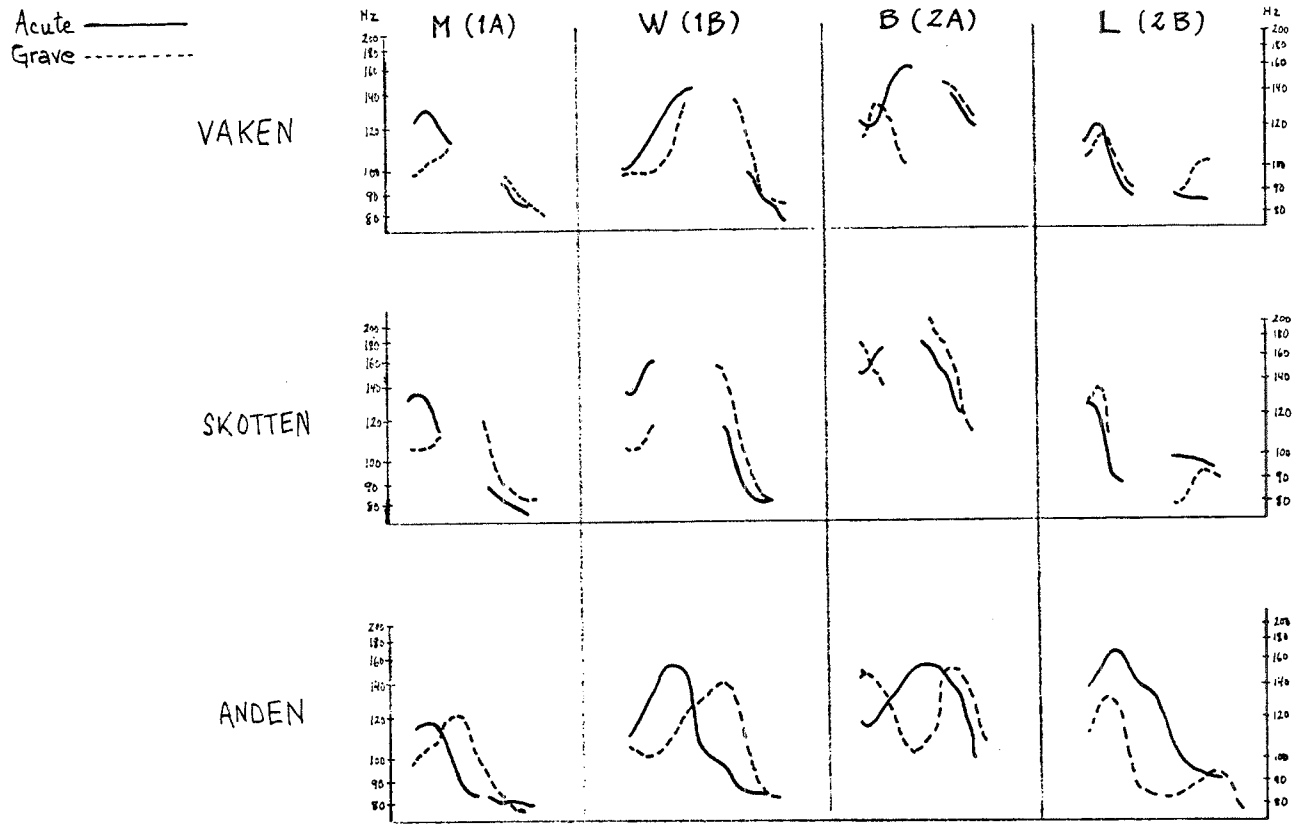

Fig. 6. Pitch curves of the test words traced from mingograms.

DISCUSSION

Pitch patterns of the test words

Narrow band spectrograms of the test words vaken and anden are shown in Fig. 5 and f_0 curves of all the test words, traced from mingograms, in Fig. 6. The different fundamental frequency patterns corroborate the results obtained by earlier investigators. The two peaks of B's and L's accent 2 words are clearly visible. The grave words of M andW have only one peak. ´Vaken (1) of W is not representative of the dialect. The rise of the contour is too slow and smooth and many listeners misinterpreted this word, although it was spoken by W, representing the listeners' own dialect.

A comparison between the identification scores and the pitch curves raises several questions. Is there a connection between the degree of intelligibility of a word and its segmental phonetic manifestion? One is apt to think that the "short" vowel and the broken f_0 curve in skotten would make the word more difficult to recognize than the others. Instead, skotten obtained high scores, especially for M and W. Are certain segmental combinations more easily interpreted than others and are they dialectally related?

We do not know how dialects are recognized. The listeners who recognized the dialects were not able to get higher identification scores than the others, which is rather surprising. Thus it seems as if the recognition of a dialect is based on the different sound qualities, which then would be a more important cue than the fundamental frequency of the accents.

We have seen that the accent 2 words of B and L (acoustical complexity) got high identification scores. The listeners have been able to learn the accent 2 patterns of these dialects but have failed to respond correctly to the accent 1 patterns. Maybe this is connected with the functional similarity of the accents in the dialects. The constructive ('connective') function of accent 2 is present in every utterance. Since the distribution rules are uniform it is possible for a listener to master the accent 2 pattern perceptually after he has heard a few sentences of a dialect unknown to him. Is it then possible for him

to identify isolated words as well?

Various types of listening tests would probably throw more light on these and other questions concerning speaker-listener relations.

NOTES

1. The following facts were taken into consideration:
   The /r/ sound: The dialect of Skåne is the only one in the group with a fricative uvular [ʁ]. The dialect of Skåne has no supradentals. The dialect of Skåne and Gotland both have diphthongization of long vowels. The difference was considered to be least in /a/.

2. For ˋvaken (awake) the frame jag låg...där (I lay...there) was used.

3. As the intonation pattern varies in the four dialects it is possible that the final fall of f_0 in the frame sentence in some dialects may influence the pitch curve of the test word. Perceptually this is probably of no importance. (G. Bruce, personal communication.)

4. Segmental differences between the words may also serve as cues to the identification of a dialect.

5. Witting (1972) doubted the validity of the description for dialect type 1.

6. The responses from the listeners who were excluded from the investigation confirm Hadding's observation (1961, p. 70) that "listeners who had lived in more than one part of Sweden showed, as a group, better results than the group that did not report any such previous experience of more than one dialect".

7. The relatively few correct responses to W's ˊvaken (1) (the listeners' own dialect) was caused by a stimulus that was not representative of accent 1 of the dialect.

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