

## Chapter 9

### Perception of dialect distance:

#### Standard and dialect in relation to new data on Dutch varieties

Ton Goeman

The contrast that is the theme of this congress — “own” “opposite” “foreign” — is also present in the relationship between standard language and dialect. The pressure from the standard language on dialects is very strong and is felt in the whole of the Dutch language area. As a counterforce, there is at the same time a *Dialektwelle*, to use the German expression, or a dialect boom, most strongly felt at the periphery. In the West of the country the relation is more problematic. The dialects of the province of South Holland are very close to the spoken variant of Standard Dutch, and dialect speakers there merely think of their dialect as a pronunciation variant of the colloquial standard, possibly as one which is somewhat sloppy or ugly. This folk concept means that one has to approach potential informants for the fieldwork I am going to talk about differently, depending on whether they are inhabitants of the West or not. For example, one may say in the eastern parts of the country that one is doing dialect research. In the West the word *dialect* is painfully resented. I asked an informant whether he often spoke his dialect at home, and I had a strong reaction: Certainly not, the idea was foreign. They did not speak a dialect, but people from the East certainly did. They themselves spoke ordinary Dutch. When I asked what he spoke at home and with his neighbors, he said: “Oh, that’s another story, at home we talk *plat* [i.e., vernacular].”

There is a second, more simple, aspect of this contrast “own — foreign” with respect to dialects. That is, one’s dialect is one’s “own,” and the other dialects are “foreign,” or more or less foreign. And on this dimension speakers have some outspoken ideas too, positive as well as and negative ones.

In what follows I will relate this double contrast of “own — foreign,” the contrast dialect — standard language and the contrast dialect — dialect, as seen by the speakers themselves to some internal linguistic features of dialect behavior: (a) word-final t-deletion, e.g. *hij loopt* versus *hij loop* (he walks), (b) vowel-shortening, e.g. *lopen* - *hij loopt*, the length of the vowels being long [o:], half-long [o.], or short [o], and (c) the counterpart of vowel shortening, hypercorrect vowel lengthening.<sup>1</sup>

### **1. Judgments of dialect speakers on “own” and “foreign”**

Subjective judgments from dialect speakers about which dialects in their neighborhood are more or less the same as their own were used in the Netherlands to establish a classification of dialect regions. For example, there are the map of Dutch dialects by Daan (1970), the maps for the Brabant (published in 1944) and Limburg dialects by Weijnen (1966), the map for South Holland and Utrecht by Goeman (1984), and, for the eastern part of the Netherlands and adjacent Germany, the map by Kremer (1984). Weijnen called the means of determining these regions the “little arrows method,” based on the fact that he drew an arrow from A to B when B was considered by a respondent from A as more or less the same dialect

as his or her own, A. In this way one gets clusters of localities, and between those clusters empty spaces are found that form the dialect boundaries of which the speakers are conscious.

Daan's map contains information over and above this classification, showing which dialects diverge more from the standard language and which ones less. This rank order does not follow from the judgments themselves, but was imposed by Daan on the speakers' classification on the basis of expert knowledge of internal linguistic dialect structure.

The underpinning of her determination of distance from the standard lies in the fact that South Holland can be considered to be the cradle of the general standard language (Daan 1964), and more than a century ago this idea was already outlined by Johan Winkler (1874), who considered the rural dialects of South Holland to be the spoken variant of the standard language (Berns 1981). We must keep in mind that 19th century Standard Dutch did not yet have a definite norm for a spoken variant. The situation was even more intricate, because the written standard had a strong southern, Brabant flavor. Genetically and geographically the recent make-up of the Holland dialects is strongly related to the standard language. This is also the opinion of the speakers themselves, as exemplified in the anecdote of the South Holland speaker I mentioned before. Winkler situated the authentic "Standard = Hollandic" just to the south of the Old Rhine river. This idea is corroborated in modern dialects, where the subjective judgments of dialect speakers show a relatively isolated group of dialects between the Old Rhine and Hillegersberg, one which is different from Delflands to the southwest, different from the dialects along the Old Rhine, and from those of the city of Gouda with its hinterland of the Krimpenerwaard (Goeman 1984); see Figure 9.1. Van Hout and Münsterman (1981) operationalize the geographical position of the standard language in a similar way: halfway between Utrecht and The Hague.

(@@Insert Figure 9.1 here.)

(a) On the basis of this consensus, I constructed a scale measuring the subjective distance of a certain dialect from the standard language by taking the cluster of South-Holland dialects as locus of the standard language (Goeman ms). The judgments were weighted, and the shortest chain was taken from each dialect to the Holland geographical cluster. The weighting was done as follows:

- 0.5 when locality A and locality B judge each other as similar
- 1.0 when locality A judges locality B as similar but B is neutral with respect to A
- 2.0 when locality A judges locality C as similar and B does so too, but C remains neutral with respect to A and to B
- 3.0 when there is no connection between A and B

Summation over the chain from each dialect to the center of the standard language gives a measure based on the perception of dialect similarity and difference.<sup>2</sup>

Here I will apply two other indicators that are based on the aforementioned perceptual judgments. Like the distance measure, they trade on the fact that these similarity judgments are pre-eminently tied to direction.

(b) We are now in the position to analyze whether dialect speakers have a strong propensity to consider everything around them as familiar (which will result in an even geographical dispersal in all directions of the dialects judged similar) or whether their

judgments show strong direction effects (in which case a pattern will show up with less dispersal, where the dialects judged similar are in the majority in a certain direction). In the last case there will be no mean direction: see Figure 9.2 — dialect C. In the first case there is such a mean direction: see Figure 9.2 — dialect A and Figure 9.1 — dialect B.

(@@Insert Figure 9.2 here.)

(c) The third measure that I will propose is the mean deviation of the dialects judged similar from the main direction to the geographical center of the standard language (measured as the angular deviation of the mean direction<sup>3</sup>), see figure 9.2. The dialects whose speakers judge their own to be more similar to the dialects that are diametrically positioned as to the geographical position of the standard language are strongly oriented in a direction away from the center of the standard language and may be more divergent from the standard language (see Figure 9.2 — dialect B) than those that are considered to be more similar to the dialects positioned in the direction of the center of the standard language (see Figure 9.1 — dialect A).

We may expect that the dispersal and deviation measures will be not such good indicators as the distance measure. The ones first mentioned are strongly locally bounded and function as ‘more or less one’s own.’ The last mentioned one does not show this drawback, and we may expect that it will give a better account of the more global situation of ‘more or less foreign.’

## **2. Dialect data: Towards a variationist dialectology.**

Recently, Goossens (1986) argued that one of the urgent tasks for dialectology was the development of a variationist dialectology. He illustrated the importance of this task by noting variation in areas with dialect mixture — on the one hand between dialects, on the other hand, the variation within regions that came into existence by the interaction of the standard language, the regional vernacular, and dialect. This is a complex field of inquiry, where “foreign,” “own,” and “appropriated” flow into each other.

Over and above these aspects of variability mentioned by Goossens, there exists other dialect internal variation of a purely linguistic character. This is the field of free variation, variation in complementary distribution of variants, lexical diffusion, and system-bound variation, in which forms of variation exist across and within dialects as well. To do reliable research in this area, we need to have a systematic, extensive, and generally comparable database in order to leave behind us ‘occurring/non-occurring dialectology.’ The two possibilities — ‘occurring/non-occurring’ — are the mere extremes of an interval with all possible positions between. By accounting explicitly for this inherent variability, there are more opportunities to solve a number of research questions, including even many in traditional dialect geography. Historical dialectology has already taken this step in the Netherlands and Belgium (e.g., the work on Old French of the Dutch linguist Dees, the work of Goossens on Middle Dutch, and, for 14th century Dutch dialects, the work of Mulder and of Van Reenen). A joint Dutch-Flemish committee of dialectologists has formulated a project<sup>4</sup> for such a new systemic database.

This plan is less extensive than the Series of Netherlandic Dialect Atlases (Reeks Nederlandse Dialectatlassen; RND) with its 3000 localities in the Netherlands and the Flemish part of Belgium (and France), but it is much more intensive. The RND offers only 600 items, not even sufficient for a study of the vowel systems of those dialects. This new project offers more than 1900 items, fully balanced for etymological origin of the vowels and for synchronic allophonic variants according to distribution of vowels and consonants as well. Among other things, pluralization of nouns, adjectival declension, diminution, comparatives, superlatives, and the verbal conjugation of strong verbs are represented. Compared to the RND, the restrictions of that earlier work had to be made up by more extensive collecting: in the Netherlands, recordings were made in 365 localities. Those were transcribed in IPA and entered in a database in which the Meertens Institute and the Free University of Amsterdam collaborated, with help from State University of Groningen.<sup>5</sup> The computerization of the corpus guarantees that this database will not share the fate of many comparable undertakings of the past: that of awe-inspiring, uninterpreted, data graveyards. The aforementioned studies of t-deletion, vowel shortening, and vowel lengthening were already based on the part of the database that was ready.<sup>6</sup>

### **3. Internal linguistic factors: t-deletion, vowel shortening and vowel lengthening**

In earlier studies of word final t-deletion, vowel shortening, and vowel lengthening in Dutch dialects, we reported on the conditioning of these processes by phonetic features of neighboring consonants. T-deletion has to do with articulatory prominence within the

consonant cluster. Vowel shortening and its hypercorrect counterpart vowel lengthening correlated with the sonority of the following consonant. Remarkably, the ‘underlying’ voiced character of this consonant exerted its influence even though the cluster had become phonetically voiceless. We looked at pairs of infinitives and third singular presents.

We concluded that vowel shortening and vowel lengthening are related to each other because they are concentrated in the same area and because they obey the same conditions with the same rank order of strength. In this article we will answer the question whether this relationship holds when we do not aggregate the data by region but when we compare it locality by locality. We offer the following four hypotheses.

I. Vowel lengthening is a hypercorrection and not a natural phonetic process. The hypothesis is that vowel lengthening does not have a relationship to vowel shortening.

II. T-deletion might be an unnatural process too. This is the idea of linguists who take it to be strongly lexicalized (Knott 1986). A relationship with a natural phonetic process such as vowel shortening may thus not exist. In that case, t-deletion will not cause vowel shortening, nor will vowel shortening facilitate t-deletion.

III. Vowel lengthening could facilitate t-deletion on the basis of a sort of syllable balance; in metric phonological terms this may be seen in the comparison of VVC versus VCC, where the last C of VVCC is deleted because VVCC would be a too heavy syllable compared to VCC, and where the last C in VCC is not deleted. If formulated in terms of a condition, we cannot decide which one is the cause of the other: t-deletion causing loss of C in VCC by which the resulting VC lengthens to VVC, or lengthening of V in VCC to VVCC causing the loss of the last C. The only thing we can see is a relationship, if any, and therefore a correlation is possible.



IV. The concept of *shortening* has to be refined. We distinguish between (a) the extent to which there is shortening in terms of the number of cases/word forms shortened, and (b) the strength of shortening in terms of the relationship of long vowel over half-long to short vowel. A dialect that realizes its length contrasts more distinctly will also show more cases of shortening.

#### **4. Extralinguistic factors**

V. We expect that the dialects will differ more and more from the standard language, the more these dialects are at the periphery, in spite of the constant global pressure of the standard language through exposure by general education and exposure to written and audiovisual media. The distance from the standard language according to a speaker's perception will therefore be reflected in his dialect behavior.<sup>7</sup>

VI. With respect to t-deletion Goeman and Van Reenen (1985) have shown a west-east contrast. We expect, therefore, that the west-east dimension will be a significant factor, in contrast to the dimension north-south.

VII. With respect to vowel shortening Goeman and Van Reenen (1985) show a geographical contrast that is mainly north-south. Therefore we expect this contrast to show up again here.

VIII. The measures of dispersion and of deviation away from the center of the standard language will not be copies of the perceptual distance measure. They are of a more

local character as indicators of ‘more or less one’s own,’ and, therefore, may or may not be important.

## **5. Results**

Our procedure is as follows. We test a number of models that incorporate the hypotheses via stepwise multiple regression. In these models we map the direction of influences as represented in our hypotheses above. Consequently, they are causal models. We include the variables that we hypothesize not to exert any influence. The data are from localities in the region shown in Figure 9.3. The fieldwork was done in 53 localities.

(@@Insert Figure 9.3 here.)

The language external factors are a part of every model. Stepwise regression eliminates all non-significant factors from the model. Those factors that are significant remain. The remaining model(s) and their factors should correspond with our expectations according to the hypotheses.

- I. vowel shortening does not cause lengthening; nor does vowel lengthening cause vowel shortening.
- II. vowel shortening does not cause t-deletion; nor does t-deletion cause

- vowel shortening (if t-deletion is unnatural in these regions).
- III. t-deletion causes vowel lengthening; or vowel lengthening causes t-deletion.
  - IV. for vowel shortening, strength of shortening is an important causal factor.
  - V. for t-deletion, vowel shortening, vowel lengthening, and perceptual distance from the standard language center are important causal factors.
  - VI. for t-deletion, west-east is an important causal factor, while north-south is not.
  - VII. for vowel shortening, north-south is an important causal factor, while west-east is not.
  - VIII. local measures may or may not be significant.

The variables t-deletion, vowel shortening and vowel lengthening are count-data (in this case proportions). In order to insure that the distributional make-up of these data is like that of a normal distribution and in order to compensate for any inherent boundedness to 0 and 1 as extremes, these data were transformed by folded logs, a transformation that belongs to a family which includes the logistic transform.

The test of the models had to be carried out in two passes: the first pass included the two local measures of deviation and dispersion, the second pass did not. The reason for their exclusion in the second pass lies in the fact that these measures were not available for certain dialects, either because speakers judged them to be totally different, or simply because there were no subjective similarity data for the localities in the 1980-1990 project. Those localities cannot be included in the analysis. The perceptual distance measure does not have this

drawback; by definition it could be constructed by taking the ‘no connection’ cases into account.

The second pass will give more stable results (estimates) given the fact that there are more data available (e.g., the model result diagrams in Figure 9.4). The arrows from variable to variable indicate the direction of influence “from-to.” The numerical labels on the arrows are the standardized estimates of the strength of the influence. We use these instead of the unstandardized estimates because the scales of measurement are different for each variable, and standardization gives us the opportunity to directly compare the relative importance of the estimates irrespective of difference of scale. Unstandardized estimates retain the original scale. The regression results and analysis of variance for the models can be found in appendix 1. The variables that turned out to be non-significant by stepwise linear regression are indicated by a cross on their arrows.

(@@Insert Figure 9.4 here.)

The results of the second pass correspond to our expectations, with one exception: perceptual distance is not important with respect to vowel lengthening. But this is in line with its hypercorrect character.

These results were also found in the first pass. This model is peculiar in that one of the two more local variables, mean (angular) deviation from center of the standard language, shows a significant influence on t-deletion. The other one (dispersion around) is not important.

One local effect being important and the other not may be in line with Goeman and Van Reenen's (1985) findings that there are two different effects for a part of the area, the western part of the Betuwe that borders South-Holland and Utrecht. Goeman and Van Reenen suggested two effects in this specific region: a long range and a short range migratory effect. This corresponds well with an interpretation of perceptual distance seen as the long range effect, and deviation and dispersion seen as the more local, short range effect.

For t-deletion, the west-east dimension, the perceptual distance from the standard language, and perhaps the geographical orientation away from the standard language of the dialect cluster to which a dialect belongs subjectively are significant factors (t-deletion first pass compared to t-deletion second pass).

For vowel shortening, the strength of the short-long contrast, the dimension north-south, and perceptual distance from standard language are important.

For vowel lengthening, the only significant factor is the geographical dimension west-east.

These results mean that t-deletion, vowel shortening, and vowel lengthening are not only independent from each other, but that they do not influence each other, each one being an insignificant causal factor for the other one as the models in Figure 9.2 show.

Returning to our hypotheses:

- I. Vowel lengthening is hypercorrect and not natural (there being no relationship with the natural process of vowel shortening).
- II. T-deletion is not related to the natural process of vowel shortening, but it is also not related to the unnatural process of vowel lengthening; the

question of its naturalness remains open.

III. There are no indications for syllable balance; vowel lengthening is not related to t-deletion, nor is t-deletion to lengthening.

IV. Dialects with strong length contrasts do show more cases of vowel shortening.

V. Perceptual distance from the standard language has a role in language behavior as witnessed by the processes of t-deletion (with less distance) and vowel shortening (with more distance).

VI. T-deletion shows a clear west-east effect indeed.

VII. Vowel shortening shows a clear north-south effect.

VIII. The subjective local measure deviation from standard language may play a role in t-deletion (less deviant).

With respect to t-deletion perceptual distance and deviation from the standard language correspond with respect to the direction of the effect: the less distant, and the less deviant in orientation the dialect cluster is from the locus of the standard language, the more t-deletion there is.

The standard language does not show t-deletion, and when it does, it occurs mainly within words and not word finally. How can we interpret the result that t-deletion does occur more when the perceptual measures are less distant and less deviant? A possible explanation would be one of polarization: a smaller perceptual distance from and an orientation towards the standard language provokes the need to polarize behavior with respect to the generally present but, in this case, geographically nearby mighty ‘brother’ that the standard language

is. More distant dialects might not feel this need. Other aspects of dialect behavior such as vowel shortening are not used to polarize and correspond more to the perceptual measures.

In Figure 9.3 we give the geographical distribution of the negative and positive residuals of the predicted values for the natural process of vowel shortening. This gives an indication where vowel shortening is used either less or more than predicted by the model. We see that other regions than the river area have also relatively more shortening than predicted by the model. This is especially the case in South Holland, although values there are lower than they are to the east. Consequently, there is no salient ‘brother’ model in the locus of the standard language to polarize against in this case.

We will end with a very global conclusion: the subjective evaluation of ‘own’ and ‘foreign’ is an important factor in language behavior besides other language internal and language external factors.

## Notes

1 See for t-deletion in dialects: Goeman and Van Reenen (1985a), Goeman (1986) en Goeman (ms.). The first is about internal linguistic conditions, the second is concerned with the reliability of dialect survey data and the third is about the relative importance for t-deletion of geographical position, distance from the standard language and social factors. For vowel shortening and vowel lengthening see Goeman and Van Reenen (1985b) and Goeman and Van Reenen (1986).

2 In the aforementioned study we measured distances to the outer boundaries of the Holland cluster. Perceptual distance, measured this way, correlated too strongly with geographical distance, and we could not decide whether this perceptual measure had an independent effect. In other words, we could not establish if an influence of perceptual distance from the standard language had an influence on t-deletion. In this article we measure distance with respect to the geographical center of the Holland dialect cluster.

3 See, for the computation, Davis (1986, 314-330).

4 The members of the committee were: J. Taldeman, J. Goossens, R. Willemys, G. Kocks and T. Goeman (secr.).

5 Part of this work was sponsored by the State Department of National Education from 1985 to 1990.

6 There has been continual output after the date of publication of the original article. Among others are articles on diphthongization and on supposed vowel shifts, on the distribution of so-called 'soft /g/,' the realization of the liquids /r/ and /l/, the realization of word initial /s/ and /z/, and on the present indicative paradigm.



7      In attitudinal behavior this will show up as resentment to all that is Western Dutch and especially 'Holland.'

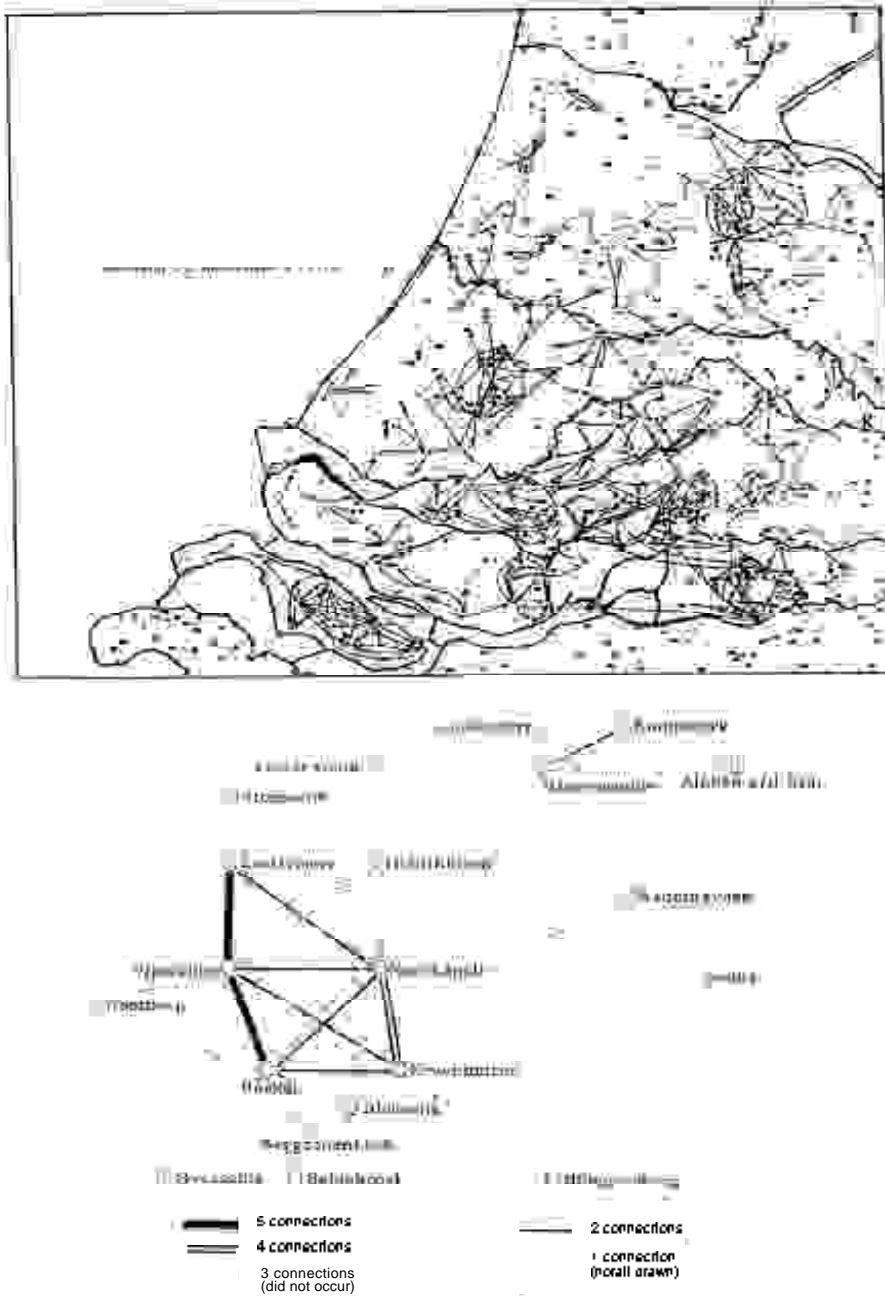
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## Figures



**Figure 9.1.** Subjective identification of southwestern Dutch dialects, general (above) and detailed (below) (Goeman 1984).

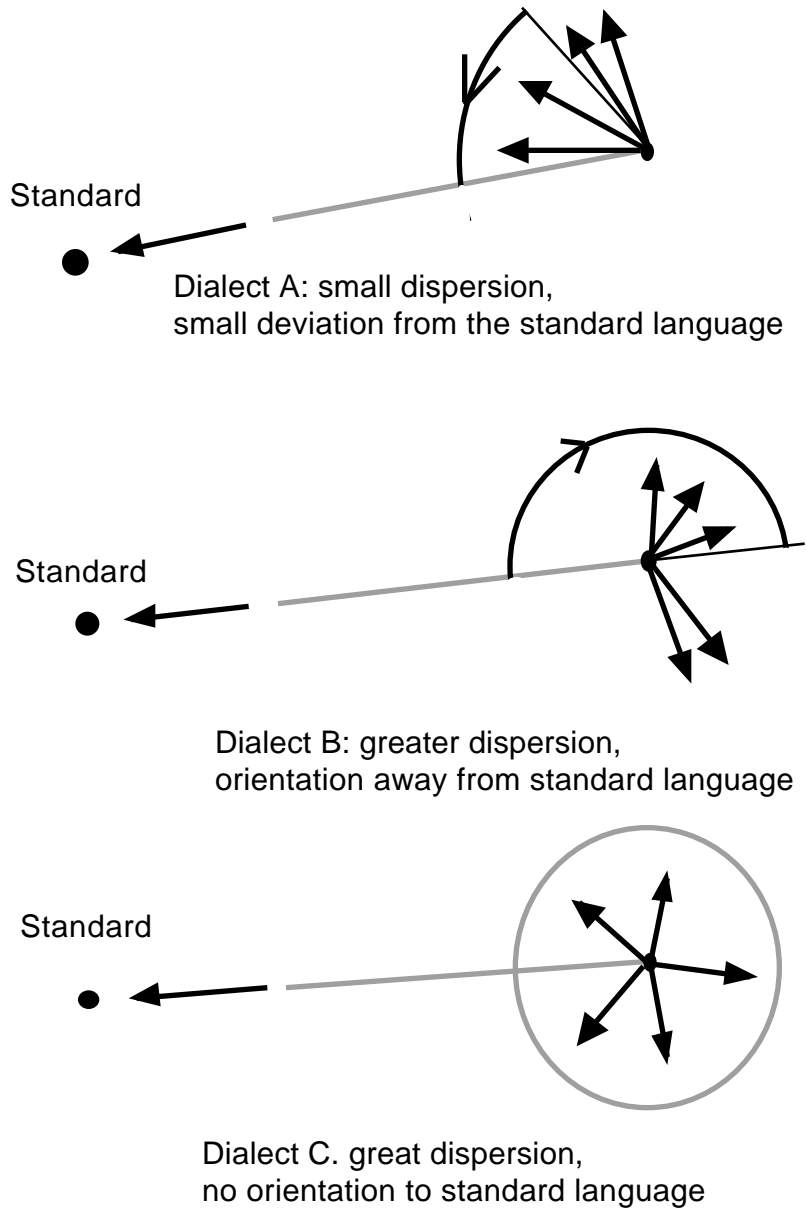
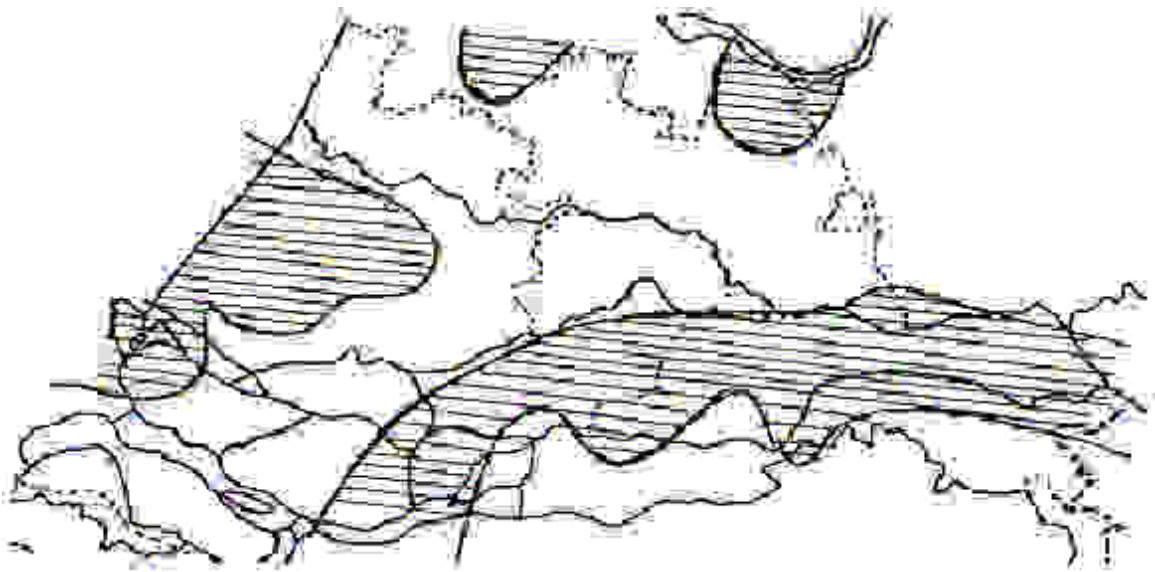


Figure 9.2. Dispersion and orientation to the standard

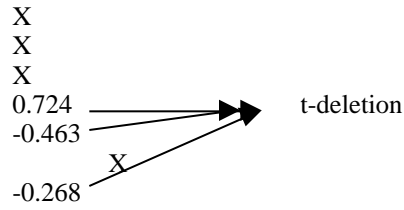
**Figure 9.2.** Dispersion and orientation to the standard.



**Figure 9.3.** Vowel shortening, showing positive residuals in the shaded areas and negative residuals in the unshaded areas.

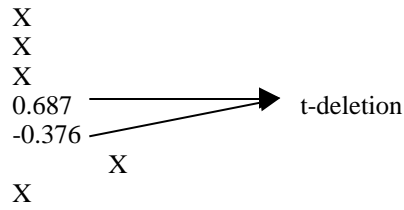
**First pass:**

vowel shortening  
vowel lengthening  
north-south  
west-east  
perceptual distance from standard lang.  
dispersion in dialect cluster  
mean deviation from standard language

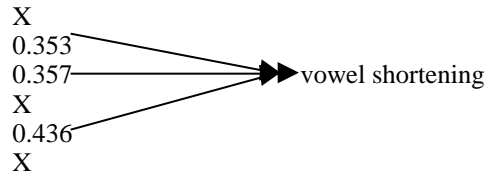


**Second Pass:**

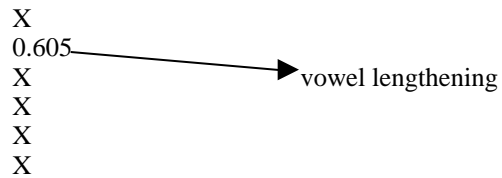
vowel shortening  
vowel lengthening  
north-south  
west-east  
perceptual distance from standard lang.  
dispersion in dialect cluster  
mean deviation from standard language



vowel lengthening  
strength length contrast  
north-south  
west-east  
perceptual distance from standard lang.  
t-deletion



t-deletion  
west-east  
north-south  
perceptual distance from standard lang.  
strength length contrast  
vowel shortening



**Figure 9.4. Models.**



## Appendix 1. Final stepwise regression results.

### First pass: t-deletion

Number of cases in data file are ..... 53  
 Number of cases used in this analysis are .. 44  
 ANALYSIS OF VARIANCE

|            | SUM OF SQUARES | DF | MEAN SQUARES | F-RATIO | P-VALUE |
|------------|----------------|----|--------------|---------|---------|
| REGRESSION | 14.4701        | 3  | 4.8234       | 6.082   | 0.002   |
| RESIDUAL   | 31.7222        | 40 | 0.7931       |         |         |
| TOTAL      | 46.1923        | 43 |              |         |         |

Dependent Variable = t-deletion  
 Number of obs. = 44  
 Multiple R = 0.5597  
 R-square = 0.3133  
 Adjusted R-square = 0.2618  
 F( 3, 40) = 6.0820  
 Prob > F = 0.0016  
 Std. Error of Est. = 0.8905  
 Durbin-Watson Stat.= 1.8684

#### =====MULTIPLE REGRESSION EQUATION=====

t-deletion = -2.582 + 0.243\*west-east + -0.006\*deviation St. Lang.  
 + -0.067\*percept.dist. + ERROR;

#### =====STANDARDIZED REGRESSION EQUATION=====

t-deletion = + 0.724\*west-east + -0.268\*deviation St. Lang.  
 + -0.463\*percept.dist. + ERROR;

#### =====REGRESSION TEST STATISTICS=====

| VARIABLES           | COEFFICIENTS | STD. ERROR | t      | P-VALUE |
|---------------------|--------------|------------|--------|---------|
| Intercept           | -2.58244     |            |        |         |
| west-east           | 0.24297      | 0.0645     | 3.768  | 0.0005  |
| deviation St. Lang. | -0.00574     | 0.0028     | -2.025 | 0.0496  |
| perceptual dist.    | -0.06724     | 0.0281     | -2.396 | 0.0214  |

### Second pass: t-deletion

Number of cases in data file are ..... 53  
 Number of cases used in this analysis are .. 49  
 ANALYSIS OF VARIANCE

|            | SUM OF SQUARES | DF | MEAN SQUARES | F-RATIO | P-VALUE |
|------------|----------------|----|--------------|---------|---------|
| REGRESSION | 14.6131        | 2  | 7.3065       | 7.674   | 0.001   |
| RESIDUAL   | 43.7965        | 46 | 0.9521       |         |         |
| TOTAL      | 58.4095        | 48 |              |         |         |

Dependent Variable = t-deletion  
 Number of obs. = 49  
 Multiple R = 0.5002  
 R-square = 0.2502  
 Adjusted R-square = 0.2176  
 F( 2, 46) = 7.6741  
 Prob > F = 0.0013  
 Std. Error of Est. = 0.9758  
 Durbin-Watson Stat.= 1.7664

#### =====MULTIPLE REGRESSION EQUATION=====

t-deletion = -2.609 + 0.243\*west-east + -0.058\*percept.dist. + ERROR;

#### =====STANDARDIZED REGRESSION EQUATION=====

t-deletion = + 0.687\*west-east + -0.376\*percept.dist. + ERROR;

```
=====REGRESSION TEST STATISTICS=====
```

| VARIABLES      | COEFFICIENTS | STD. ERROR | t      | P-VALUE |
|----------------|--------------|------------|--------|---------|
| Intercept      | -2.60937     |            |        |         |
| west-east      | 0.24255      | 0.0633     | 3.829  | 0.0004  |
| percept. dist. | -0.05788     | 0.0276     | -2.098 | 0.0414  |

**Second pass: vowel shortening**

Number of cases in data file are ..... 53  
 Number of cases used in this analysis are .. 53  
 ANALYSIS OF VARIANCE

```
=====
```

|            | SUM OF SQUARES | DF | MEAN SQUARES | F-RATIO | P-VALUE |
|------------|----------------|----|--------------|---------|---------|
| REGRESSION | 177.9047       | 3  | 59.3016      | 16.053  | 0.000   |
| RESIDUAL   | 181.0142       | 49 | 3.6942       |         |         |
| TOTAL      | 358.9190       | 52 |              |         |         |

Dependent Variable = vowel short.  
 Number of obs. = 53  
 Multiple R = 0.7040  
 R-square = 0.4957  
 Adjusted R-square = 0.4648  
 F( 3, 49) = 16.0528  
 Prob > F = 0.0000  
 Std. Error of Est. = 1.9220  
 Durbin-Watson Stat.= 1.6595

```
=====MULTIPLE REGRESSION EQUATION=====
```

vowel short. = -11.101 + 2.270\*strong length contr.+ 0.544\*north-south  
 + 0.161\*percept.dist.+ ERROR;

```
=====STANDARDIZED REGRESSION EQUATION=====
```

vowel short. = + 0.353\*strong length contr. + 0.357\*north-south  
 + 0.436\*percept.dist. + ERROR;

```
=====REGRESSION TEST STATISTICS=====
```

| VARIABLES            | COEFFICIENTS | STD. ERROR | t     | P-VALUE |
|----------------------|--------------|------------|-------|---------|
| Intercept            | -11.10079    |            |       |         |
| strong length contr. | 2.26955      | 0.6739     | 3.368 | 0.0015  |
| north-south          | 0.54407      | 0.1593     | 3.416 | 0.0013  |
| percept.dist.        | 0.16061      | 0.0376     | 4.271 | 0.0001  |

**second pass: vowel lengthening**

Number of cases in data file are ..... 53  
 Number of cases used in this analysis are .. 53

ANALYSIS OF VARIANCE

```
=====
```

|            | SUM OF SQUARES | DF | MEAN SQUARES | F-RATIO | P-VALUE |
|------------|----------------|----|--------------|---------|---------|
| REGRESSION | 8.0538         | 1  | 8.0538       | 29.408  | 0.000   |
| RESIDUAL   | 13.9672        | 51 | 0.2739       |         |         |
| TOTAL      | 22.0210        | 52 |              |         |         |

Dependent Variable = vowel length.  
 Number of obs. = 53  
 Multiple R = 0.6048  
 R-square = 0.3657  
 Adjusted R-square = 0.3533  
 F( 1, 51) = 29.4078  
 Prob > F = 0.0000  
 Std. Error of Est. = 0.5233  
 Durbin-Watson Stat.= 1.4631

```

=====MULTIPLE REGRESSION EQUATION=====
vowel length. = -2.698 + 0.128*west-east + ERROR;
=====STANDARDIZED REGRESSION EQUATION=====
vowel length. = + 0.605*west-east + ERROR;
=====REGRESSION TEST STATISTICS=====
VARIABLES    COEFFICIENTS  STD. ERROR    t          P-VALUE
Intercept    -2.69815
west-east    0.12802        0.0236        5.423     0.0000

```