Preaspiration in the Nordic Languages
Synchronic and diachronic aspects

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Abstract

Preaspiration—the production of glottal friction at the juncture of a vowel and a consonant—appears to be typologically rare but is an areal linguistic feature of Northwestern Europe. This study contains a survey of the known geographical spread of preaspirated stops, their phonological distribution and phonetic expressions in some Nordic dialects. The study also suggests a reconstruction of the phonetics of the Proto-Nordic stop contrasts based on synchronic data as well as a more general framework of historical sound change.

Following an introduction (Chapter 1), Chapter 2 deals with the definition and typology of preaspiration presenting a global overview of the known geographical spread of preaspiration. The apparent rarity of preaspiration is considered. Proposed, perceptually based explanations of this rarity are evaluated.

Chapter 3 offers a fairly detailed account of the known areal spread of preaspiration in Europe. Stop systems of several dialects in which preaspiration occurs are analysed in terms of voicing conditions. These analyses are based mainly on descriptions provided in the dialectological literature.

Chapter 4 presents data on durational variation and other phonetic patterns of stop production in Central Standard Swedish, Tórshavn Faroese, Gräsö Swedish and Western Åland Swedish. The results reveal a greater degree of phonetic variation than has been assumed to date. In particular, speakers of Central Standard Swedish are shown to use preaspiration as a regular feature in their voiceless stop production.

In Chapter 5, finally, the results of the data analysis are used in an attempt to reconstruct the phonetic expression of stop contrasts in Proto-Nordic. It is argued that Proto-Nordic stop production was largely similar to the stop production of today’s Central Standard Swedish. As regards phonological structure, however, the Proto-Nordic stop contrasts appear to have been largely preserved in all dialects considered. This conclusion is found to be compatible with an expansion/contraction (E/C) model of historical sound change.
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“Life without you would be like a broken pencil… Pointless.”
1 INTRODUCTION

1.1 Overview

This study deals, for the most part, with the stop systems of the languages and dialects that derive from Old Norse, referred to here as “Nordic languages.” Preaspiration (as opposed to postaspiration) of stops is the central theme, from both a synchronic and a diachronic point of view, and the largest part of the text is devoted to this subject. However, the general characteristics of the stop systems of the Nordic languages are also considered, especially those of Central Standard Swedish, Faroese and Icelandic. In current descriptions, Swedish has two stop series, voiced and voiceless, in which differing degrees of postaspiration are seen as an effect of stress. This characterisation of the Swedish stop system is reviewed and an alternative interpretation of the facts, rooted in the historical development of the Swedish stop system, is proposed.

Chapter 2 deals with the typological aspects of preaspiration, particularly its definition, the question of its relationship to postaspiration and its global geographical spread. As we shall see, preaspiration appears to be very rare in the languages of the world, at least preaspiration in the normative sense (cf. section 2.3). We examine possible reasons for this and particularly consider the claim that preaspiration is badly suited for audition.

In Chapter 3, we focus on Northwestern Europe (see map, Figure 1–1), and consider those languages and dialects preaspiration has been reported to occur. The emphasis is on Nordic languages (i.e. those descending from Old Norse), although both Celtic and Saami languages are also considered. The map in Figure 1–1 gives an overview of the locations where either normative or non-normative preaspiration in word-medial position has been reported to occur. Also shown are locations where normative postaspiration in word-medial position has been re-
ported, but these should only be taken to refer to Nordic languages on the Scandinavian peninsula, the Faroes and Iceland and not, for example, to Denmark or the British Isles. Each star (★), diamond (♦) and circle (●) represents a location mentioned or discussed in Chapter 3. Several areas are covered in more detailed maps in Chapter 3. References to these maps are given in the map in Figure 1–1.

For each dialect¹ examined, the focus is on four aspects regarding the development of stops from Old Norse. First, we examine the development of ON  \( p, t, k \) and  \( pp, tt, kk \) in word-medial, postvocalic position in the dialect. Second, we consider the development of ON clusters in which the first element is  \( p, t, k \). Third, we consider the way in which the dialect reflects ON sequences of sonorant +  \( p, t, k \). And fourth, we look at the development of ON word-medial  \( b, d, g \) and  \( bb, dd, gg \). Since preaspiration seems to be a gradually disappearing speech pattern in Norwegian and Swedish (as are so many other dialectal features), this review of the development of Old Norse stops in Norwegian and Swedish dialects relies heavily on old descriptions, many of which date back to the latter half of the 19th century.

In Chapter 4, we focus further on four Nordic language communities located in the Faroes, Sweden and Finland.² Here, we consider not only dialects that have preaspirated stops in word-medial position, but also dialects that have postaspirated stops. Again, since dialectal characteristics have been disappearing rapidly in recent years, some of the data has been obtained from Swedish dialectal archives. For each of the five language communities considered, spontaneous speech data are analysed, with a view to establishing the durational relationship of preaspiration and the vowel that precedes it. The ratio of vowel to preaspiration has been shown to play a central role in the perception of Icelandic preaspiration (Pind 1986, cf. Ch. 3, section 3.2.2).

¹ The dialects examined are: Southern Icelandic; Tórshavn Faroese; Jæren Norwegian (Southwest Norway); the dialects of Northern Gudbrandsdalen (Central Norway); the dialects of Härjedalen (Central West Sweden); Northern Gräsö Swedish (Central East Sweden); Kökar Swedish (Åland archipelago); and Central Standard Swedish (the received pronunciation of Central Sweden, especially the Stockholm area).

² To be exact: Tórshavn Faroese; Northern Gräsö Swedish (Central Eastern Sweden); Central Standard Swedish; and Western Åland Swedish (in the Åland archipelago).
Figure 1–1. Principal locations of pre- and postaspiration reported in Scandinavia and the North-Atlantic. (Further in text.)
Finally, in Chapter 5, the patterns of preaspiration established for the Nordic dialects in the previous chapters are used in a comparative analysis, the aim of which is to derive a probable “shape” of the Old Norse stop system. Several theories on the origin of preaspirated stops are reviewed and evaluated in light of the present data. Finally, a scenario of sound change is considered, by which normatively preaspirated stops can emerge from a stop system that does not have normative preaspiration.

1.2 Background

From the earliest descriptions and onwards, the stop systems of most Swedish and Norwegian dialects have been characterised in similar ways. In Lundell’s (1879:11) description of Swedish there are two stop series, voiced and voiceless, which seemingly are found in almost all dialects. Places of articulation are accounted for in some detail, as Swedish dialects utilise many different places for stop and affricate production. Aspiration, however, is left unmentioned and fortis stops are transcribed in the same way irrespective of word-position, even though there are noticeable differences in aspiration between word-initial and word-medial stops.

This is not to say that Lundell and his contemporaries did not notice such differences. First, one should consider that the system of transcription that Lundell worked with and helped develop, *Landsmålsalfabetet*, (the Swedish Phonetic Alphabet) is not based on ideal articulations but rather on actual pronunciation encountered in various dialects, primarily well-known ones. In this sense, the system is based on knowledge that is shared between all those interested in describing Swedish pronunciations. As a result, one finds that certain aspects of pronunciation—sometimes basic ones such as aspiration—are left largely unaccounted for, while seemingly esoteric items are sometimes elaborated upon in meticulous detail. The difference in aspiration between initial and medial fortis stops may simply have been knowledge that Lundell could assume was shared between him and his audience and needed no further explanation.¹

Second, the transcription system did not specify such things considered to be a result of the phonetic context. Lundell writes:

¹ Cf. Sperber and Wilson’s (1986:15ff) “mutual-knowledge hypothesis.”
Such characteristics in the formation of a speech sound, which unavoidably occur as a result of the transition from or to an adjacent speech sound, do not affect the notation. One thus writes: handla, vattna, köpmann, even though d, t and p in these words are not formed in the same way as in händig, vata, köpa; nor are the p-sounds at the beginning and the end of the word papp wholly identical, yet they are nevertheless denoted with the same letter.

(Lundell, 1879:7; my translation)

Apparently, then, Lundell considered the difference between the initial and final stops in the word papp to be a result of context, the former being word-initial before a stressed vowel, the latter being word-final before a pause. There are reasons to believe that Lundell and his contemporaries would also have considered the difference between the two stops in pappa to be the result of context. Possibly, the difference was thought to be a result of stress: if the following vowel was stressed, the stop was more forcefully articulated than if the vowel was unstressed.

For Norwegian, a similar story can be told. In Storm’s (1908)1 overview of Norwegian, most dialects have voiced and voiceless stops and no apparent differences in degree of aspiration. However, Storm indicates more clearly than does Lundell that in addition to voicing, consonants (including stops) vary in their force of articulation:

One can, in fact, distinguish between two degrees of voicelessness, weak or without stress: whispered [Hvisken], and strong or with stress: puffed [Pust]. One can, for example, produce a strong f and a weak f, a strong v and a weak v, so that only the strength of the sound, and not its nature, changes.

(Storm, 1908:29; my translation)

In other (perhaps less influential) writings, differences in degree of aspiration are accounted for more explicitly. For example, Lyttkens & Wulff (1885:266ff) advocate four series of stops in their phonetic account of Swedish: strongly aspirated p', t', k'; weakly aspirated p, t, k; voiceless (or half-voiced) unaspirated2 b, d, g; and voiced b, d, g. In their description, strongly aspirated stops occur mainly in word onsets before stressed vowels, as well as in utterance-final position, e.g. påde, tall and

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1 The part of Storm’s overview referred to here was originally published in 1884.
2 Or very weakly aspirated.
lock (ibid:267; boldface mine). Weakly aspirated stops occur in word-medial position before vowels, as well as following fricatives in any position, e.g. *ske*, *muskel*, *stoppa*, *skratta*, *harpa* and *halta* (ibid:267; boldface mine). In a rather fanciful account of the distribution of these stop variants, Lyttkens & Wulff attribute the differences in the degree of aspiration to articulatory factors:

In the former case [i.e. in the case of stops following fricatives] the diminished force can be so explained that, as the fricative has expended a great deal of air, and the stop has such a short duration, there is not enough time for new air to accumulate while the stop is being articulated. If the stop comes between two vowels, a strong air pressure could be built up, but this is mitigated through the influence of the vowels on each side, which have a weak expiration and therefore cause an equalisation [of air pressure].

(Lyttkens & Wulff, 1885:267f; my translation)

Noreen (1903–7) appears to make a more categorical distinction between aspirated and unaspirated variants. For example, in his discussion of the pronunciation of labial stops in Swedish (ibid:409) he says:

Between *p* and a following voiced sound the aspiration reveals itself in such a way that the voiced sound loses its voicing. […] Only in word-medial position immediately following *s* as well as before voiceless and aspirated sounds, at least fricatives and sonorants [resonanter], does *p* lack aspiration […] and is then similar to the *p*-sounds of Finnish and French; compare, for example, the unaspirated *p* in *spå*, *sprida*, *split*, *spjälka*, *vispa*, *snaps*, *psykisk*, *knapphål* with the aspirate in *på*, *pris*, *plit*, *pjunk*, *visp* (in which the *p* comes after *s*, but is not word-medial), *knapp*.

(Noreen, 1903–7:409; my translation)

Here, Noreen makes a clear distinction between the aspirated and unaspirated variants, noting that the unaspirated variants are similar to those we generally find in Finnish and French. However, notice that examples of intervocalic *p* are conspicuous by their absence. This apparent evasiveness is repeated in his discussion of other stops (ibid: pp. 421, 461 and 481). One possible interpretation of this is that Noreen felt that intervocalic stops were aspirated. Alternatively, he may have ascribed the differences in aspiration to an effect of stress. A stop followed by a stressed vowel was more forcefully articulated, and thus had more aspiration, than a stop followed by an unstressed vowel.
In most respects, the general description of the distribution of stop variants in Swedish has not changed from the latter half of the 19th century, and the difference between word-initial and -medial fortis stops still appears to be regarded as a result of context, although this is seldom stated explicitly. For example, Löfqvist & Yoshioka (1980) give the following account:

Swedish voiceless stops are aspirated in prestress position and unaspirated when they immediately follow a stressed vowel or /s/.

Although this difference between aspirated and unaspirated voiceless stops is not phonemic in Swedish, when aspiration occurs it serves as one of the cues for the distinction between voiced and voiceless stops, since the former are always unaspirated. In addition, the presence or absence of aspiration in voiceless stops in some contexts marks the location of a word boundary.

(Löfqvist & Yoshioka, 1980:793f)

The last remark, that aspiration in stops can be an indicator of a word boundary, appears to be a response to examples in which the placement of a word boundary decides whether a stop is aspirated. For example, Löfqvist & Yoshioka investigated word pairs such as Liszt pilar vs. Lis spelar, in which the former p is aspirated and the latter is not. The effect of word boundary placement had been noted earlier (cf. Lyttkens 1898:25, Noreen 1918-24:24-28, Elert 1957, Gårding 1967), although differences in the degree of aspiration as such are not specifically mentioned.

Obviously, the characterisation of a stop system in terms of parameters such as aspiration and voicing is a simplification, especially since it has been demonstrated that a large number of different acoustic cues are relevant for the perception of stop contrasts. Reviewing the research on the perceptual categorisation of initial stops in English, Diehl and Kluender (1987) identify ten acoustic parameters that are relevant for stop category judgements. These include voice-onset time, duration of voiced-formant transitions, onset frequencies (and directions) of first, second and third formants, duration of aspiration, and intensity of aspiration. For stop contrasts in word-medial position in English, Lisker (1978) has compiled an even longer list of cues, including the presence or absence of low-frequency buzz during the closure interval, duration of closure, first-formant offset frequency before closure, voice-onset time after
closure, decay time of the glottal signal preceding closure, and burst intensity following closure.

The list of acoustic parameters relevant for categorical judgements is bound to be language dependent, since aspiration and voicing are utilised in different ways in different languages. As for the languages of Scandinavia and the North Atlantic, one relevant acoustic parameter is the amount of (glottal) friction present in the acoustic signal on the boundary of a vowel and a subsequent stop. Such friction occurs when voice offset is initiated before oral closure for the stop is achieved, and is perceived as an *h*-sound on the vowel–stop boundary. This phenomenon is most commonly referred to as preaspiration.

The presence of such glottal friction in the production of word-medial fortis stops in Central Standard Swedish has been noted by Gobl & Ni Chasaide (1988) as well as Fant et al. (1991). In this work it is demonstrated that some speakers of Swedish use this type of early voice offset, i.e. preaspiration, systematically when producing sequences of vowel and fortis stop, while others tend not to do so, or only do so to a limited extent. A similar trend has been noted for Trondheim Norwegian (Moxness 1997; van Dommelen 1998, 1999, 2000). Importantly, van Dommelen (1998) demonstrates that speakers who do not preaspirate themselves are still able to use preaspiration to distinguish between stop categories in Trondheim Norwegian.

Preaspiration has been “generalised” in several languages and dialects in Northwestern Europe. The term “generalised” implies that early voice offset (relative to stop closure) has become normative, i.e. obligatory in the production of the vowel + fortis stop sequence. This phenomenon is most widely recognised as a feature of Icelandic, but is in fact found in Faroese and several dialects of both Norwegian and Swedish, as well as in Scots Gaelic and most Saami languages. The fact that such diverse language groups are involved has prompted the classification of preaspiration in Northwestern Europe as an areal phenomenon (Wagner 1964).

Several different accounts regarding the origin of preaspiration have been advanced. In this respect there are two central issues. The first concerns the age of preaspiration: Is preaspiration a relatively late develop-
ment that has emerged in each language or dialect independently of others? Or is it an early development, predating the separation of Icelandic, Faroese and mainland Scandinavian (Norwegian and Swedish), that has since disappeared in most of Scandinavia? The second issue concerns the question of whether Celtic, Old Norse or Saami should be seen as the “source” of preaspiration. As regards the latter issue, the position of Posti (1954), Borgstrøm (1974) and Hansson (1997) will be adopted, that preaspiration in both Saami and Gaelic is due to contact with Nordic languages. As regards the former issue, some earlier theories, as well as some ideas based on the findings of the present work, will be outlined in Chapter 5.
2 DEFINITION AND TYPOLOGY

2.1 Defining preaspiration

The following, two-part definition of preaspiration will be used in this study:

- Preaspiration is a period of (usually glottal) friction that occurs between a vocalic and a consonantal interval.
- Phonotactically within a language, this type of friction noise occurs only before a limited subset of consonant types, typically voiceless stops.

The first part of this definition is found, in some form, in the works of most authors who have addressed preaspiration (cf. also Thráinsson 1978). It is simply a statement of a typical phonetic realisation of pre-aspirated stops. Obviously, some variations on the theme occur. For example, in the definition of Ladefoged & Maddieson (1996:70), preaspiration can occur not only in vowel + stop sequences, but also in sequences of nasal/liquid + stop. Their definition thus incorporates a phenomenon commonly referred to as sonorant devoicing (see following section). Hansson’s (1997) approach is to have two definitions of preaspiration, a “narrow” definition that only encompasses vowel + stop sequences, and a “wide” definition that encompasses both vowel + stop and sonorant + stop sequences. However, I have chosen to refer to the two types of sequences separately: thus preaspiration is what occurs in vowel + stop sequences, and sonorant voicelessness is what occurs in sonorant + stop sequences.

In most accounts, the friction noise preceding the occlusion is specified as glottal; this is indicated by saying that it is an “h-sound” (Jespersen 1897–9:326; Noreen 1903:400), a “puff of breath” (Bloomfield 1933:99; Bloch & Trager 1942:34; Einarsson 1945), a “breath-glide” (Sweet 1877:147; Kolsrud 1951:117) or a “voiceless vowel” (Storm 1908:60;
Reitan 1930:67f). But, as with practically any aspect of pronunciation, there is a great deal of language-, speaker- and context-dependent variation in the production of preaspiration. By having “usually glottal” in parentheses, I want to emphasize that in the production of preaspiration there is a wide range of possible (and regularly occurring) variants that are not simple glottal fricatives. For example, the Faroese data discussed in Chapter 4 show that there is considerable variation in the expression of preaspiration. Thus the same speaker may express preaspiration a glottal fricative [h] in one production of a word (Figure 4–49) and a uvular trill [ʁ] in another instance of the same word (Figure 4–50).

As the first part of the definition implies, any consonant may, in principle, be preaspirated. However, preaspiration seems to become normative only before voiceless occlusions, and therefore most definitions of preaspiration specify that the glottal friction noise (or “h-sound”, “puff of breath,” etc.) occurs only before occlusions.

We now come to the second part of the definition, which states that phonotactically within a language, the friction noise that we identify as preaspiration should occur only before a limited subset of consonants. This is usually not stated in definitions of preaspiration. It is, however, stated here since in many languages there are sequences of h-sound + occlusion that are not considered to be preaspirated stops. Instead, they are thought of as clusters.1

Consider Finnish and Icelandic, which have very similar phonetic sequences by which a [h]-like sound (i.e., an aspiration) can be followed by an occlusion.2 For example, Icelandic has the word [l̥htɪ] ‘made lazy’

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1 One aspect that is not considered here is the importance of morphophonemic alternations in the phonological interpretation of h-sounds (or any other sounds, for that matter). Phonotactic distribution cannot, on its own, explain their links to other aspects of a language’s phonology, even though the following discussion singles out phonotactics as a major contributor. The present approach, therefore, requires some revisions, taking morphophonemic considerations into account.

2 Through an auditory (and to a more limited extent, spectral) analysis of spontaneous Finnish speech from two informants, I have not been able to detect any appreciable difference between preaspirated stops in Icelandic and sequences of [h] and stop in Finnish. In fact, barring some vowel differences, quite a number of the Finnish words could very easily pass as Icelandic when listened to in isolation. Apparently, though, Finnish has processes of “fortition” in its preaspirations similar to those we find in Faroese (cf. Ch. 4, section 4.3.3).
and Finnish the word [lɑ̂hti] ‘bay’ (see spectrograms in Figure 2–1). In Icelandic, we tend to refer to the aspiration preceding the occlusion as a preaspirated stop. In Finnish, that same sequence is analysed as a cluster of two segments, a [h] and a stop. Thus, we have two different phonological analyses for what is essentially the same phonetic exponency.

![Figure 2–1. Finnish hC cluster and Icelandic preaspirated stop. The words are a Finnish informant’s production of Finnish lahti ‘bay’ (left) and the production of Icelandic latti ‘dissuaded’ (right) by an Icelandic informant.](image)

These differences in analysis seem to depend on the phonotactics of h-sounds in the two languages. In general, Icelandic and Finnish have a fairly similar distribution of [h]-like sounds. The sounds can occur in syllable-initial position, but never in syllable-final position unless some other consonant follows. However, here there are significant differences. In Icelandic, the only consonants that can follow an h-sound are voiceless stops, whereas in Finnish, almost any consonant (e.g. /d/, /k/, /l/, /m/, /n/, /j/, /r/ and /v/) can follow an h-sound. Thus, Finnish has words such as tahna ‘(tooth)paste,’ tuhlata ‘waste’ and ahven ‘perch (Perca fluviatilis).’

As a consequence, preconsonantal h-sounds in Icelandic can be interpreted as being affiliated specifically with stops, whereas in Finnish there is no reason to regard preconsonantal h-sounds as such. Whether these analyses in some way reflect a psychological reality for the speakers is another matter. This discussion serves only to clarify the concepts that we use to classify and discuss the phenomena we are dealing with.
For comparison, let us consider postaspiration. Postaspiration also incorporates a statement regarding the phonological conditioning of $h$-sounds, although this is seldom expressed. Consider a language that has an intervocalic sequence of a voiceless occlusion followed by (a release burst and) an $h$-sound, i.e. a postaspirated stop. In most cases, linguists would interpret the occlusion and $h$-sound as being a single phonological unit (a phoneme), and call it an aspirated stop. One would seldom see such a sequence analysed as a cluster, i.e. a stop followed by an /h/.\footnote{As we shall see later, Taba has sequences that can be analysed in this way (Bowden & Hajek 1999). Undoubtedly, there are more languages in which this can be the case (e.g., Arabic). One should also keep in mind that in languages that have a voiceless stop series and an $h$-sound, one will surely find many examples in which these build a phonetic sequence like the one described, but which would be analysed phonologically as stop + /h/ clusters (i.e., two phonological units) with an intervening morpheme boundary.}

Thus, phonologically, such a language would almost inevitably be described as having a voiceless aspirated stop series, rather than as having voiceless stops and $h$-sounds that can build clusters. In this sense, the $h$-sound of a postaspirated stop is affiliated with the preceding occlusion.

As with preaspirated stops, the reasons why postconsonantal $h$-sounds are affiliated with the preceding occlusion seem to lie in the phonotactics of $h$-sounds. It is well established that stop releases are a relatively unavoidable effect in stop production. When pulmonic air flow is cut off with an oral occlusion, intraoral air pressure increases. Once the closure is released, the heightened intraoral pressure causes a sudden increase of air flow across the releasing stricture, resulting in a noise that we refer to as simply “burst” or “release.” The timing of voice onset can vary as well. If voice onset is delayed relative to release, this results in aspiration or ejection. In this sense aspiration occurs most “naturally” after voiceless stops, slightly less so after other voiceless consonants, and least “naturally” after voiced consonants. As a result, in terms of phonotactics, we find that postaspirations in most languages tend to be restricted to occurring after voiceless stops. Such a distribution makes it more likely that, in a phonological analysis, the postaspirations are affiliated with the preceding occlusion.

Of course, $h$-sounds after occlusions may come about by different means. For example, through vowel deletion, $CV_1hV_2$ sequences may
turn into ChV₂ sequences in which V₁ is lost. The distributional character of h-sounds may turn out to be quite different in such cases, since the h-sound will occur not only after voiceless stops. How will this affect the phonologist’s interpretation of h-sounds?

Insights into this question may be obtained from, for example, Bowden and Hajek’s (1999) analysis of Taba, an Austronesian language spoken in Indonesia. In Taba, an aspiration that follows a stop is most appropriately viewed as an independent segment and not as a property of the stop. This is unusual, and its reasoning may be that the h-sound in Taba can occur in various postconsonantal positions, due largely to the prefixing of verbs with simple consonants. Apparently, these prefixes originally had a CV structure, but the vowel has been lost. Thus in Taba we find words such as [ˈmhonas] ‘sick,’ [ˈnhik] ‘bat,’ [ˈkhan] ‘I go’ and even [ˈhhan] ‘you (pl.) go’ (Bowden and Hajek’s transcriptions). Given this distribution for h-sounds, a phonological interpretation by which a sequence of a stop and an h-sound build a cluster of two separate phonological units is viable and appropriate.

We now come to the question of whether preaspiration is reversed postaspiration. Thráinsson (1978) argues that since preaspiration in Icelandic has normal segment length (i.e., is not that different from, for example, [s] or [n] in its typical duration), it is “not simply the inverse of postaspiration.” For this reason, Thráinsson suggests that preaspiration in Icelandic should be given “segment status.” Consequently, Thráinsson opposes the view that preaspiration is a “component” or a “phonetic feature” of the stop that follows. However, the question itself is imprecise. Are we asking whether preaspiration is an exact phonetic mirror image of postaspiration? Or whether preaspiration and postaspiration are phonological correspondences? Or both?

Let us consider the phonological aspects. As to whether preaspirations are components or features of the following stop, this is only relevant if we have a strictly segmental view of phonology. In a less segmental view, the question of whether or not preaspiration “belongs to” the stop is less of an issue. Preaspirations are used as one of the phonetic correlates that signal the difference between two kinds of vowel + stop sequences. As for phonotactics, it has been argued that preaspiration and
postaspiration tend to have equally limited phonotactic distributions. In fact, when preaspirations have wider phonotactic distributions, something we find in a number of languages,\(^1\) they cease to be viewed as preaspirations (at least in terms of phonological analysis) and are instead taken to be \(hC\) clusters. Therefore, one can argue that, phonologically, preaspiration is a mirror image of postaspiration.

Now, let us consider the phonetic aspects. First, one should be careful in letting the realisation of preaspiration in Icelandic have a bearing on the way we define preaspiration. Consider a parallel example. If we found that ejectives in one language had a longer silent interval after the release than in another (as has been found by Lindau 1984), this should not lead us to conclude that the longer silent intervals are “segments” and the shorter intervals are not. Phonetic measurements cannot be used to assess phonology in this way. The realisation of preaspiration in Icelandic does not provide a definition of preaspiration any more than the realisation of ejectives in Amharic provides a definition of ejectivity. In any case, even if we find that preaspiration and postaspiration are not phonetic mirror images of one another, this does not subtract from their phonological correspondence.

When we look about in the world, should it be the case that we find no genuine cases of \(h\)-sounds that are phonologically bound to a following stop (through phonotactics), we will be forced to conclude that there is no such thing as a preaspirated stop. However, the phonetic findings from individual languages that allegedly do have preaspirated stops should not force us to alter the basic definition of preaspiration with which we are working. As a matter of definition, preaspiration is post-aspiration reversed.

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\(^1\) The languages that I have happened to have come across include Finnish, Menomini, Taba, some varieties of Spanish, Arabic (as well as many languages that have borrowed from Arabic), many of the Algonquian languages, Comanche and Mono, as well as some Oto-Manguean languages. This list is hardly exhaustive.
2.2 Linking preaspiration and sonorant voicelessness

A phenomenon that seems to be intimately linked with preaspiration is voicelessness in sonorants preceding a stop, commonly referred to as sonorant devoicing. Several authors have treated this subject from different angles (cf., e.g., Pétursson (1976) for a physiological perspective, Thráinsson (1978) for a phonological perspective and Hansson (1997) for a historical perspective). It is a striking fact that most of the Nordic languages that contrast preaspirated stops with unaspirated ones also tend to contrast sequences of (at least partially) voiceless sonorant + stop with voiced sonorant + stop (voicing in the stop varies). This is so in, for example, Southern Icelandic, Tórshavn Faroese and the Northern Gräsö dialect of Swedish. It is no less striking that both Scots-Gaelic and most Saami languages, which have preaspirated stops, also have such voiceless sonorants.

This has a direct parallel in the way sonorants are produced when they follow stops, i.e. stop + sonorant clusters. Many languages that have an aspirated and an unaspirated stop series may also have a distinction between voiced and (partially) voiceless sonorants following a stop. Often, the phonological analysis of a language makes this less than explicit. Such an analysis may indicate that a contrast is made between a voiced unaspirated stop followed by a voiced sonorant and a voiceless aspirated stop followed by a voiced sonorant, e.g., English /blænd/ bland vs. /pʰlænd/ planned. The pronunciation, though, will typically contrast a sequence of a voiced occlusion + voiced sonorant with a voiceless occlusion + (partially) voiceless sonorant, *[blænd] vs. *[pʰlænd].\(^1\) The parallel with voiceless sonorants preceding stops is obvious, and in terms of articulatory organisation the two are very similar. Voice onset is delayed relative to stop release to produce a voiceless sonorant after a stop, and voice offset is made to occur earlier relative to stop closure to produce a voiceless sonorant before a stop.

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\(^1\) The exact nature of this contrast depends on such factors as phonetic context, speaker and dialect. This example can be said to apply in voiced contexts (e.g. when the preceding word ends with a vowel) in middle-class London English.
Figure 2–2. Spectrograms and schematic articulatory representations of the production of a vowel + stop sequence with (lower) and without (upper) pre-aspiration. The words are the author’s own productions of Southern Icelandic labba ‘to walk’ and lappa ‘feet (gen.)’
The similarity in gestural organization between sonorant voicelessness and preaspiration is also striking. Both are achieved by timing voice offset in such a way that it occurs before the stop closure. In a sequence of vowel + stop, an early voice offset results in aspiration. In a sequence of a sonorant + stop, the result is a (partially) voiceless sonorant.

This similarity can be assessed by considering the examples in Figures 2–2 and 2–3, which contain the author’s own productions of four (Southern) Icelandic words, *labba* ‘walk,’ *lappa* ‘legs (gen. pl.),’ *lamba* ‘lambs (gen. pl.)’ and *lampa* ‘lamp (obl.)’ In Figure 2–2, a voiceless unaspirated stop (upper spectrogram) is compared with a preaspirated one (lower spectrogram). Beneath each spectrogram is a schematic representation of the articulatory event. Disregarding durational differences, in the upper, unaspirated example, voice offset and the onset of stop closure occur (relatively) simultaneously, while in the lower, preaspirated example, voice offset occurs approximately 75 ms before stop closure.

Now consider Figure 2–3, which compares a sequence of a voiced nasal and a voiceless unaspirated stop with a sequence of a (mostly) voiceless nasal and a voiceless unaspirated stop. Again, (disregarding durational differences) we find that the essential difference between the two is the relative timing of the supralaryngeal closure and voice offset. In the upper example, voice offset and the onset of supralaryngeal (oral and velar) closure occur almost simultaneously, while in the lower example, voice offset occurs before the supralaryngeal closure is made.

Although these examples are from Icelandic, they are fairly typical for the production of sonorant + stop sequences in isolated content words in both Icelandic and Faroese. In both languages, a sequence of a sonorant + lenis\(^1\) stop is expressed as a voiced sonorant followed by an voiceless unaspirated stop and a sequence of a sonorant + fortis stop is expressed as a largely voiceless sonorant followed by an unaspirated voiceless stop. The Northern Gräsö dialect of Swedish has a different pattern, by which a sonorant + lenis stop is expressed as a voiced sonorant followed by a voiced stop and a sonorant + fortis stop is expressed as a partially voiceless sonorant followed by a voiceless unaspirated stop (see, e.g., Figures 4–64 through 4–67).

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\(^1\) See explanation for the use of the terms fortis and lenis in Ch. 3, section 3.1.
Figure 2–3. Spectrograms and schematic articulatory representations of the production of a nasal + stop sequence with (lower) and without (upper) voicelessness in the nasal. The words are the author’s own productions of Southern Icelandic lambs (gen.) and lamp (obl.)
The fact that both preaspiration and sonorant voicelessness are the result of a simple gestural asynchrony, together with the fact that the languages best known for having preaspiration also have corresponding voiceless sonorants, makes it tempting to see sonorant devoicing and preaspiration as two sides of the same coin. Attempts to link the two phonologically have assumed that either underlying segments or features are processed by rule to produce an appropriate output. Note that the terminology traditionally used to refer to voiceless sonorants before fortis stops is “sonorant devoicing,” which implies a generative process. A nasal that “should be” voiced undergoes devoicing when it occurs in a particular context.

In the present work, it is not deemed necessary to assume that either preaspiration or sonorant voicelessness is a result of processing in the speakers’ minds that uses input forms to produce output forms. The focus here is on the historical aspects, to account for the phonetic changes that appear to bring forth preaspiration and sonorant voicelessness from nothing. It will be shown that when phonetic detail is considered, one finds that the seeds of such a change may be present long before the change is manifested in terms of normative pronunciation. We shall also see that in the languages and dialects considered, preaspiration and sonorant voicelessness manifest themselves in different ways and different phonological contexts to such a degree that statements in segment- and feature-based formal phonological frameworks do not serve to simplify or clarify any issues.

2.3 Normative and non-normative traits
In this work, a distinction is made between normative and non-normative phonetic traits. These terms can be explained in the following way: If the absence (or presence) of a particular phonetic trait leads to a pronunciation that is considered deviant by the speakers of a given dialect, that trait can be classified as normative (or normatively absent) in that dialect. Conversely, a trait whose absence or presence does not lead to deviant pronunciation can be classified as non-normative in that dialect. Here,

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1 For example, Thráinsson’s (1978) account of preaspiration and sonorant devoicing.
these terms are used mostly in conjunction with aspiration (pre- and postaspiration), but ideally should be generally applicable in phonetics. Still, the definition will undoubtedly show weaknesses in some situations, since the terms it employs, “phonetic trait” and “dialect,” are themselves not always easily defined.

Nonetheless, the distinction between normative and non-normative traits has been found useful in discussing aspiration. The linguistic groups focused on here are defined on the basis of geographical and linguistic criteria, similar to those used to establish “traditional” dialectal divisions. These groups are Southern Icelandic, Northern Icelandic, Tórshavn Faroese, Northern Græsö dialect, Central Standard Åland dialect and Central Standard Swedish (henceforth CSw).

In all these dialects, the fortis stop series has normative postaspiration in certain contexts, which vary slightly depending on dialect. Common to all is postaspiration on fortis stops in word-initial position and before stressed vowels. These stops can be said to be normatively postaspirated, since a failure to aspirate properly would be interpreted as deviant (e.g., as with a foreign accent) by the native speakers of the dialect. They contrast with lenis stops, which lack postaspiration (in the corresponding positions) and which may be voiced or voiceless depending on dialect. This yields minimal pairs such as:

<table>
<thead>
<tr>
<th>Dialect</th>
<th>Fortis Stop Series</th>
<th>Lenis Stop Series</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faroese</td>
<td>+[tʰɛːla]</td>
<td>+[tɛːla]</td>
<td>(‘to speak’ vs ‘to wane’)</td>
</tr>
<tr>
<td>Icelandic</td>
<td>+[pʰɛːʃ]</td>
<td>+[pɛːʃ]</td>
<td>(‘pair’ vs. ‘bar’)</td>
</tr>
<tr>
<td>CSw</td>
<td>+[ɔɹˈkʰɛm]</td>
<td>+[ɔɹˈɡɛm]</td>
<td>(‘to empty’ vs. ‘to judge’)</td>
</tr>
<tr>
<td></td>
<td>+[ɔɹˈɡʃɛm]</td>
<td></td>
<td>(‘hurricane’ vs. ‘organ’)</td>
</tr>
</tbody>
</table>

The two stop series are traditionally referred to as fortis and lenis, and in the absence of unifying phonetic criteria for these stop contrasts (a fact that becomes even more evident in the following paragraph), the traditional terminology will be adhered to.

Word-internally, especially intervocally after stressed vowels, the expression of fortis stops in these dialects is much more complex. Some

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1 The four-spoked asterisk is used to indicate that the example being transcribed does not occur in the recorded data, but is an “invention” of the author. This is explained in more detail in section 3.1.
have normative preaspiration, others have normative postaspiration and in some cases one finds normatively unaspirated stops. CSw sets itself apart from the other dialects in terms of aspiration in these medial stops. In CSw, such stops are frequently preaspirated in the speech of some informants, while others tend to preaspirate much less or hardly at all. Therefore, the preaspiration found in CSw can be said to be non-normative. That is, the absence of preaspiration in CSw does not lead to a pronunciation that is considered deviant, even though preaspiration is a regular feature for many speakers.

One might wonder whether the concept of free variation could not replace non-normative in this discussion. Indeed, the two terms have very similar connotations. However, note that non-normative variation does not necessarily imply that the variation is free. In the data on CSw (discussed in greater detail in Ch. 4), there is one speaker who is particularly prone to producing fortis stops with preaspiration. In fact, this speaker almost always produces such stops with preaspiration. For this speaker, then, it is difficult to say that preaspiration in fortis stops in her speech has “free” variation. At the same time, her preaspirations are not normative, since there are speakers who regularly produce fortis stops with little or no preaspiration. However, if the reader feels that “free variation” covers this sort of variation, then the terms are interchangeable.

2.4 The geographical distribution of preaspiration

Hansson (1997) gives a detailed overview of the literature on reported occurrences of preaspiration. The following account of the known geographical distribution of preaspiration draws heavily on Hansson’s study. In some cases I try to evaluate these reports in terms of whether the language in question is an hC-cluster type or a preaspiration type language, as well as whether the preaspiration should be considered normative or non-normative. Also, some languages not included in Hansson’s overview are discussed.

Outside Europe, there are very few languages in which preaspiration has been reported to occur. A total of 15 languages are discussed here, but in very few of these cases can we reliably conclude that what is being
described is true preaspiration (as it has been defined in previous sections). The following discussion begins by listing the 15 languages in question, and then discusses each case in greater detail. The first mention of a language in which preaspiration is reported to occur is underlined to make it easier for the reader to keep track of the languages mentioned.

Four of the languages are from the Uto-Aztecan family: O’odham, a Sonoran language spoken in south central Arizona and into Mexico; Hopi, a Northern Uto-Aztecan language spoken in several villages in northeast Arizona, and to a lesser extent in neighbouring areas in Utah and New Mexico; Comanche, a Numic language spoken in western Oklahoma; and Mono, also a Numic language, which is now virtually extinct but used to be spoken in east-central California (around Lake Mono). One additional language in North America is reported to have preaspiration. This is Eastern Ojibwa, an Algonquian language spoken around Lake Huron and in southeastern Ontario. In Central America, one variety of Zapotec, an Oto-Manguean language, may have preaspirated stops. In South America, the Arawakan language Goajiro (also known as Guajiro and Wayuu), spoken on the Guajira Peninsula on the border between Colombia and Venezuela, is the only one reported to have preaspiration. Three languages with preaspiration are found in the westernmost part of Asia. One, located in Siberia, is Forest Nenets, from the (North) Samoyedic branch of Uralic, which is spoken south and southeast of the Ob delta region. The other two are closely related North Caucasian languages, Chechen and Ingush, spoken in the northeastern part of the Caucasus. Further east in Asia, we shall consider the Turkic languages Western Yugur, (also known as Yellow Uyghur) Tuvan and Tofa, as well as the language isolate Ket. And last, we shall consider recent findings regarding preaspiration in Halh Mongolian, a Mongolian language spoken in Mongolia.

Preaspiration in O’odham was described by Voegelin et al. (1962:22) and Alvarez & Hale (1970:94; both are cited in Hansson, 1997:30). According to these accounts, O’odham has two stop series, one of which is

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1 Actually, *Ethnologue* (Grimes & Grimes, ed.) lists two languages, Ket and Yugh, as the only members of a family called Yenisei Ostyak. However, by 1991 Yugh had only “2–3 semi-speakers” remaining and can therefore be considered virtually extinct.
usually expressed as unaspirated and voiceless, the other as postaspirated in word-initial position and preaspirated medially and finally. Hansson (1997:30) also cites unpublished material from Fitzgerald, who finds that preaspiration occurs after both long and short vowels, and that it is longer after long vowels. According to Fitzgerald’s account, preaspiration in O’odham can occur word-initially if the preceding word or prefix ends in a vowel. Thus, following Fitzgerald, preaspiration in O’odham could be described as occurring intervocally in all word positions, while postaspiration occurs only in stops not preceded by a vowel.

Whorf (1946) analysed four Hopi dialects from the villages of Toreva, Oraibi, Sipoulovi and Polacca. He concluded that the Toreva dialect had preaspirated stops and found that similar pre-occlusive aspirations in the Oraibi dialect should rather be analysed as hC clusters. Pre-occlusive aspirations did not occur in the remaining two dialects. Instead, these dialects reflected the preaspirated stops of the Toreva dialect as long stops.

The phonological status of occurrences of pre-occlusive aspiration in Comanche and Mono is less clear. Hansson (1997:31) tends towards viewing these as preaspirated stops, pointing out that in both languages, preaspiration seems to arise spontaneously on VC boundaries (i.e., it does not develop from a consonant such as a voiceless fricative). However, in the description of Voegelin et al. (1962:124) the preaspirations of Comanche and Mono are interpreted as hC clusters. Such an analysis is supported by their claim that both /s/ and the nasals in both languages also have preaspiration. This being the case, it may be more appropriate to analyse the pre-occlusive aspirations in Comanche and Mono as hC clusters.

Many of the Algonquian languages of North America are alleged to have preaspirated consonants. However, I find, as does Hansson (1997:28), that pre-occlusive aspirations in these languages should rather be considered hC clusters because they originate in the lenition to /h/ of the first consonant in consonant clusters, which entails that h-sounds can, as a rule, occur before most types of consonants.

Eastern Ojibwa sets itself apart from the other Algonquian languages in that instead of having lenited the first elements in clusters, these have completely disappeared and a compensatory lengthening has occurred in the second cluster element. This yields an opposition between geminate and non-geminate stops. In his account of Ojibwa, Bloomfield (1956) briefly describes the nature of the phonetic distinction between geminates and non-geminates.

The fortes are voiceless, vigorously articulated, and often rather long. The stops, \( pp, tt, kk, cc \), are often preceded by a slight aspiration: 
\[ \text{eto·ppuwin} \quad \text{‘table’} \]

The lenes are usually voiceless; between vowels and especially after a nasal they are often partly or wholly voiced: 
\[ \text{ekate·ntam} \quad \text{‘he is ashamed.’} \]

The lenes are quite vigorously articulated, but less so than the fortes; they are decidedly short and are never aspirated. The lenes occur initially, after vowels, and after nasals.

(Bloomfield 1956:8)

This is basically all that is known about preaspiration in Ojibwa. Maddieson (1984) and Ladefoged and Maddieson (1996) have interpreted this as meaning that the fortes stops are preaspirated. Consequently, Ojibwa is described as having preaspiration in the UPSID database (Maddieson & Precoda 1989). However, from Bloomfield’s comments one may infer that preaspiration in Ojibwa is fairly sporadic (“The stops […] are \( often \) preceded by a slight aspiration”; my italics) rather than a general characteristic of the language. We should also keep in mind that lenes and fortes seem to differ in duration more consistently than they differ in preaspiration. For these reasons, it is possible that Ojibwa has (or at least had) non-normative preaspiration very similar to that in CSw today (cf. Ch. 4, section 4.2.3.2), rather than the normative kind found in Icelandic and Faroese. The issue remains undecided, however.

Holmer (1949) describes occurrences of preaspiration in Goajiro. He finds that preaspiration is an idiolectal rather than a normative feature of the language, used by relatively few speakers (ibid:49). Thus, according to Holmer’s own description, we should describe preaspiration in Goajiro as non-normative, like in CSw. However, the situation here may be more complex. Historically, according to Holmer, these preaspirated stops have developed from “simple” stops (i.e., not clusters or geminates)
while clusters have developed into geminate stops. Thus the preaspirating speakers of Goajiro seem to contrast intervocalic preaspirated stops with intervocalic geminate stops, much as do speakers of Icelandic. In Maddieson’s (1984) description of Goajiro, no such stop contrast is reported. It is possible that a normative stop contrast once existed, but that it was already disappearing at the time of Holmer’s observations and later died out completely. Whether this contrast is upheld by some other means (for example through duration) by non-preaspirating speakers is unclear.

Ladefoged & Maddieson (1996:73) analysed a recording of a Goajiro speaker who did not preaspirate consistently but “sometimes used a breathy voice offset to a vowel that was followed by a long stop.” Since there are no durational measurements of the stops and they are not “tagged” for historical origin, it is impossible to tell whether or not the contrast described by Holmer is upheld.

According to Holmer, a peculiarity in Goajiro preaspiration is that word-initial stops can be preaspirated if the preceding word or prefix ends in a vowel. Thus a word like [⟨ʰ⟩paŋa],¹ ‘leaf,’ will be produced as [p] utterance-initially, without aspiration, but postvocically the [ʰp] is preaspirated, as in [unuʔuʰpaŋa] ‘tree leaf’ and [nuʰpaŋa] ‘its leaf; leaves.’ As Hansson points out (1997:32), this pattern is reminiscent of Fitzgerald’s account of O’odham.

Material suggesting that preaspiration is found in Forest Nenets dates as far back as the middle of the 19th century (Hansson 1997:24). Hansson interprets his sources (Lehtisalo 1947, 1956, 1960; Posti 1954; Marosán 1983) as indicating that a long stop in the Tundra Nenets dialect corresponds to a preaspirated stop in the Forest Nenets dialect. Given that Hansson’s sources are competent in Finnish, and are thus familiar with a language in which /h/ can occur in any preconsonantal position, it may be assumed that Forest Nenets allows aspirative sounds only before stops and not before other consonants. Otherwise, these authors would have analysed the pre-occlusive aspiration as /h/, like they would in Finnish.

¹ The double brackets indicate that these transcriptions are taken from Holmer’s work (cf. Chapter 3.1).
As to preaspirated stops in Chechen and Ingush, information is scarce indeed. Catford (1977:114) claims that preaspiration occurs in both languages, but does not go into detail regarding its distribution or phonetic character. The only other source of information is Hansson’s personal communication with Johanna Nichols (of the University of California, Berkeley) who “confirmed the existence of preaspiration in Ingush” (Hansson 1997:27; my translation).

Turning now to Central Asia, Roos (1998) has described preaspiration in Western Yugur, an Eastern Turkic language spoken in the Gānsū province in the People’s Republic of China. Roos uses data from a variety of written sources, and has also made (impressionistic) analyses of a recording of a male Western Yugur speaker. According to Roos, most voiceless consonants in Western Yugur, including stops, affricates and fricatives, can be preaspirated. Also, voiceless liquids occur before voiceless consonants; this has been analysed as part of the preaspiration phenomenon. The phonetic shape of this preaspiration varies with context:

In Western Yugur, preaspiration generally occurs as an $h$-like element [$h$], but before [$q$] as a fricative [$\chi$]; it may be realised as [$s$] near the front high vowels, and as [$\varphi$] near [$u$]. [...] Preaspiration may spread over the entire vowel, resulting in a completely whispered vowel, e.g. [$q$]; especially high vowels when occurring between [$s$, $s$] and a velar of uvular plosive [$k$, $q$] […] tend to be whispered.

(Roos 1998:30)$^{1}$

The type of variation Roos describes here is very similar to that found in the preaspiration data reviewed in Chapter 4, especially the realisation of oral friction in lieu of aspiration proper. Roos cites numerous examples from the production of his informant, e.g: [$[\text{a}^\text{h}\text{t}]$] / [$[\text{g}\text{t}]$] ‘horse,’ [$[\text{k}\text{e}^\text{b}\text{p}]$] ‘many,’ [$[\text{s}\text{i}\text{q}\text{q}]$] ‘to squeeze,’ [$[\text{q}\text{\alpha}\text{q}^\text{q}]$] ‘to fear’ and [$[\text{p}\text{d}\text{b}\text{s}]$] ‘to press.’$^{2}$

Historically, Roos explains that Common Turkic non-initial sequences of short vowel and fortis stop (*$p$, *$t$, *$k$) are reflected with preaspiration in Western Yugur. Fortis stops preceded by a long vowel are reflec-

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$^{1}$ The phonetic notation of the original has been kept in this citation.

$^{2}$ These transcriptions are from Roos’s text (hence the use of the double brackets—cf. Chapter 3.1) and have been adapted to the current IPA notation. The following forms appear in the original: $a^h\text{t}$ / $\text{g}\text{t}$, $k^b\text{p}$, $s^i\text{q}\text{q}$, $q\text{\alpha}\text{q}^q$ and $\text{p}\text{d}\text{b}\text{s}$. 
ted as voiceless unaspirated or postaspirated. The development of pre-aspiration before sibilants is less consistent. Thus a Common Turkic sequence of a short vowel and a sibilant does not always yield preaspiration, but at the same time it seems clear that a Common Turkic sequence of a long vowel and a sibilant never results in preaspiration.

In addition to Western Yugur, Roos also cites examples from both Tuval and Tofa\(^1\), which are fairly closely related to Western Yugur but are spoken in Russia, in a region northwest of Mongolia. Both Tuval and Tofa have been reported to have “pharyngealised” consonants (cf., e.g., Schöning, 1998), and Roos points out that the distribution of pharyngealisation in these languages corresponds very well with the distribution of preaspiration in Western Yugur, so much so that they are bound to reflect a common origin. In fact, Roos transcribes his Tuval and Tofa examples (again taken from several sources) as having preaspiration rather than some kind of a pharyngealised or glottalised element. For example, for Tuval he offers the example ɔʰt ‘grass’ with preaspiration, whereas, for example, Johanson (1998:98) offers ɔʔt, with a glottalised stop.

The sentiment that Tuval and Tofa pharyngealisation is misrepresented is echoed in Liberman (1982:126ff; 300f). Like Roos, Liberman transcribes Tuval examples with preaspiration rather than glottalisation. Further, Liberman claims that what has been described as pharyngealisation in the neighbouring language isolate Ket is also preaspiration. However, I have no true first-hand information confirming that pharyngealisation in Tuval, Tofa and Ket is actually most appropriately described as preaspiration.

Lastly, we turn to Halh Mongolian. Mongolian has two stop series, usually referred to as “strong” and “weak” (corresponding to fortis and lenis). Svantesson & Karlsson (2002) have shown that the “strong” stops of Ulaanbaatar Halh (i.e., the variety spoken in the Mongolian capital, Ulaanbaatar) are preaspirated. They also found that in sonorant + stop sequences, the “strong” series is expressed through partial voicelessness in the sonorant preceding a voiceless stop, while the “weak” series has a fully voiced sonorant before a voiceless stop. According to Svantesson & Karlsson, preaspiration in Ulaanbaatar Halh also occurs on word-initial

\(^1\) An alternate name is (Turkic) Karagas.
stops if the preceding word ends in a vowel or a sonorant. Thus the pattern described for O’odam and Goajiro earlier is repeated here.

Figure 2–4(a–b). Illustration of preaspiration in Halh Mongolian. Figure (a) contains the sequence /pii ata gisəŋ/ ‘I said demon’ without preaspiration, and Figure (b) the sequence /pii aʰta gisəŋ/ ‘I said camel-gelding’ with preaspiration. The data (courtesy of Svantesson & Karlsson) are recorded on location in Ulaanbaatar. Note that the noise during the [t]-closure in Figure (a) is caused by an echo of the preceding vowel.

The Ulaanbaatar Halh stop contrast is illustrated in Figure 2–4 (data courtesy of Svantesson & Karlsson). Two sentences are produced, one with a “weak” stop, /pii atə gisəŋ/ ‘I said demon (I demon-RFL said)’ in 2–4(a), and one with a “strong” stop, /pii aʰta gisəŋ/ ‘I said camel-gelding (I camel-gelding-RFL said)’ in 2–4(b). The sentences are spoken
by a middle-aged male speaker. In both examples the stop itself is produced as voiceless and unaspirated. However, in the latter example, the stop is preceded by a preaspiration, which is not present before the former stop.

Finally, we consider some stray remarks on possible preaspiration “sightings” in the Americas. Hansson (1997:33) cites personal communication with Michael Piper¹, who described to him “some kind of preaspirated stops” in one of the numerous dialects of the Oto-Manguean language Zapotec, which in some other dialects was reflected as preglottalisation. Lastly, Holmer (1952:19), who described preaspiration in Goajiro, comments that many of the Iroquoian languages in southeastern Canada had “an aspirate (h) before a stop” resulting in “such combinations as hk and ht.” Holmer does not name specific languages or dialects and it is difficult to know whether he interprets these aspirative sounds as being an inherent property of the stops or /h/-phonemes. Although information in these cases is very limited, they certainly warrant further investigation.

Within Europe, preaspiration has been reported to occur only in the northwestern region: the Scandinavian peninsula, Iceland, the Faroes, the Orkneys, Shetland, the Western Isles, and the northernmost parts of Scotland and Ireland. In this area, preaspiration is found in a number of languages and dialects from no less than three language families (Germanic, Celtic and Lappic) of two different stocks (Indo-European and Finno-Ugric). Thus, as Wagner (1964) observes, preaspiration in this part of the world is clearly an areal phenomenon. Depending on the criteria used for counting, there are 10–20 languages and dialects in this area in which preaspiration has been reported to occur. These include Icelandic, Faroese, several dialects of Norwegian and Swedish, Scots Gaelic, Irish and almost all the Saami languages. The nature and geographical distribution of preaspiration in this area, as well as the languages and dialects involved, will be discussed in more detail in Chapter 3.

The segment inventories of several of the languages in which preaspiration is alleged to occur form part of the UCLA Phonological Segment Inventory Database, or UPSID (Maddieson, 1984; Maddieson &

¹ Affiliated at the time with the Summer Institute of Linguistics.
Precoda, 1989). The languages in question are Hopi, Ojibwa, Goajiro, Nenets and Norwegian. However, only one of the languages in UPSID, Ojibwa, has preaspirated stops in its inventory. This apparent discrepancy has its explanations. First, in Hopi, Nenets and Norwegian, preaspiration is found only in dialects and can thus not be said to be a feature of each of these languages as a whole. For Hopi, as we saw earlier, the speech in only one out of the four villages studied had preaspirated stops. For Nenets, only speakers of the Forest dialect preaspirate, while speakers of the Tundra dialect (who by far outnumber the Forest dialect speakers) do not. As regards Norwegian, there are reports of preaspiration in a few relatively small areas involving only a handful of Norway’s numerous dialects. And as regards Goajiro, we saw earlier that even if preaspiration was once normative in the language, it seems to have died out completely. We are thus left with Ojibwa as the only preaspirating language in UPSID.

2.5 How rare is preaspiration?

Judging by UPSID, in which only one of the 451 languages has preaspiration, preaspirated stops are even more exclusive than, for example, dental and lateral clicks. This does raise the issue of whether the frequency of occurrence of preaspiration in the world’s languages is being severely underestimated. The main cause of concern here is that preaspiration is, at least in my own experience, a fairly subtle phonetic feature (for reasons that we shall try to unearth in the following section). In auditory analysis, one can easily miss instances of preaspiration if one is not specifically looking for them. Thus it is quite conceivable that many an impressionistic analysis of the phonology of a language fails to accord the preaspirated consonant its rightful place.

Another concern is that, as we have seen, dialectal variations are, to a large extent, not represented in the UPSID data. This could be the case in phonemic descriptions of languages in general. A case in point is Norwegian, the only Nordic language\(^1\) in UPSID. It is well established that several Norwegian dialects do have preaspirated stops (cf. Chapter 3.4),

\(^1\) The term “Nordic language” is used here to refer to those languages (and dialects) that derive from Old Norse.
but this is not true of the “standardised” dialect used for UPSID. Consequently, in UPSID, Norwegian has no preaspirated stops. This is quite justifiable, since “on average” Norwegian does not have them. But what if this is true for more languages than Norwegian? Perhaps preaspiration does occur in dialects of various other languages in different geographical locations but is overlooked in the “greater scheme” of things.

Here it may be useful to make a comparison between preaspirated stops and clicks. Clicks are perceptually highly salient events. It is most unlikely that even the most inexperienced linguist would fail to detect them when constructing a phonetic or phonological account of a language. At least—and in contrast to preaspirated stops—it is very difficult to believe that there are languages (or dialects of languages) out there teeming with click sounds that linguists have failed to spot.

Preaspiration is generally regarded as an extremely rare phenomenon. However, it is possible that a great deal of the occurrences of preaspiration in languages in general are being overlooked, since most detailed acoustic phonetic studies have concentrated on the more standard varieties of “mainstream” languages. And even when acoustic studies (as opposed to auditory ones) on the production of stops are carried out, there is no guarantee that preaspirations are even noted by researchers. One reason for this is that field recordings often contain considerable echo, which can be hard to distinguish from preaspiration in spectrographic analysis.\(^1\) Unless the recording is made in a properly sound-treated room, preaspirations may be confused with the echo that is often present in the stop silence of voiceless stops. Therefore, it is not unlikely that the frequency of occurrence of preaspiration of the non-normative type (like the ones reported for CSw, see Ch. 4.2.3) has been severely underestimated.

It seems less likely that normative preaspirated stops have been overlooked to the same degree. One must at least assume that a phonetic detail that is an essential cue to a phonemic contrast is less likely to be overlooked or disregarded than are phonetic details in general. However, it is also quite possible that preaspirated stops have been registered as

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\(^1\) For instance, one can detect some echo in the illustration of the Halh Mongolian stop contrast in Figure 2–4(a).
“normal” unaspirated, voiceless stops. For Halh Mongolian, for example, which Svantesson & Karlsson (2002) have shown has normatively pre-aspirated stops, two divergent descriptions of the “strong” vs. “weak” contrast exist. According to Svantesson & Karlsson, Ramstedt (1902) described the strong series as postaspirated in word-initial position, and pre- and postaspirated in word-medial position. This description is echoed in Vladimirov (1929), Poppe (1936, 1951) and Sanzheev (1953). However, it seems that there is a more widespread belief that the strong vs. weak contrast is expressed as voiceless vs. voiced stop in all positions. This characterisation of the contrast can be found in, for example, Rudnev (1905), Hattori (1943) and Todaeva (1951). Thus, although Ramstedt had correctly identified the occurrence of preaspirated stops in Halh Mongolian, this did not prevent the less correct description of stops such as simply voiceless unaspirated (contrasting with voiced stops) from gaining ground.

The case of Halh Mongolian preaspiration suggests that preaspiration is particularly difficult to detect in impressionistic analysis. It is only through the instrumental analysis of Svantesson & Karlsson that we can confirm that there are preaspirated stops in Halh Mongolian. Since most existing phonematic descriptions of languages are based on impressionistic analyses, including those that make up the bulk of the UPSID data, one may begin to suspect that preaspirated stops are far more frequent in the world’s languages than has hitherto been thought.

But even if normatively preaspirated stops occur more frequently than was previously believed, they may still be relatively rare. And, as I have claimed, preaspiration seems to be a subtle, almost evasive phonetic trait that tends to escape detection in auditory analysis. The apparent rarity and elusiveness of preaspirated stops may have to do with the perceptual characteristics of the preaspiration noise. Is it hard to hear preaspiration? And is this the reason for its apparent rarity? These questions are considered in the following section.
2.6 Auditory constraints and the rarity of preaspiration

The apparent rarity of normative preaspiration in the world’s languages has not received much attention in the literature. One of the few extant accounts that deals with the issue of on an empirical basis is Bladon’s (1986) explanation of the rarity of preaspiration in terms of auditory constraints. Drawing mostly on the research of Delgutte (1980, 1982), Bladon has established a set of general principles of audition. These principles act as constraints on the possible sound patterns of languages. Sound patterns that, in some way, provide good perceptual discriminability are favoured over those that result in poor discriminability. In this way, Bladon tries to explain some general tendencies in the sound patterns in languages.

Of the constraints proposed by Bladon, mainly two are of concern here: On/off response asymmetry and Short-term adaptation. As for On/off response asymmetry, Bladon proposes that “spectral changes whose response in the auditory nerve is mainly onset of firing are much more perceptually salient than those producing an offset.” Using preaspiration as an example, Bladon points out that any temporal information for the preaspiration relies entirely on the detection of offsets, rather than onsets, which is poor in terms of salience. Postaspiration, on the other hand, is optimally salient from this point of view, since it is preceded by a silence.

And as regards Short-term adaptation, Bladon refers to Delgutte’s (1980, 1982) work, saying that “after a rapid onset of auditory nerve discharge at a particular frequency, there is a decay to a moderate level of discharge even though the same speech sound is continuing to be produced.” Turning to preaspiration again, Bladon notes that, unlike postaspiration, preaspiration is subject to widespread short-term adaptation. This results from the fact that a vowel and a following preaspiration have very similar spectral characteristics and therefore there is little chance of neural recovery before the onset of preaspiration.

Thus, preaspiration takes pride of place among Bladon’s examples of sound patterns that are bad for audition. In fact, Bladon describes preaspiration as an “auditory phonetic dinosaur” that could hardly be less
suited for communicative purposes. This, he claims, is reflected in UPSID, in which “from the 317 languages […] preaspiration is attested in only 2 or 3.”¹

Bladon’s account is convincing and has intuitive appeal for those that feel, as I do, that preaspiration is a fairly unobtrusive phonetic feature that tends to escape detection. However, his claims should not be viewed uncritically, and there are problems with his approach.

First, Bladon relies on UPSID for information on the frequency of occurrence of the sound pattern [h] + stop (i.e. pre-occlusive aspirations). As was discussed in the preceding section, a problem with UPSID is its possible underestimation of the frequency of preaspiration occurrence. A more serious problem is the fact that UPSID does not contain any information regarding the frequency of occurrence of hC clusters.² The auditory constraints Bladon proposes should apply to any VhC sequence, not only to sequences in which the h-sound happens to get classified as preaspiration (cf. discussion in section 2.1). It is in this way that the frequency of occurrence of pre-occlusive aspirations—i.e., h-sounds in hC clusters and preaspirations—is underestimated (see also Hansson (1997:9).

For comparison, consider if one were investigating the frequency of occurrence of pre- and post-affricated [t], e.g., [ʃt] and [tʃ]. UPSID tells us that 41% of languages have [tʃ], but no pre-affricated stop [ʃt] whatsoever is found—it is not even part of the UPSID segment inventory. We cannot conclude from this that the sequence [ʃt] is auditorily inept. The reason why [ʃt] does not show up in UPSID is not that it does not occur in the languages of the world, but rather that when it does occur, linguists seem to analyse it as a cluster instead of a pre-affricate “segment.”

¹ Bladon used a version of the UPSID database that contained phonological inventories from 317 languages (cf. Maddieson 1984). In the updated UPSID (Maddieson & Precoda 1989), which has inventories from 451 languages, only one language has preaspiration.

² It is difficult to obtain reliable estimates on how many languages allow hC clusters. The ones I am aware of include Finnish, Menomini, Taba, some varieties of Spanish (esp. American), Arabic (as well as many languages that have borrowed from Arabic, e.g. Urdu, Persian and Turkish), many of the Algonquian languages, Comanche and Mono, as well as some Oto-Manguean languages. This list is hardly exhaustive. My hunch is that the languages in which pre-occlusive aspirations are most appropriately analysed as clusters outnumber the languages in which they are most appropriately analysed as preaspirated stops.
The second criticism of Bladon’s approach concerns discharge rates in the auditory nerve. Since Bladon limits his discussion to a comparison between preaspiration and postaspiration, one may lose sight of the fact that not all speech sounds have high neural discharge rates at their onset. In fact, it is a general property of voiceless fricatives that they have long rise-times and therefore generate only modest surges in neural discharge rate at their onsets (Delgutte, 1980). Most likely, these surges are hardly noticeable at all for sounds with low SPLs, such as [x], [f] and [h]. By comparing sequences such as [aft] and [aht], one would find only modest differences in neural discharge rates (e.g., due to the labiodental place cue in the vowel), certainly much smaller than the differences one might observe for sequences such as [ðθθθ] and [ðθθθ]. Thus even if the presence of a high neural discharge rate may provide some auditory enhancement to a sound, this does not entail that the absence of such a peak of neural discharges indicates that a sound is auditorily inept.

Furthermore, a surge in neural discharge rates for a particular speech sound cannot be considered an invariant property of that speech sound, because the preceding context is bound to vary and neural recovery (from a state of adaptation) is relatively slow. Thus Delgutte (1980) showed, for example, that onset discharge rates for specific nerve fibre channels of the vowel [ɹ] varied depending on whether the preceding segment was the nasal [m] or the stop [b].

Most important of all, however, is that it has not been effectively demonstrated that a given increase in discharge rates in the auditory nerve leads to a comparable increase in perceptual salience. We should keep in mind that although Delgutte’s findings reveal that abrupt onsets are much more clearly marked than are gradual onsets at the level of the auditory nerve, they do not indicate to us the differences in auditory salience between abrupt and gradual onset. For such indications, Delgutte’s experiments on anaesthetised cats must be supplemented by more subjective experiments on human listeners.

Such experiments have not been conclusive. Lacerda (1987) performed a series of experiments designed to determine whether non-adapted auditory nerve responses (i.e., with high neural discharge rates)

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1 The original has [a], here interpreted as an open central unrounded vowel.
are better discriminated than are adapted responses (i.e., with low neural discharge rates). In one experiment, Lacerda investigated the difference in discriminability between short, synthetic vowel stimuli with abrupt vs. gradual onsets. F2-values for the stimuli varied, ranging from 1510 Hz to 1690 Hz in 30-Hz increments. F1 was fixed at 200 Hz, F3 at 2600 Hz, and F4 at 3600 Hz. A two-alternative forced choice paradigm was used and subjects were asked to note whether or not the two alternatives presented were different. Lacerda found that when the F2 difference between two stimuli was 60–90 Hz, the stimuli with abrupt onsets had significantly better discrimination rates than did gradual stimuli. This indicates that the F2 differences have more auditory salience in abrupt than in gradual stimuli.

However, in an identical experiment using aperiodic instead of periodic stimuli (thus essentially synthesising an aspiration, but possibly using a more fricative than aspirative source), Lacerda did not find that gradualness of onset lessened discriminability at all. Instead, discriminability scores for stimuli with abrupt and gradual onsets were almost identical. The scores lay somewhat below those for abrupt periodic stimuli, but above those for gradual periodic stimuli. (This applies to the cases in which F2 differs by 60 Hz or 90 Hz; other differences are much smaller). Thus the abrupt vs. gradual difference found in the first experiment does not appear in the second.

One may note that aperiodic sounds with abrupt and gradual onset are both “natural” in speech (abrupt onset = affricate, gradual onset = fricative). Periodic sounds with an abrupt onset (vowels) are also “natural” in speech. However, periodic sounds with a gradual onset (such as the one synthetically created by Lacerda) are not. Perhaps subjects are better able to discriminate sound patterns that are used consistently in speech than sound patterns that humans may not even be able to produce (such as the periodic gradual onset vowel stimulus used in Lacerda’s experiment).

Reviewing these facts, one may perhaps conclude that there is some degree of correlation between discharge rate and auditory salience, but that the two can in no way be equated directly. Thus a three-fold increase
in discharge rates in the auditory nerve does not translate into a threefold increase in auditory salience.

The third criticism of Bladon’s account concerns the principle of on/off response asymmetry. As support for this principle, Bladon refers to a study by Tyler et al. (1982), but it appears that their findings are inappropriately applied to the principle. In their experiment, Tyler et al. attempted to establish: a) the smallest perceivable durational differences (i.e., durational difference limens) of silence in noise; and b) the smallest perceivable durational differences of noise in silence. The silences, or gaps, were embedded in 1000-ms noise bursts. The minimal duration of the gaps was 80 ms, and the total duration of gap and noise burst was kept constant at 1000 ms. Subjects were presented with three stimuli at a time with differing gap durations and were asked to identify the longest gap. For the detection of noise in silence, noise bursts were used. The shortest noise bursts were 30 ms long. The subjects’ task was to identify the longest of three noise bursts. Tyler et al. found that “Filled intervals [noise bursts in silence] are about three times easier to discriminate than unfilled intervals [gaps in noise]” (1982:745).

There are several problems in translating these findings into a principle of audition. In accordance with Weber’s Law, durational difference limens increase as the duration of the stimulus increases. This means that it is easier to detect a 15 ms difference in duration between two relatively short stimuli (say 15 and 30 ms) than it is to detect a 15-ms difference between two relatively long stimuli (say 85 and 100 ms). Since the noise bursts and the gaps in the experiment of Tyler et al. are not of comparable durations, their claim that sensitivity to differences in noise burst duration is greater than sensitivity to differences in gap duration may partly be a result of the fact that the gaps in their experiment were longer than the noise bursts. Additionally, Formby and Sherlock (1998) have recently shown that the subjective duration of a gap is extremely dependent on the frequency characteristics of the preceding and following stimuli. Thus, in the words of Formby and Sherlock, “detection thresholds for a silent temporal gap may increase by an order of magnitude depending upon the number, temporal position, and frequency relations of the components that mark the temporal onset and offset of the gap signal.”
Lastly, even if we are truly better at discriminating noise duration in silence than silence duration in noise, it does not follow that “spectral changes whose response in the auditory nerve is mainly onset of firing are much more perceptually salient than those producing an offset” (Bladon 1986:5). Offset of firing in the auditory nerve occurs in both types of stimuli, noise bursts and gaps. If the time lag between voice offset and onset (gap) or voice onset and voice offset (noise burst) is used to establish duration, an inherent difficulty in pinpointing voice offset should render the duration of both types of stimuli equally difficult to gauge. Bladon’s principle therefore does not explain the data provided by Tyler et al.; nor do the data of Tyler et al. illustrate Bladon’s principle.

However, other kinds of evidence may support the notion of on/off response asymmetry. For example, experiments on the reaction time (RT) to the onset vs. offset of stimuli may indicate an existence of such an asymmetry. But, while there have been numerous studies on RT for the onset of stimuli, few experiments have been carried out in which RT to offset is measured. In by far the most extensive such study to date, testing 60 subjects, Rammsayer (1998) found that for white noise stimuli at both 65 and 90 dB, onset reaction times were significantly faster than were offset reaction times.

If these findings are an indication that there is such a thing as on/off response asymmetry, its cause is still unclear. One might speculate that it is related to the findings of Delgutte (1982) and that it should be seen as a consequence of short-term adaptation. If this is the case, the principle may provide some indication of the degree to which neural discharge rates can be translated into salience.

To summarise, Bladon attributes the rarity of preaspiration to properties of the auditory nerve, in essence to the absence of non-adapted neural activity at the onset of preaspiration. However, non-adapted neural activity is not a prerequisite for auditory robustness, and there is little evidence that non-adapted neural activity gives significant returns in terms of auditory salience. Thus, although there may be some perceptual benefits from non-adapted neural activity, this approach exaggerates the significance of neural discharge rates, essentially turning them into a measuring stick for perceptual salience. Also, Bladon underestimates the
number of languages that possess sequences of aspiration and stop (be they called preaspiration or hC clusters). Two phonetically similar sound sequences that differ only in terms of phonological interpretation should not respond in different ways to the same auditory constraint. Such constraints must be applicable to sound patterns, irrespective of how these sound patterns are organised phonologically.

To conclude, the auditory constraints proposed by Bladon are not as powerful as he claims, and can hardly be wholly responsible for the apparent rarity of normative preaspiration. Nevertheless, they should be given serious consideration, since they indicate that postaspiration is better in terms of perceptual discriminability than is preaspiration. Possibly, this has a bearing on the outcome of a process of sound change in that postaspiration has a perceptual advantage over preaspiration.
3 PREASPIRATION IN NORTHWESTERN EUROPE

3.1 Introduction

In this chapter, the stop systems of the known preaspirating Nordic languages\textsuperscript{1} and dialects are examined. The aim of this analysis is to get a more detailed picture of the similarities and dissimilarities of these stop systems, particularly with regard to the phonological distribution of preaspiration. Ultimately, the comparison of these systems may give us clues as to how Old Norse (henceforth ON)\textsuperscript{2} differentiated between, e.g., word-medial \textit{b, d, g} and \textit{p, t, k} as well as their geminate counterparts, \textit{bb, dd, gg} and \textit{pp, tt, kk}. We might also gain some insights into what triggered the development of normative preaspiration in these dialects.

For each dialect, the focus is on four aspects of the stop system. First, we examine how the dialect in question reflects the distinction between ON \textit{p, t, k} and \textit{pp, tt, kk} in word-medial, postvocalic position. Often, this question is inseparable from the question of how the quantity system has developed. Second, and intimately related to the first, is the development of ON clusters in which the first element is \textit{p, t, k}. Third, we consider how each dialect reflects ON sequences of sonorant + \textit{p, t, k}. And fourth, we try to determine whether ON word-medial \textit{b, d, g} and \textit{bb, dd, gg} are reflected as voiced or voiceless in the dialect in question.

In Europe, normatively preaspirated stops have been reported to occur only in Scandinavia and neighbouring regions in the Atlantic. Three language families are involved, Germanic and Celtic (Indo-European)

\begin{enumerate}
\item The term “Nordic language” is used in this here to refer to those languages and dialects that derive from Old Norse.
\item My use of the term “Old Norse” can be taken to refer to those features that are common to the dialects spoken in Scandinavia, the Faroes and Iceland around 1000 AD (cf. discussion later in this section).
\end{enumerate}
and Lappic (Finno-Ugric). It has been suggested that through the influence of Old Norse, preaspiration spread to Celtic (Borgstrøm 1974) and Lappic languages (Posti 1954), but also that it may have spread from Celtic to Old Norse (Naert 1969). These views will be discussed briefly in Chapter 5 (see also overview of these hypotheses in Hansson 1997:189ff). As for the Nordic languages, the areas under consideration are Iceland, the Faroes, Jæren (Norway), Gudbrandsdalen (Norway), Härjedalen (Sweden), Gräsö (Sweden), the Åland archipelago and the Åboland archipelago (Finland).

The bulk of the dialectal descriptions referred to in this chapter were written in the late 19th and early 20th centuries. Most of the dialectologists working on Swedish and Norwegian during this prolific era of Scandinavian dialectal research used the Swedish Phonetic Alphabet (Landsmålsalfabet) notation, or its Norwegian equivalent Norsk lydskrift, for their transcriptions (cf. Lundell 1879 and Storm 1908\(^1\), respectively, for overviews of the Swedish and Norwegian systems). Generally, these transcription systems are now considered overly elaborate and cumbersome, especially The Swedish Phonetic Alphabet, which contains a large number of possible symbols, many of which are difficult to make sense of at first glance.

Still, the number of symbols used for the average dialect is usually fairly small. When describing the pronunciation for a given dialect, the dialectologist would establish a sound inventory for the dialect. These inventories were systematic and reductive but not phonemic (i.e., not based on the distinctive function of speech sounds), and therefore contained a considerable degree of allophony. Thus, each word was represented by a (non-phonemic) canonical form of sorts, but the transcriptions came much closer to the sound values actually produced than would a phonemic representation.

In the following discussion, I have translated all examples referred to in these works into the current IPA notation as closely as possible. In some cases, prosodic information, especially about the placement of stress and tone type (i.e., grave vs. acute), has been omitted. English glosses are provided, but note that these sometimes involve some guess-

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\(^1\) The first half of Storm’s overview was originally published in 1884.
work on my part since glosses appear haphazardly in the sources. I en-
courage the reader to consult the original before citing the examples
given here.

In transcription I adhere to the current IPA standard with only minor
idiosyncrasies. I should first explain my use of the four-spoked asterisk * before transcribed examples. Transcriptions that reflect actual instances
from my data are simply transcribed within brackets. However, I often
find it useful to give examples using words that do not appear in the data.
Such examples are transcribed using a phonetic standardisation of sorts
for the language in question and the transcription is preceded by a four-
spoked asterisk. The four-spoked asterisk thus makes it clear that an
example is not from the recorded data, and provides a way to distinguish
between attested examples and such “putative” examples. Note, though,
that I apply this distinction only to my own data and not to examples pro-
vided by other authors.

My use of double brackets also bears explanation. When a tran-
scription is enclosed in double brackets (e.g., [vɐ hãːnæ] or [fæhp]), this
indicates that the example in question is being cited from another source,
and that I have not had the opportunity to listen to the data myself. Thus
one may find, for example, that all examples given for the dialects of
Jæren, Gudbrandsdalen, Härjedalen and Kökar are enclosed in double
brackets, since I have no data of my own for these dialects. Through the
use of the four-spoked asterisk and the double brackets, I hope that the
source of the examples given will always be clear.

My use of the IPA tie bar — requires some explanation as well. In my
eamples, two consecutive vowels are often connected by a tie bar.
The reason for this is that in the vowel systems of some of the dialects
discussed, monophthongs and diphthongs can occur in both VːC and VC:
syllables. The tie bar provides a way to mark that, even though we are
dealing with a diphthong, it should be regarded as any other vowel in
terms of quantity. Thus in the Icelandic word pair *[vːsɐ] ‘hurry (obl.)’
and *[vːskɐ] ‘ash’ we have the same difference in quantity as in the pair
*[vːsɐ] ‘to agitate’ and *[vːskɐ] ‘youth’ — the diphthong [vːi] in the latter
word is short.
For the sake of simplicity and lucidity, I have generally chosen to stick to the rather loose term “Old Norse” rather than make use of terms with more precise time frames such as Proto-Nordic, Old East Nordic, Old West Nordic and Old Icelandic. In my text, Old Norse can be taken to refer to those features that are common to the dialects spoken in Scandinavia, the Faroes and Iceland around 750–1000 AD. The phonological organisation of the stop system is one of the features considered to be common to these dialects.

Further license is taken in that word examples from Old Icelandic texts are passed off as Old Norse. Again, this is done for the sake of exposition, and in the belief that the phonological organisation of the stop system remained fairly stable over time. These examples will be presented in a normalised orthography in italics. As such, they indicate the major phonological contrasts that existed within Old Norse, not their exact or even approximate phonetic realisations.

Similarly, the use of the terms “fortis” and “lenis” should not be interpreted as a statement about the phonetic character of these stop categories. Instead, these terms are simply used to differentiate between the two stop series on an abstract level. For all intents and purposes I could have used such terms as “series-A” stop and “series-B” stop, but I wished to refrain from introducing such new terminology.

The languages and dialects discussed are categorised by countries. However, one should be aware that often a sharp linguistic boundary does not exist between Swedish and Norwegian. In the case of several Central Scandinavian dialects, particularly those of Härjedalen and Dalarna, dialects that could be classified as Norwegian are now on the Swedish side of the border (Hansson, 1997:53). Also, the dialects in the western part of Jämtland in Sweden have a mixture of Swedish and Norwegian features.

3.2 Icelandic

Already in the latter half of the 19th century, phoneticians seem to have been aware that Icelandic had preaspirated stops. For instance, Henry Sweet describes preaspiration in Icelandic in his *Handbook of Phonetics* from 1877. Among Scandinavian dialectologists, general
awareness of Icelandic preaspiration is evident at the beginning of the 20th century, for example in the works of Hesselman (1905) and Storm (1908). More detailed reviews of the phonological distribution of preaspiration in Icelandic are found in later literature, perhaps most accessibly in Thráinsson (1978).

In both the northern and southern varieties of Icelandic, as in most of the languages and dialects reviewed in this chapter, ON pp, tt, kk are reflected as preaspirated. As examples we have *[lɔhp] loppa ‘paw,’ *[kʰøhty] köttur ‘cat,’ *[ŋyhcɪ] hnakki ‘(back of the) neck,’ and *[tœhkœ] drekka ‘to drink.’ ON word-medial and -final p, t, k are reflected differently in Northern and Southern Icelandic. In Southern Icelandic, they are usually realised as voiceless unaspirated as in *[tœøpœ] ‘drop,’ *[tœtyɪ] latur ‘lazy’ and *[vœkœ] vika ‘week.’ In Northern Icelandic these stops are postaspirated, which is actually quite unusual for such stops in the Nordic languages. We shall consider this type of postaspiration again later (cf. Ch. 4, section 4.5). However, the remaining exposition of the Icelandic stops pertains to the Southern dialect unless otherwise stated. A more detailed description of the Northern dialect is given in Chapter 4, section 4.5.1.

A distinction is made between ON p, t, k + r, j, v and pp, tt, kk + r, j, v clusters. The former are reflected as voiceless unaspirated stops in VːC syllables, e.g. *[neŋpœ] nepja ‘chill,’ *[stœjœ] sitja ‘sit,’ and *[vœŋkvœ] vökva ‘to water.’ The latter are reflected as preaspirated stops in VCC syllables, e.g. *[mehtœrœ] mettra ‘sated (gen. pl.),’ *[seŋhvœ] sökkva ‘sink,’ and *[nœhkœrœ] nokkra ‘a few.’ However, Icelandic does not reflect a distinction between ON p, t, k + l, n and pp, tt, kk + l, n clusters. All such clusters are now preaspirated, e.g. *[ehplœ] epli

---

1 The four-spoked asterisk indicates that the example is not from the recorded data, but is instead my own rendering of a possible pronunciation for a word (see preceding section).

2 This is not to be taken as a statement that ON had a distinction between all possible combinations of these consonants, merely that if ON had a distinction between a particular pair, say kl and kkl, then Icelandic does not reflect that distinction. Note also, that pm and tm clusters, which were uncommon (or nonexistent) in ON, are preaspirated in Modern Icelandic, e.g. *[kʰøŋpœŋvœ] kaupmaður ‘merchant’ and *[rœhmœ] rynti ‘rhythm.’ Note that in the former word, the preaspiration has come about as the result of a loss of the morpheme boundary between kaup and maður.
‘apple,’ *[vøþtnɔð] vatnía ‘the water’ and *[øhklɪ] ökkli ‘ankle.’ The
clusters pt and kt as well as ppt and kkt are reflected as sequences of a
voiceless fricative and a stop, e.g. *[stʃlɛtɪ] sleppti ‘released’ and
*[vøþxɛv] vakta ‘to guard.’ However, tk clusters have neither a fricative
nor preaspiration, but are instead voiceless and unaspirated, e.g.
*[vɪʃΧɛʃ] vitkast ‘become wiser.’

Finally, ON homomorphemic p, t + s and x are generally reflected as
sequences of fricative + [s], e.g. *[yfsɛl] upsir ‘eaves,’ *[þlesnɔ] blessa
‘bless’ and *[lɤxɛʃ] laxar ‘salmons.’ For x, though, there is an ongoing
trend towards producing these as [ks] sequences, e.g. *[lɤsɛl] (cf.
Þráinsson & Árnason, 1992). Across a morpheme boundary, e.g. when
attaching the genitive -s to a noun, the general rule is that the -s is added
without affecting it. Thus we get, for example, *[þrɛhpɔ] hраpps as the genitive of *[þrɛhpɔʃ] hраppur ‘scoundrel,’ *[mɛtsɔs] mats
However, one sometimes hears that the vowel in such genitives gets
shortened, but the stop remains unaspirated. For *[sɛʃpɔ] skip ‘ship,’ for
example, the genitive can be both *[sɛʃhps] and *[sɛʃps] (and actually
even *[sɛʃfs]). The form **[sɛʃhps] is not allowed, however.

ON bb, dd, gg are predominantly reflected as voiceless unaspirated,
as in *[lɤɭɔ] labba ‘walk,’ *[vɪtʃ] vidd ‘width,’ *[skɭɔʃ] skuggi ‘shadow,’
and *[rɤkɔ] rugga ‘to rock.’ Modern Icelandic also has clusters with
lenis stops as the first elements, e.g. *[nɭplɪ] naflil ‘navel,’ *[fɛɭɭiʃ] fellur
‘falls’ and *[rɤkɔɭ] rugla ‘to confuse.’

From the preceding discussion we see that the presence of preaspira-
tion on stops in postvocalic position before voiced segments goes hand in
hand with the length of the preceding vowel. Preaspirated stops can

---

1 As Hansson (1997:36) points out, such clusters are sometimes produced with
preaspiration, and it is not uncommon to hear, for example, *[nɭhɪkɔŋ] notkun ‘use
(noun).’

2 Whether these sequences actually had stops in ON is uncertain. Possibly, x in words
like lax ‘salmon’ was produced as [xs] while ks in þaks ‘roof (gen.)’ (where the -s is a
genitive marker, and k and s thus heteromorphemic) was produced as [ks].

3 In ON, lenis stops seldom preceded r, j, v, l, n. Genitive plural forms of adjectives are
a potential source for such sequences, e.g. tryggra, ‘loyal’ and høæдра ‘scared.’
Other examples include words such as hɔggva ‘hew,’ and, perhaps, uggla ‘owl.’
occur only after short vowels, and then the ON fortis vs. lenis distinction\(^1\) is reflected as unaspirated vs. preaspirated. After long vowels, stops are never preaspirated in Icelandic, and there is no fortis ~ lenis distinction. Thus, when Icelandic borrows from other languages, typically English, the loan words conform to this pattern and fortis ~ lenis distinctions in the lending language are ignored, e.g. \(\text{þ}[\text{pʰeɪt}]\) \text{bæt} ‘byte,’ \(\text{þ}[\text{sʌpɛ(ɹ)}]\) \text{súper-} ‘super-’ vs. \(\text{þ}[\text{ɾɛ̃tɛɹ]}\) \text{radar} ‘radar’ and \(\text{þ}[\text{tʰupa}]\) \text{túpa} ‘tube’.

Before voiceless segments (essentially \([t], [k] \text{ and } [s])\), ON stops can be reflected both as preaspirated and unaspirated, and the preceding vowel can be either long or short.

Lastly, we consider sonorant + stop sequences. In Southern Icelandic, ON \(r, l, m, n + p, t, k\) are reflected as sequences of voiceless sonorant followed by a voiceless stop, whereas ON \(r, l, m, n + b, d, g\) are reflected as sequences of a voiced sonorant followed by a voiceless stop. Voicelessness in the sonorants is complete (and not partial), i.e. virtually the entire sonorant is voiceless. As examples, we have word pairs such as \(\text{þ}[\text{vɛlɪɹ}]\) \text{veltur} ‘falls, capsizes’ vs. \(\text{þ}[\text{vɛltɪɹ}]\) \text{veldur} ‘causes,’ \(\text{þ}[\text{ɭɛmpɪ}]\) \text{lampi} ‘lamp’ vs. \(\text{þ}[\text{ɭɛmpɪ}]\) \text{lambi} ‘lamb (dat.)’ and \(\text{þ}[\text{ɕɪŋkɪm}]\) \text{einkum} ‘especially’ vs. \(\text{þ}[\text{ɕɪŋkɪm}]\) \text{engum} ‘nobody (dat. pl.).’

Finally, Table 3–1 provides an overview of how ON stops in different contexts are reflected in Southern and Northern Icelandic in terms of voicing conditions. In this table, the following conventions are used:

- + indicates that voice onset occurs after release (postaspiration)
- – indicates that voice offset occurs before stop closure (preaspiration or sonorant voicelessness)
- = indicates that voice onset and offset are timed in synchronisation with closure and release (voiceless unaspirated)
- \(\approx\) indicates a voiced stop

An asterisk indicates that a stop contrast has now emerged where ON had no stop contrast (the nature of this contrast is not indicated in the table).

\(^1\) The reader is again reminded that the use of the terms “fortis” and “lenis” does not express a phonetic differenciation, but instead provides a way of abstract distinction between the two stop series.
Table 3–1. Reflexes of Old Norse stops in Southern and Northern Icelandic in terms of voicing conditions (further explanation in text).

<table>
<thead>
<tr>
<th>ON examples</th>
<th>S. Icel.</th>
<th>N. Icel.</th>
</tr>
</thead>
<tbody>
<tr>
<td>tala ~ dala</td>
<td>+  =/≈</td>
<td>+  =/≈</td>
</tr>
<tr>
<td>mata</td>
<td>=</td>
<td>+</td>
</tr>
<tr>
<td>átta ~ odda</td>
<td>−  =</td>
<td>−  =</td>
</tr>
<tr>
<td>vanta ~ vanda (mn)</td>
<td>−  =</td>
<td>+  =</td>
</tr>
<tr>
<td>hjalpa (lp and lk)</td>
<td>− *</td>
<td>+ *</td>
</tr>
<tr>
<td>elta ~ elda (lt vs. ld only)</td>
<td>−  =</td>
<td>−  =</td>
</tr>
<tr>
<td>varta</td>
<td>−</td>
<td>−</td>
</tr>
<tr>
<td>vatna (n1)</td>
<td>− *</td>
<td>− *</td>
</tr>
<tr>
<td>nötra (rjv)</td>
<td>=</td>
<td>+</td>
</tr>
<tr>
<td>vaxa (x, p + ts)</td>
<td>fricative</td>
<td>fricative</td>
</tr>
</tbody>
</table>

In the first column, a word pair illustrating an ON fortis ~ lenis contrast is given. Note that in some cases, ON had no such contrast (e.g., for mata). A boldface t or d indicates that all places of articulation are involved (in other words t = p, t, k and d = b, g, d). If a symbol is underlined, the contents of the following parentheses indicate which consonants can appear in that position. Thus, for example, for the pair vanta ~ vanda, both m and n followed by a stop yield the result indicated in the columns to the right.

3.2.1 Icelandic stop durations

Several studies of preaspiration duration in Southern Icelandic have been carried out, most notably by Pétursson (1974, 1978), Garnes (1976), Rögnvaldsson (1980) and Indriðason et al. (1991). The latter study compares the production of word-medial stops for 6 Northern and 6 Southern Icelandic speakers. The speech materials used by Indriðason et al. consist

1 Glossary: tala ‘to speak,’ dala ‘valleys (gen.),’ mata ‘to feed,’ átta ‘eight,’ odda ‘points (obl.),’ vanta ‘to need,’ vanda ‘problem (obl.),’ hjalpa ‘help,’ elta ‘to chase,’ elda ‘fires (gen.),’ varta ‘wart,’ vatna ‘waters, lakes (gen.),’ nötra ‘to shiver,’ vaxa ‘to grow.’

2 The lateral is voiceless when the -lt- sequence is homomorphemic. Thus elta ‘chase’ has a voiceless sonorant, but gult ‘yellow (neut.),’ where -t is an inflectional ending, has a voiced sonorant (cf. Jónsson 1982).
of disyllabic words embedded in frame sentences. The words tested were:

<table>
<thead>
<tr>
<th></th>
<th>Lenis geminate</th>
<th>Fortis singleton</th>
<th>Fortis geminate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bilabial</td>
<td>gabba</td>
<td>gapa</td>
<td>happa</td>
</tr>
<tr>
<td>Dental</td>
<td>gadda</td>
<td>gata</td>
<td>hattur</td>
</tr>
<tr>
<td>Palatal</td>
<td>haggi</td>
<td>haki</td>
<td>bakki</td>
</tr>
<tr>
<td>Velar</td>
<td>hagga</td>
<td>haka</td>
<td>hakka</td>
</tr>
</tbody>
</table>

Each of these words was recorded once for each subject. Thus a total of 144 observations were made, 48 for each of three stop categories: reflexes of ON lenis geminates (e.g. *hagga* [+hk]), fortis singletons (e.g. *haka* [+hk]) and fortis geminates (e.g. *hakka* [+hk]). Indriðason et al. measured vowel (V) duration, preaspiration (Pr) duration (where applicable), stop occlusion (O) duration, and postaspiration (Po) duration (i.e., VOT). As regards segmentation criteria, it appears that voice onset and offset were used to delimit the onset of preaspiration and the cessation of postaspiration, respectively. Thus, the period of breathy voice that often precedes a preaspiration and follows a postaspiration does not seem to be included in their measurements of aspiration duration.

Table 3–2 provides a summary of the findings of Indriðason et al. for mean durations in vowel + stop sequences in Southern and Northern Icelandic. These means have been obtained by averaging the results for bilabial, dental and velar stops (i.e., palatal stops are excluded). The table also indicates the C/VC ratio, where C is the combined duration of Pr (where present), O and Po.

Their results reflect the fact that both Southern and Northern Icelandic have complementary length distribution (see Bannert 1979 for similar results for Swedish). This implies that stressed syllables have either a V:C structure or a VC: structure and that the durational ratio between vowel and consonant is relatively constant, at least compared with absolute durations. For V:C syllables (i.e., *haka* type words), the VC sequence is split almost equally between V and C in the Southern dialect.

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1 Glossary: *gabba* ‘to fool,’ *gapa* ‘to gape,’ *happa* ‘luck, chance (gen pl.),’ *gadda* ‘tack (acc. pl.),’ *gata* ‘road,’ *hattur* ‘hat,’ *haggi* ‘to budge,’ *haka* ‘chin,’ *hakka* ‘to hack,’ *hagga* ‘budge (lsg. conj.),’ *haki* ‘pick’ and *bakki* ‘bank, hill.’
In the Northern dialect, \( V \) is slightly shorter than \( C \). For VC: syllables there are both unaspirated (\( hagga \) type words) and preaspirated (\( hakka \) type words). However, in both word types the \( V/VC \) ratio is very similar and \( V \) is approximately one-fourth of the total \( VC \) duration. This holds in spite of the fact that the segmental structure of the two word types is radically different. The duration of \( C \) in \( hagga \) type words is comprised only of \( O \) (and \( P_0 \)), while in \( hakka \) type words \( C \) is divided between \( P_r \) and \( O \) (as well as \( P_0 \)).

Table 3–2. Mean durations (in ms) of \( V \)(owel), \( P_r \)(easpiration), \( O \)(clusion) and \( P_0 \)(taspiration) for word-medial, intervocalic stops Southern and Northern Icelandic. The last column indicates the \( C/VC \) ratio, where \( C \) is the combined duration of \( P_r \) (where present), \( O \) and \( P_0 \). For further discussion see text.

<table>
<thead>
<tr>
<th></th>
<th>( V )</th>
<th>( P_r )</th>
<th>( O )</th>
<th>( VP_rO )</th>
<th>( P_0 )</th>
<th>( C/VC )</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Southern Icelandic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( haka )</td>
<td>161</td>
<td>—</td>
<td>117</td>
<td>278</td>
<td>36</td>
<td>0.49</td>
</tr>
<tr>
<td>( hagga )</td>
<td>74</td>
<td>—</td>
<td>212</td>
<td>286</td>
<td>14</td>
<td>0.75</td>
</tr>
<tr>
<td>( hakka )</td>
<td>83</td>
<td>100</td>
<td>126</td>
<td>309</td>
<td>21</td>
<td>0.75</td>
</tr>
<tr>
<td><strong>Northern Icelandic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( haka )</td>
<td>133</td>
<td>—</td>
<td>119</td>
<td>252</td>
<td>52</td>
<td>0.56</td>
</tr>
<tr>
<td>( hagga )</td>
<td>71</td>
<td>—</td>
<td>172</td>
<td>243</td>
<td>18</td>
<td>0.73</td>
</tr>
<tr>
<td>( hakka )</td>
<td>73</td>
<td>89</td>
<td>115</td>
<td>277</td>
<td>20</td>
<td>0.75</td>
</tr>
</tbody>
</table>

Garnes (1976) published similar findings for six Southern Icelandic speakers. In her study, overall (i.e., \( VC \)) durations are generally slightly longer than in the study of Indriðason et al. As regards the \( C/VC \) ratio, Garnes reports ratios of 0.37 for \( haka \) type words, and 0.71 for \( hagga \) type words and 0.69 for \( hakka \) type words. Thus Garnes’s ratios are all slightly lower than those of Indriðason et al. This difference may simply reflect a difference in method, for example measurement procedures or analysis apparatus.

In Table 3–2 one may note that there is a significant difference in \( P_0 \) duration between Northern and Southern speakers. This is a sign that the Northern dialect reflects the ON singleton fortis as postaspirated, rather than preaspirated (cf. Ch. 4, section 4.5.1).
3.2.2 The perception of Icelandic preaspiration

As we saw in the preceding section, the ratio \( C/VC \) (or, equally, \( V/VC \)) is relatively constant parameter in the production of VC sequences in Icelandic. A series of experiments on the perception of preaspiration in Icelandic have been carried out by Pind (see, e.g., 1986, 1993, 1995a, 1996a 1998). These experiments are part of a wider program of establishing which factors underlie the perception of quantity in Icelandic (cf., e.g., Pind 1986, 1995b, 1996b, 1996c). Pind (1986) showed that the ratio \( V/VC \), which indicates the relative contributions of vowel and consonant in a VC sequence.

Pind (1993) suggested that the ratio \( Pr/VPr \) might provide a similarly useful measure in the perception of preaspiration, since previous durational measurements had shown that the \( Pr/VPr \) ratio was a relative constant in speech production (e.g., Pind 1982). In one experiment, Pind (1993; cf. also 1996a for similar findings) tested the perceptual threshold of preaspiration in velar stops for Icelandic listeners. He prepared two sets of vowel + stop stimuli, one with a total duration of 297 ms, and one with 350 ms. In each set, 60% of the available duration was allotted to \( VPr \) and the remaining 40% to \( O \). Within each of the two sets, a new set of 11 stimuli were created such that the contribution of \( Pr \) within \( VPr \) varied in 11 increments between 0–64 ms. This yielded a total of 22 stimuli.

The results indicated a “phoneme boundary” between unaspirated and preaspirated stops in Icelandic at 27.35 ms for the 297 ms stimuli, and at 34.4 for the 350 ms stimuli. Thus the phoneme boundary shifts upwards slightly as overall duration increases. However, viewed in terms of the \( Pr/VPr \) ratio, there is far less difference in the phoneme boundaries. For the 297 ms stimuli, the \( Pr/VPr \) ratio is 0.15 and for the 350 ms stimuli it is 0.16. In terms of absolute durations, these results indicate that preaspiration must be approximately 45–50 ms in duration for listeners to be fairly sure that a stop is preaspirated at these long \( VPr \) durations. It is likely that at shorter \( VPr \) durations, for example 150 ms, listeners will still be evaluating the syllable in terms of \( Pr/VPr \) ratios and will thus require a duration of perhaps only 25 ms to perceive the stop as preaspirated. Such an experiment remains to be carried out, however.
Pind’s experiments as well as the durational data presented in the preceding section, show that proportional durations are better suited to elucidate durational information from the production data than are absolute durations alone. However, one should keep in mind that Pind’s findings relate to Icelandic, which demonstrably has complementary length distribution. It should not be taken for granted that an approach highlighting $Pr/VPr$ ratios is appropriate for all languages that have preaspiration.

3.3 Faroese

The presence of preaspirated stops in Faroese was noted by Jacobsen as early as 1891 and has been discussed by a number of researchers since, e.g. Jacobsen & Matras (1927–28), Naert (1958), Rischel (1961), Werner (1963), Zachariasen (1968), Henriksen (1983), Petersen et al. (1998) and Petersen (1994–5). The descriptions of the phonological distribution of preaspiration presented by these authors differ. They all agree on the presence of preaspiration before stops that derive from ON $pp$, $tt$, $kk$ (which yield VC: syllables in Modern Faroese). This is reflected in the data analysed for the present study, where we find, for example, [klɔʰpʰ] glopp ‘gap,’ [uɬɪhʰu] troyttur ‘tired’ and [pʰkɐɹ] bakkar ‘banks (e.g., of a river).’ Although it is not explicitly stated, one can infer from these descriptions that clusters of ON $pp$, $tt$, $kk$ + $n$, $l$, $r$, $j$, $v$ (containing what is presumably a geminate fortis stop in ON) are also preaspirated in Faroese today. The available data do not contain any such examples, but they are found in words like kettlingur ‘kitten,’ styttri ‘shorter’ and lykkja ‘loop.’

However, as regards reflexes of ON $p$, $t$, $k$ in words like leypa ‘to run,’ litur ‘colour’ and baka ‘to bake,’ which in Modern Faroese have a VːC syllable structure, the descriptions are contradictory. According to the earlier sources (e.g., Jacobsen 1891, Jacobsen & Matras 1927–28, Rischel 1961, Werner 1963), ON fortis stops are preaspirated in VːC syllables only if the preceding vowel is a diphthong that ends as a close

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1 Again it should be pointed out that the use of the terms “fortis” and “lenis” does not express a phonetic differenciation, but instead provides a way of distinguishing between the two stop series on an abstract level.
vowel (i.e., [i] or [u]). All other vowels, including close monophthongs (+[iː] and +[uː]), seem to block preaspiration.

Table 3–3. Main dialectal divisions in the production of Faroese V:C syllables, where C is a reflex of ON p, t, k. Based on Petersen (1994–5).

<table>
<thead>
<tr>
<th>Region</th>
<th>Context &amp; realisation</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Area 1</em></td>
<td>Mykines, Vágar, Eysturoy, Northern Streymoy;</td>
</tr>
<tr>
<td></td>
<td>(see area 1 in Fig. 3.1)</td>
</tr>
<tr>
<td></td>
<td>Vː + p/pʰ t/tʰ ŋ/ŋʰ k/kʰ</td>
</tr>
<tr>
<td><em>Area 2</em></td>
<td>Nordoyar, Southern Streymoy;</td>
</tr>
<tr>
<td></td>
<td>(see area 2 in Fig. 3.1)</td>
</tr>
<tr>
<td></td>
<td>Vː + p t ŋ k</td>
</tr>
<tr>
<td><em>Area 3</em></td>
<td>Sandoy, Suðuroy;</td>
</tr>
<tr>
<td></td>
<td>(see area 3 in Fig. 3.1)</td>
</tr>
<tr>
<td></td>
<td>Vː + b d ŋ</td>
</tr>
</tbody>
</table>

More recent accounts (e.g., Henriksen 1983, Petersen 1994–5 and Petersen et al. 1998) are quite at odds with these earlier descriptions. According to Petersen (1994–5), the Faroes can be divided into three main areas with regard to how such sequences are produced, which will be referred to here simply as Area 1, Area 2, and Area 3 (see Table 3–3 and map in Figure 3-1 for further specifications of these areas). Preaspiration in V:C syllables is found only in Area 1, and then only if the stop is preceded by a non-close vowel (i.e., +[ɔː eː eː ɔː ɔː]1). After close vowels (i.e., +[iː uː ʊː ʊː iː ʊː iː ʊː iː ʊː iː ʊː]2) stops are voiceless and unaspirated or (sporadically) slightly postaspirated. In Area 1, therefore, one would expect leypa to be produced as +[lɛipʰ] or +[lɛiʰpʰ] and baka as +[pɛːʰkʰ].3 Note that this is almost the reverse of the earlier description.

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1 These are represented as [ɔː eː eː ɔː ɔː] in, e.g., Petersen et al. (1998). The most common orthographic representations for these vowels are å, a/æ, e, ø and o.
2 These are represented as [iː uː ʊː ʊː ʊː ɪː ʊː ɪː ʊː ɪː ʊː ɪː ʊː] in, e.g., Petersen et al. (1998). Orthographically, these are commonly represented as i/ý, u, i/ý, û, ò, e, e, and oy.
3 Also, although this is not mentioned by Petersen, one might expect to find a contrast between unaspirated and preaspirated stops after long vowels in Area 1. The Faroese data analysed in Chapter 4 indicate, for example, that one of the subjects produces the “native” word eta ‘to eat’ as [ɛhʰ], while the loan word sleta ‘sleigh’ is produced as [sleʰ].
In Area 2, where Tórshavn is situated, stops in VːC syllables are voiceless unaspirated (and neither preaspirated nor postaspirated). Finally, in Area 3, stops in VːC syllables are voiced.

Figure 3-1. The Faroe Islands. The broken lines indicate the main dialectal divisions in the production of Faroese VːC syllables, where C is a reflex of ON p, t, k (further in text and in Table 3–3). The numbers refer to Area 1, Area 2 and Area 3 (see text). Based on Petersen (1994–5).

It is difficult to explain away the disagreement between the earlier and the more recent descriptions, particularly the Area 1 distribution. Of course, it is possible that different dialects are being described, and that the pattern described in earlier accounts has disappeared. It is also possible that the earlier, impressionistic analyses are unreliable, but without access to the data on which the earlier analyses are based, such a claim cannot be evaluated.

The data analysed in the present work may throw some light on the presence of preaspiration in Faroese VːC syllables. Spontaneous speech from four Tórshavn subjects (SG, BJ, EI and MS) was analysed (see Ch. 4, section 4.3 for details), and since Tórshavn is situated in Area 2, one might expect the Area 2 distribution, i.e. voiceless unaspirated stops only.
Two out of the four subjects (EI and MS) behave entirely according to the Area 2 pattern. Thus they do not preaspirate stops in V:C syllables, irrespective of vowel height, for example: [bɔːtɛ] báti ‘boat (dat.),’ [mɛɾt] mat ‘food (acc.),’ [eɾt] eta ‘to eat’ and [ʃiːpʰ] skip ‘ship.’¹ One of the subjects (SG), behaves according to the Area 1 pattern, and so ON p, t, k are never reflected as preaspirated when they follow close vowels, but do tend to be preaspirated following other vowels. Thus, he says [bɔːtʰən] bátin ‘the boat’ and [eɾtə] eta ‘eat,’ but [vɔːtʰ] vik ‘bay’ and [liʃːl] lykil ‘key.’ Lastly, one subject (BJ) behaves, in most respects, according to the Area 1 pattern. In her speech, though, [eː] tends to block preaspiration, at least in the word [eɾt] eta ‘to eat,’ which she produces 7 times and which never has a preaspirated stop.²

For those speakers who have the Area 1 distribution of preaspiration (like SG), there is a phonological contrast between two stop series in V:C syllables. This is apparent when one compares “native” words with loan words. An intervocalic stop in a word that derives from ON, e.g. eta ‘eat’ and göta ‘street,’ is preaspirated. By contrast, a loan word may have an intervocalic stop that is voiceless unaspirated, e.g. sleta ‘sleigh’ and radar ‘radar.’

One may infer from this distinction that preaspiration in V:C syllables is not an entirely new phenomenon in Faroese. A word like sleta, for example, which does not have a preaspirated stop, must have come into Faroese at a time when preaspiration in V:C syllables was already normative. Otherwise, the stop in sleta would be preaspirated. Speakers who do not preaspirate in V:C syllables (i.e., have the Area 2 distribution) make no such distinction, and therefore there is only one stop series

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¹ Since the data reported in this section reflect actual pronunciations in spontaneous speech data, they contain considerable variation in phonetic detail. Particularly, one should keep in mind that the individual words presented here are often taken out of their phonetic context. For example, the example [bɔːtɛ] has a voiced bilabial stop in its onset since it was preceded by a voiced segment. Likewise, the difference in post-aspiration between [mɛɾt] and [ʃiːpʰ] has to do with the fact that [mɛɾt] is followed by a word beginning with a vowel, whereas [ʃiːpʰ] is in utterance-final position.

² Out of curiosity, I analysed some read speech material produced by BJ, and found that the stop in the word part -net- (found in various forms of the word internet) was usually preaspirated. Therefore one can not say that [eː] generally blocks preaspiration in her speech.
in VːC syllables in their speech, just like in the Southern Icelandic dialect (cf. preceding section).

Now, let us turn to preaspiration in clusters. ON postvocalic p, t, k + n as well as tl are reflected as preaspirated clusters in Faroese, and they always yield VCC syllables: e.g., [vʰthₜₜ] vatn ‘water’ and *[vʰhₜₜn] sakna ‘to miss’ and *[vʰhₜₜn] ætla ‘to intend to.’

However, a vowel followed by p, t, k + l yields a VːC syllable in Faroese; this applies to p, t, k + r, j, v as well. Whether or not these clusters are preaspirated seems to depend on the same factors as for the intervocalic stops in VːC syllables (in, e.g., eta ‘to eat’) discussed above.

Speakers who do not preaspirate intervocalic stops in VːC syllables (like EI and MS) produce these clusters without preaspiration, for example: *[ɛːpl] epli ‘potato, apple’ [petr] betri ‘better’ and [flɔŋ] fløkju ‘tangle (obl.)’ Speakers who do preaspirate intervocalic stops in VːC syllables, according to the pattern discussed earlier (like SG and BJ) do so also in clusters. Thus, for SG and BJ we find *[ɛːpl] epli ‘potato, apple’ [petr] betri ‘better’ and [flɔŋ] fløkju ‘tangle.’

In the speech of all four subjects, ON x/ks is usually reflected as either [hks] or [xs], and the syllable always has a VCC structure. For example, we find [sɛkstɔn] sekstan ‘sixteen’ (subject MS), [vɛkslɔbɔu] vekslibúð ‘exchange bureau’ (EI), [vʰkstɔt] akstur ‘driving’ (BJ), [sɛks] seks ‘six’ and [buxsnæð] buksurnar ‘the trousers’ (SG).

The same is true for the clusters kt and pt. All subjects tend to produce either [hkt] / [hpt] or sequences of [xt] / [ft]. Thus we find, for example, *[tʰhpt] keypt ‘bought’ (MS), [vʰktskʰlɔn] vektreglurnar ‘weight rules’ (EI), [luhn] lukta ‘smell’ (BJ) and [fʰktsɔt] faktiskt ‘actually’ (SG).

Let us now summarise the facts regarding the phonological distribution of preaspiration for these four speakers of Tórshavn Faroese. For two of the speakers (EI and MS), only the syllable type is relevant for describing the distribution. Reflexes of ON p, t, k / pp, tt, kk are only pre-aspirated when they occur in VC: or VCC syllables, e.g., *[kʰvthₜₜɔ] kottr ‘cat,’ *[pʰvthₜₜ] botn ‘bottom’ and *[vʰksₜₜ] vaksa ‘grow.’ When they occur in VːC or VːCC syllables, there is no preaspiration, e.g.
ʻ[mæːta] mata ‘feed,’ ʻ[jøːklær] jöklar ‘glaciers.’ This is the type of distribution that Petersen (1994–5) described for Area 2.

For the remaining two speakers (SG and BJ), both syllable type and vowel type are relevant. This means that the distribution of preaspiration for SG and BJ is the same as for EI and MS, with the exception that reflexes of ON p, t, k are preaspirated in VːC and VːCC syllables when the preceding vowel ends in a non-close position. Thus SG and BJ preaspirate the stop in ʻ[mæːhtæ] mata ‘feed’ and ʻ[jøːklær] jöklar ‘glaciers,’ but not in ʻ[biːtæ] bita ‘bite’ and ʻ[mjøːkær] mjúkur ‘soft.’ The distribution for SG, and for the most part BJ as well, conforms to Petersen’s description of stop production in Area 1.

Let us turn now to voiceless sonorants. Sonorants in ON m, n, l, r + p, t, k, s clusters are reflected as voiceless consonants in Faroese. The inclusion of s in the latter part of the cluster is unique to Faroese, but otherwise this type of voicelessness is common to most languages and dialects that have normative preaspiration.¹ The nasals and laterals are simply voiceless, e.g. ʻ[læmpɔ] lampi ‘lamp,’ ʻ[vɑntæ] vanta ‘need,’ ʻ[mjøːk] mjólk ‘milk’ and ʻ[dænsæ] dansa ‘dance.’ The r in ON r + p, t, k, s clusters is reflected as a voiceless retroflex sibilant in Faroese, e.g. ʻ[ɛʂpɔ] skerpa ‘to sharpen’ and ʻ[viːkɔ] virka ‘to make, to sew.’

Reflexes of ON lenis stops, bb, dd, gg, which occur only word-medially, are usually voiceless unaspirated Faroese. Reflexes of the word-initial b, d, g tend to be voiced when preceded by a voiced context, but voiceless when preceded by a voiceless context as well as utterance initially. The exponents of these stops are discussed in more detail in the section on Faroese in Chapter 4.

Finally, Table 3–4 provides an overview of the way ON stops in different contexts are reflected in Faroese in terms of voicing conditions. The conventions used in the table (such as the use of boldface, underlining, +, −, etc) are explained earlier at the end of section 3.1, in which a similar overview (Table 3–1) for Icelandic is presented. The question marks indicate that information on realisation is lacking.

¹ The ON sequence rs is actually reflected as a voiceless retroflex or postalveolar sibilant in most Nordic dialects, and so it is exempt from this comment.
Table 3–4. Reflexes of ON stops in Faroese in terms of voicing conditions (further explanation in text and discussion of Table 3–1).

<table>
<thead>
<tr>
<th>ON examples</th>
<th>Area 1</th>
<th>Area 2</th>
<th>Area 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>tala ~ dala</td>
<td>+ =/≈</td>
<td>+ =/≈</td>
<td>+ ≈?</td>
</tr>
<tr>
<td>mata</td>
<td>−*</td>
<td>=</td>
<td>≈</td>
</tr>
<tr>
<td>lita</td>
<td>=</td>
<td>=</td>
<td>≈</td>
</tr>
<tr>
<td>átta ~ odda</td>
<td>− =</td>
<td>− =</td>
<td>− =</td>
</tr>
<tr>
<td>vanta ~ vanda (mnlr)</td>
<td>− =</td>
<td>− =</td>
<td>− =</td>
</tr>
<tr>
<td>heilsa (mnlr)</td>
<td>− −</td>
<td>= −/=</td>
<td>≈?</td>
</tr>
<tr>
<td>vatna (pkt+n, tl)</td>
<td>−*</td>
<td>−*</td>
<td>−*</td>
</tr>
<tr>
<td>jöklar (pl, kl)</td>
<td>− pl</td>
<td>=</td>
<td>= ?</td>
</tr>
<tr>
<td>nótra (pkt+rjv)</td>
<td>− =</td>
<td>=</td>
<td>= ?</td>
</tr>
<tr>
<td>vaxa (pkt+ts)</td>
<td>− −</td>
<td>=</td>
<td>= ?</td>
</tr>
</tbody>
</table>

3.4 Norwegian dialects

3.4.1 Jæren

Preaspirated stops have been reported to occur in Jæren on the southwesternmost tip of Norway (see map in Figure 3-2). The existing descriptions pertain mainly to two areas, Gjesdal on the one hand and Stavanger and Sandnes on the other, although preaspiration seems to occur across all of Jæren (Oftedal, 19723). The stop systems in the dialects described are similar, but there are some differences in detail that warrant that they be discussed separately.

Oftedal (1947) gives an account of the stop system in the Gjesdal dialect. His observations are impressionistic and he relies on one infor-

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1 Glossary: tala ‘to speak,’ dala ‘valleys (gen.),’ mata ‘to feed,’ lita ‘to colour,’ átta ‘eight,’ odda ‘points (obl.),’ vanta ‘to need,’ vanda ‘problem (obl.),’ heilsa ‘health,’ vatna ‘waters, lakes (gen.),’ jöklar ‘glaciers,’ nótra ‘to shiver,’ vaxa ‘to grow.’

I have only anecdotal information that the sonorants before [s] are voiced in Suðurey.

3 For example, Oftedal (1972:431) comments that in both Gjesdal (in the easternmost part of Jæren) and Varhaug (in the southernmost part) speakers “preaspirate their post-vocalic tenues quite as strongly and audibly as most Icelanders.” He also says that the Rural Jæren dialects are “remarkably homogenous” (ibid. p. 424). However, he does not give any further description of the preaspiration in Varhaug.
mant for his examples, but makes it clear that he has made observations of other speakers of the Gjesdal dialect as well.

First, the ON geminate fortis stops, $pp$, $tt$, $kk$, are preaspirated in the Gjesdal dialect. This we see in words such as $[\text{sl}^h\text{e}^h\text{p}^h\text{u}]$ ‘release,’ $[\text{k}^h\text{b}^h\text{r}^h\text{u}]$ ‘cat,’ and $[\text{se}^h\text{k}^h\text{u}]$ ‘bag.’\(^1\) The corresponding ON singleton stops, $p$, $t$, $k$, are produced as voiceless (or half-voiced) stops, as in, for example, $[\text{o}^h\text{b}^h\text{a}^h\text{n}]$ ‘open (adj.)’ and $[\text{sjo}^h\text{d}^h\text{e}^h\text{r}]$ ‘boil.’\(^2\) The development of the basic contrasts in the stop system from ON is therefore similar to that in Southern Icelandic and Area 2 Faroese.

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\(^1\) All the examples from the Gjesdal dialect given here are from Oftedal (1947), adapted to current IPA usage with minor modifications. His use of a superscript $^h$ for preaspiration is kept here. The use of a double bracket for these transcriptions indicates that they are citations from Oftedal’s text (cf. section 3.1 earlier).

\(^2\) This has resulted in a merger of ON postvocalic $t$ with $d$ and $k$ with $g$ in many contexts.
long vowel followed by a preaspirated stop: e.g., \([p^h\varepsilon:\theta\sigma]\) ‘spoke’ (from \([p^h\varepsilon:\theta\sigma]\)) and \([p^h\sigma\theta\sigma]\) (meaning uncertain)\(^1\) (from \([p^h\sigma\theta\sigma]\)). This can also occur in clusters: e.g., \([k^h\varepsilon:k\sigma]\) ‘cackle,’ \([s^h\varepsilon:k\sigma]\) ‘to weaken’ and \([\sigma^h\sigma\sigma\sigma]\) ‘to open.’ Oftedal’s use of [h] in the first examples reflects his impression that the preaspiration is unusually long in such cases (i.e., when the stop is intervocalic and the vowel is long), much longer than after short vowels.

The distribution of preaspiration in clusters seems straightforward in the Gjesdal dialect. Although Oftedal does not give examples for all the possible clusters, one can infer from his discussion that preaspiration is always present, even when there is no fortis–lenis contrast. His examples of contrastive clusters include: \([\sigma^h\sigma\sigma\sigma]\) ‘do woodwork’ vs. \([\sigma^h\sigma\sigma\sigma]\) ‘to flutter’; \([s^h\sigma\sigma\sigma]\) ‘to sprawl’ vs. \([k^h\sigma\sigma\sigma]\) ‘to call’; and \([\varepsilon^h\sigma\sigma\sigma]\) ‘careless (pl.)’ vs. \([\varepsilon^h\sigma\sigma\sigma]\) ‘corner (pl.)’ When there is no contrast (essentially when stops precede /s/) the clusters are still preaspirated: e.g., \([\varepsilon^h\sigma\sigma\sigma]\) (meaning uncertain) and \([\sigma^h\sigma\sigma\sigma]\) ‘ear (e.g., of wheat).’

Table 3–5. Reflexes of ON stops in the Gjesdal dialect of Norwegian in terms of voicing conditions, based on the description of Oftedal (1947). (Further explanation in text and discussion of Table 3–1.)

<table>
<thead>
<tr>
<th>ON examples(^2)</th>
<th>Gjesdal dialect</th>
</tr>
</thead>
<tbody>
<tr>
<td>tala ~ dala</td>
<td>+ =/||</td>
</tr>
<tr>
<td>mata</td>
<td>=/|| *</td>
</tr>
<tr>
<td>åţa ~ odda</td>
<td>- =/||</td>
</tr>
<tr>
<td>vantă ~ vanda (mnr1)</td>
<td>- =/||</td>
</tr>
<tr>
<td>VATNA (mnr)</td>
<td>- *</td>
</tr>
<tr>
<td>vaxa (x, pt + s)</td>
<td>-</td>
</tr>
</tbody>
</table>

The Gjesdal dialect contrasts voiced and voiceless sonorants before stops, much as do Icelandic and Faroese. The r-sound, which is velar in this dialect, is voiceless throughout when it reflects ON r+p, t, k. However, it is Oftedal’s impression that only the last part of the nasals and

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\(^1\) Oftedal does not cite any meaning for most of his examples.

\(^2\) Glossary: *tala* ‘to speak,’ *dala* ‘valleys (gen.),’ *mata* ‘to feed,’ *åţa* ‘eight,’ *odda* ‘points (obl.),’ *vanta* ‘to need,’ *vanda* ‘problem (obl.),’ *vainta* ‘waters, lakes (gen.),’ *vaxa* ‘to grow.’
lateral are voiceless in such positions. This is reminiscent of the voiceless sonorants in the Gräsö dialect, discussed in section 3.5.3 and Ch. 4, section 4.5, which are half-voiced, half-voiceless. Oftedal’s examples of the contrast in such sequences include [mɛɾk] vs. [mɛɾkʰ], [kʰɛɾt] vs. [kʰɛɾt], [kʰɛɾt] vs. [kʰɛɾt] and [tʰɛɾt] vs. [tʰɛɾt].

To round off this discussion of the Gjesdal dialect, Table 3–5 provides an overview of the way ON stops in different contexts are reflected in terms of voicing conditions, according to Oftedal’s description. The conventions used in the table are explained at the end of section 3.1, where a similar table for Icelandic is presented (Table 3–1).

Let us now turn to Stavanger and Sandnes. In one of very few experiments on Scandinavian preaspiration, Wolter (1966; see also a brief account in Wolter 1965) studied the duration of preaspiration in the speech of 21 subjects from Stavanger and Sandnes. Wolter found that in terms of phonological distribution, preaspiration in the Stavanger-Sandnes dialect was very similar to that in Gjesdal. For intervocalic stops the distribution is identical, i.e. only stops that derive from ON geminates are preaspirated.

As for clusters, there are two differences between the dialects that should be mentioned. First, Wolter did not include a /aviors/ cluster in his experiment, saying that such clusters are always realised as [ɾn], without preaspiration. Although Oftedal did not include such an example in his discussion of the Gjesdal dialect, one can infer from his discussion that such a cluster is preaspirated there. Second, stops preceding /s/ are not preaspirated in the Stavanger-Sandnes dialect. As for other clusters, Wolter tested combinations of /p t k/ + /l n r t/ with a preceding short vowel, as well as /tr/ after a long vowel, and these are all preaspirated. Unfortunately, Wolter did not include any /p t k/ + /r j v/ clusters in his survey so we do not know how such clusters are produced in the Stavanger-Sandnes dialect.

Wolter’s data consist of a list of 48 words, read twice by 21 subjects. The subjects were all students between 17 and 22 years old, 4 male and 16 female. The measurements were made from oscillograms (mingo-

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1 Glossary: ‘land’ vs. ‘marrow’; ‘called’ vs. ‘counted’; ‘run’ (past. part.) vs. ‘ran’; ‘tamed’ (past part.) vs. ‘tamed’ (praet.)
grams), with the occasional aid of spectrograms. According to Wolter’s measurements, preaspiration duration is on average 90 ms in monosyllabic words (i.e., words with a VC: structure) and 85 ms in disyllabic words (i.e., words with a VC:V structure). In clusters (/p t k/ + /l n r t/) the preaspirations are somewhat shorter, ranging from 67–84 ms depending on the cluster. And as was mentioned before, no preaspiration occurred in /ps/ and /ks/ clusters.

Unfortunately, Wolter did not measure the duration of the vowel preceding the stops. However, he does append to his thesis the entire set of mingograms for one reading of one subject, an 18-year-old male. Also appended are 17 spectrograms from two further subjects, 10 from a 21-year-old female and 7 from 22-year-old female. These data only allow a coarse estimate of the durations, and at times require some educated guesswork. Nevertheless, to gain some insight into the relationship between vowel duration and preaspiration duration in this dialect, the approximate durations of vowel, breathiness, preaspiration and stop closure in both the mingograms and the spectrograms were measured. No sound recordings were available, thus no auditory analysis was possible.

![Graph](image)

Figure 3-3. Preaspiration duration (Pr) plotted against the combined duration of vowel and preaspiration (VPr) for a subset of the data in Wolter’s (1966) study of the Jæren dialect.

The available test words can be divided into three groups, according to syllable type: VC:, VC:V and VCCV syllables (e.g., vått ‘wet,’ åtte ‘eight’ and sakne ‘to miss’); 14 VC:, 24 VC:V, and 12 VCCV words were analysed, thus a total of 50 words. Figure 3-3 shows preaspiration
duration ($Pr$) plotted against the combined duration of vowel and preaspiration ($VPr$) for all test words from all subjects.\footnote{Since preaspiration duration is partly being plotted against itself, the trend line should not be taken to show a statistically valid. However it does provide a visual indication of how preaspiration duration changes as a function of the duration of the vowel + preaspiration sequence (cf. Ch. 4, section 4.1.3).}

It is evident that $Pr$ duration increases with increased $VPr$ duration. The ratio of $Pr$ to $VPr$ (a measure of how much of the vowel + preaspiration interval is taken up by preaspiration) even seems to increase slightly with increased $VPr$ duration. These results are very similar to the results from other preaspirating dialects, for example Faroese (cf. Ch. 4, section 4.3). One should keep in mind that these data come from read word lists while the data on Faroese are from spontaneous speech.

Wolter did not consider the production of sonorants before stops in his survey of the Stavanger-Sandnes dialect. However, Oftedal (1972) describes the general characteristics of the dialect he calls Urban Jæren, which comprises only the town of Sandnes, and Rural Jæren, which comprises all other parts of Jæren south of Sandnes (including Gjesdal). According to Oftedal, the sonorants are partially voiceless and /r/ fully voiceless in both Rural and Urban Jæren.

### 3.4.2 Gudbrandsdalen

Hesselman (1905:10ff), Ross (1907:37ff) and Storm (1908:60, 150) describe preaspiration of fortis stops in the dialects of several parishes in the northern part of Gudbrandsdalen in Norway (see map in Figure 3-4).\footnote{See also Marstrander (1932), who provides no transcribed examples from these dialects, but offers some impressionistic comments concerning preaspiration. According to him, preaspiration is “very common” in Lesja and Dovre, “fairly clear” in Skjåk, “clear” in Sel, “fairly weak, but at times clear” in Vågå and “hardly noticeable” in Lom.}

The most extensive description is provided by Ross, who draws mostly on the community of Vågå for his examples. However, his text includes numerous examples from Lesja, Skjåk, Sel, Lom, Dovre and Fron. The informants seem to come mostly from the main villages in these parishes.

The dialects in the northern part of Gudbrandsdalen are, in fact, better known for their quantity system than for preaspiration. Most of the languages and dialects that derive from Old Norse have a two-way
quantity system instead of the ON four-way system. In ON, both vowels and consonants could be long and short, and syllables (or, rather, vowel + consonant sequences) are, in traditional accounts, either light, heavy or overlong (cf. Haugen 1982, 24ff, for an overview). Light syllables, VC(V), had a short vowel followed by a short consonant, e.g. mata ‘to feed.’ Heavy syllables had either a long vowel followed by a short consonant, VːC(V), e.g. lāta ‘to let’ or a short vowel followed by a long consonant, VC:(V), e.g. kattā ‘cats (gen. pl.).’ Overlong syllables had both a long vowel and a long consonant VːCː(ːV), e.g. áttā ‘eight.’

Figure 3-4. A map of Northern Gudbrandsdalen. Current county district boundaries and town names are shown.

Across much of the ON language community, this quantity system was reduced to a two-way system, in which differences in syllable quantity were abandoned while contrastive segmental lengths were kept

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1 A heavy syllable could also have two consecutive consonants following a short vowel, as in hatna, ‘recover, get better.’

2 Again, the long consonant can also be represented by two consecutive consonants, as in seytla ‘to ooze, to drip.’

3 This portrayal of ON quantities is, perhaps, somewhat simplistic. For further insights, cf., e.g., Riad (1992:235ff).
(Hesselman 1901 & 1902, Riad 1992). For example, modern Swedish reflects the examples above roughly as mata *[mːtɑ], lāta *[lːtɑ], katter *[kʰtːɛɾ] and åtta *[ɑːtɑ]. The length distribution has thus become complementary, and phonetically (in Swedish, at least) the contrast is made primarily through segmental duration and quality, whereas overall syllable duration is relatively constant (Bannert 1979).

In the Gudbrandsdalen dialects there is a three-way system, which preserves the ON distinction between light and heavy syllables, as well as the segmental quantity distinction. However, the ON overlong syllable type has merged with the heavy syllables (see Table 3–6).

Table 3–6. Overview of quantity distinctions in Old Norse, Northern Gudbrandsdalen and generally in Nordic languages.

<table>
<thead>
<tr>
<th></th>
<th>Old Norse</th>
<th>N. Gudbr.</th>
<th>Elsewhere²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light</td>
<td>VCV</td>
<td>VCV</td>
<td>VCV</td>
</tr>
<tr>
<td>Heavy</td>
<td>VCV</td>
<td>VCV</td>
<td>VCV</td>
</tr>
<tr>
<td>Overlong</td>
<td>VCV</td>
<td>VCV</td>
<td>VCV</td>
</tr>
</tbody>
</table>

Keeping this quantity system in mind, let us now turn to the distribution of preaspiration in these dialects. According to Ross’s description, preaspiration occurs on all fortis stops that were geminated in ON. Thus words such as ON litr ‘colour’ and lēt ‘let (praet.)’ are reflected as [[le[t]]] and [[le[t]]] respectively in the Vågå dialect, while ON batt ‘bound’ and lētr ‘light (adj.)’ become [[bːh[t]]] and [[lːh[t]]].³

As for preaspiration in clusters, the situation is less clear since there are relatively few examples. ON t, k + j clusters are reflected as voiceless fricatives, as in [[viçɑ]] ‘give way’ (< ON vika) and [[fl̥oçɑ]] ‘move’ (<

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³ There is optional preaspiration on the medial stops (cf. section 4.2.3.2).
² Danish and a number of Scandinavian dialects are exempt from this heading, and should be disregarded in the present context.
³ All the examples in this section are taken from Ross (1907:37ff) and transferred into the current IPA notation as closely as possible. Ross uses h to denote preaspiration throughout his text. As for the durational aspects, another way to transfer Ross’s examples would be to have extra short vowels in light syllables and vowels of “normal” length in heavy syllables, thus: [[le[t]], [[le[t]], [[bːh[t]]] and [[lːh[t]]].
ON flytja). There are no examples of \(tt\), \(kk + j\) clusters. It is very probable, however, that these clusters have developed in the same way as have stops preceding close front vowels, which according to Ross are produced as \([hçː]\), e.g. \([bçhçːin]\) ‘the hill.’

There are three examples of \(k(k)r\) clusters. Two have preaspiration, \([vøhkːrə]\) ‘most beautiful’ and \([døhkːrə]\) ‘your (pl.)’ The third example has no preaspiration, \([ɔkɾə]\) ‘fields’ (the dative form, \([ɔkɾe]\), is also cited). Similarly, there is one example of a \(k(k)l\) cluster with preaspiration, \([ɔhklːe]\) ‘ankle,’\(^1\) and one without preaspiration, \([nykɾə]\) ‘keys.’ The word \([epɾə]\) ‘apple,’ without preaspiration, is the only example of a \(p(p)l\) cluster. As for \(t(t)n\) clusters, Ross states that these are reflected as \([l]\) or \([ʃ]\),\(^2\) but he provides no examples. From these meagre data we can tentatively infer that for \(k(k) + r, l\) clusters, a distinction is made between preaspirated and unaspirated variants—note that it is also possible to have a voiced stop in such clusters, as in \([ɛŋpɾeiːn]\) ‘the nails.’ However, it is difficult to infer from these examples whether they reflect the ON distinction between singleton and geminate stops.

ON \(t(t)n, k(k)n\) clusters are invariably reflected as preaspirated, as in \([vøhɾə]\) ‘the water,’ \([kvehŋə]\) ‘come to life’ and \([ɾhːŋə]\) ‘rotten (pl.)’ ON \(pn\), however, is usually reflected as \([fn]\), e.g. \([ɔfŋə]\) ‘to open,’ and sometimes as unaspirated \([pŋ]\), e.g. \([ɔpŋə]\).

ON \(pt\) yields \([ft]\), e.g. \([ʃfːtə]\) ‘bought,’ but ON \(kt\) yields \([hkt]\), e.g. \([tyhktːə]\) ‘thought.’ The evidence for preaspiration in ON \(ks\) clusters is problematic, since the examples variably have preaspirated and unaspirated stops. Thus we have, for example, \([vekse]\) ‘grow’ and \([vøks]\) ‘grew’ as well as \([vehkse]\) and \([vøhks]\). Taken at face value, this suggests that in the Gudbrandsdalen dialects, preaspiration on such clusters is non-normative.

We turn now to voicelessness in sonorants before ON \(p, t, k\). Judging from the examples and comments provided by Ross and Hesselman, the nasal in ON sequences of nasal + \(p, t, k\) is invariably reflected as voiced.

\(^1\) One would expect a flap here, instead of the alveolar lateral, i.e. \([ɔhːɾə]\). In the original, a flap is denoted with a \(l\) and an alveolar lateral as a \(l\), so this may simply be an oversight.

\(^2\) He transcribes these as \(hli\)l and \(jl\), which I interpret as a voiceless alveolar lateral approximant and a voiceless palatal lateral approximant respectively.
in the Gudbrandsdalen dialects, as in [[vɪntɔrɔn]] \(^1\) ‘the winter’ and [[tʰɛɾɲɛɾ]] ‘to think.’ However, one should keep in mind that these words are unlikely to be direct developments from ON, since most sequences of nasal + stop develop into a long stop in the western dialects of ON (i.e., \(mp > pp\); \(nt > tt\); \(nk > kk\)). ON \(l\) before \(p, k\) is reflected as a voiced flap, e.g. [[fɔɾkɔm]] ‘people (dat. pl.)’ and [[ʃɔɾpə]] ‘to help.’ However, ON \(lt\) sequences are reflected as \([l_t]\), e.g. [[vɛltɔ]] ‘to fall over, capsize,’ [[vɛt]] ‘all, everything’ and [[ɡɔmɔt]] ‘old.’

Regarding \(r\) before \(p, t, k\), things are less clear. ON \(rk\) sequences seem to have a voiced \(r\)-sound, e.g. [[ɔɾtʃun]] ‘the church’ and [[mɛɾɔ]] ‘fields,’ although one also finds [[mɛɾtɔn]] ‘market’ (< ON marknaðr) \(^2\). As for ON \(rt\), Ross has many examples of both \([h_ʈ]\) and \([ʈ]\), e.g. [[hɔt]] ‘heard,’ [[ʃɔt]] ‘done,’ [[vɛlt]] ‘became’ and [[svɛlt]] ‘black.’ We also find both [[jeʃtɔn]] and [[jeʃtɔ]] ‘heart,’ as well as [[goʃtɔ]] ‘kind-hearted.’ As with \(ks\) clusters, this may suggest that the presence of voiceless sonorants in such sequences is non-normative.

The ON lenis stops, \(b, d, g\), (which only occurred in geminates and in clusters) generally seem to be reflected as voiced in intervocalic position in the Gudbrandsdalen dialects. This goes for geminates as well as the simple lenis stops that originate in ON word-medial voiced fricatives. However, Hesselman (1905:11) remarks that in word-final position the lenis stops are voiceless. \(^3\) Since he gives no specific examples, it is not clear what this implies. Possibly, his comment should be interpreted as meaning “utterance-finally and before voiceless consonants.” Otherwise, one has to assume that, for example, a sequence like född i ‘born in’ has a voiceless stop, while the sequence födde ‘bore child’ has a voiced one.

To summarise the development of ON stops in the Gudbrandsdal dialect, Table 3–7 provides an overview of the way ON stops in different contexts are reflected in terms of voicing conditions. For an explanation of the conventions used in this table, cf. section 3.1 (Table 3–1).

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\(^1\) Keep in mind that these transcriptions are translated as faithfully as possible from the original representation. The seemingly strange transcription [[rn]] simply represents the sequence \(rn\) in the original.

\(^2\) Possibly ON marknaðr > Gudbr. *martna, which should turn out as [[mɛɾʃn]].

\(^3\) His exact words are: “‘\(bp, dt, gk\) i slutljud finnes också i […] Gudbrandsdalen […]’”
Table 3–7. Reflexes of ON stops in the Vågå variety of the Gudbrandsdalen dialect in terms of voicing conditions. (Further explanation in text and discussion of Table 3–1.)

<table>
<thead>
<tr>
<th>ON examples</th>
<th>Gudbrandsd.</th>
</tr>
</thead>
<tbody>
<tr>
<td>tala ~ dala</td>
<td>+ ≈</td>
</tr>
<tr>
<td>mata</td>
<td>= *</td>
</tr>
<tr>
<td>átta ~ odda</td>
<td>− ≈</td>
</tr>
<tr>
<td>vanta ~ vanda (m n)</td>
<td>= ≈</td>
</tr>
<tr>
<td>hjalpa (1r + pk)</td>
<td>= *</td>
</tr>
<tr>
<td>elta ~ elda (1r)</td>
<td>− ≈</td>
</tr>
<tr>
<td>epli (pk + rl)</td>
<td>=</td>
</tr>
<tr>
<td>vatna (ni r)</td>
<td>− *</td>
</tr>
<tr>
<td>keypti (pt and pn only)</td>
<td>fricative</td>
</tr>
<tr>
<td>vaxa (x only)</td>
<td>−/=</td>
</tr>
</tbody>
</table>

3.4.3 Trønder Norwegian

Moxness (1997) investigated the occurrence of preaspiration in the Trønder variety of Norwegian, spoken in the Trøndelag region, which stretches to the north and south of the city of Trondheim (see map, Figure 1–1). Having noted (unexpectedly) that Trønder speakers tended to preaspirate their fortis stops, Moxness set out to quantify Trønder preaspiration. She used 10 speakers of the Trønder dialect, 5 male and 5 female. As test words, she used 18 monosyllabic and 18 disyllabic (mostly nonsense) words. For each group, she had 9 words with CVCː(V) structure and 9 words with a CVːC(V) structure, testing 3 vowels (/i/, /a/ and /u/) and three medial stops (/p/, /t/ and /k/). The initial consonant was always /p/. The resulting test words thus included (mostly nonsense) words such as: /piːp/, /putːa/, /patː/ and /pikːa/. A total of 2,160 tokens were produced. Although not stated specifically, it seems that the words were produced in isolation (i.e., not in a frame sentence).

1 Glossary: tala ‘to speak,’ dala ‘valleys (gen.),’ mata ‘to feed,’ átta ‘eight,’ odda ‘points (obl.),’ vanta ‘to need,’ vanda ‘problem (obl.),’ hjalpa ‘help,’ elta ‘to chase,’ elda ‘fires (gen.),’ epli ‘apple,’ vatna ‘waters, lakes (gen.),’ keypti ‘bought,’ vaxa ‘to grow.’
According to the segmentation criteria set up by Moxness (ibid:14), preaspiration is the “interval from the offset of periodicity to the end of friction/beginning of the complete closure for C2 [i.e., the stop].” However, from the individual examples discussed one must infer that complete aperiodicity was not a criterion for marking the onset of pre-aspiration. Thus it is not clear to which extent the period of breathy voice before the onset of voiceless aspiration is included in Moxness’s measurements of preaspiration duration.

Moxness’s findings show that speakers of the Trønder dialect do tend to preaspirate, and as in the case of most other Nordic languages, the preaspirations are longer in VC: than in VːC syllables. For all speakers pooled, the mean duration of preaspiration in VC: syllables was 23.9 ms, whereas in VːC syllables it was 15.0 ms. A considerable gender difference was observed in the degree of differentiation between syllable types with regard to preaspiration. For the males, mean preaspiration duration in VC: syllables was 22.4 ms, and 18.3 in VːC syllables. The corresponding figures for the females were 25.4 ms and 11.5 ms. Thus the females seem to use preaspiration as a correlate of stops in VC: syllables to a much greater degree than in VːC syllables, whereas the males make far less of a distinction between syllable types. Comparable gender differences in durational differentiation have been observed by, e.g., Wassink (1999), Ericsdotter & Ericsson (2001), and Simpson (2001, 2002).

The preaspiration durations cited above also reveal that mean preaspiration in VC: syllables for females is 3 ms longer than for males. Although small (and probably imperceptible), this difference is significant at p<0.001. Conversely, the mean preaspiration duration in VːC syllables is 6.8 ms higher for males than for females. This difference proved significant at p<0.05.

According to Moxness, all of the 1080 VC: syllable tokens analysed (for 5 males and 5 females) contain some degree of preaspiration. As for VːC syllables, however, there are 240 tokens (out of the total of 1080) that have no preaspiration. From this information it is tempting to conclude that, at least for VC: syllables, preaspiration is a normative feature in stop production in the dialect. However, Moxness does not indicate
whether she thinks that leaving out preaspiration in VC: syllables in Trønder Norwegian leads to a pronunciation that Trønder speakers would consider “un-Trønderish.” Thus as far as the Trønder dialect is concerned, this question is left open.

3.4.4 Senja

In his account of the dialect spoken on the island Senja, which lies to the southwest of Tromsø in Northern Norway, Iversen (1913) describes what appears to be preaspiration. According to Iversen (ibid:8), an h-sound occurs before stops, especially “k(k)” in words like tahkk ‘thanks.’ He also comments that this is especially noticeable in the speech of children. Later, Iversen (ibid:24f) gives an impressionistic account of the way in which stress is realised before voiceless stops. What he describes seems to be preaspiration:

The Senja dialect differs from the neighbouring dialects in this respect, in that it can place the syllable peak in a voiced aspirate or even in — or more strictly speaking: immediately before — a voiceless plosive.

(Iversen, 1913: 24–5; my translation)

Iversen claims that there is another type of realisation found only in the speech of the “older generation”:

[...] in a word like bak’ken the syllable-accent can actually have two peaks, such that first there is a rise in stress to a place inside the a, followed by a decrease in expiration strength, concomitant with a voiceless vowel glide; then again an increase in the air stream, as a rule with a postaspirated k [...]

(Iversen, 1913: 25; my translation)

While it is difficult to know to what degree this impressionistic portrayal is reliable, it does seem that what Iversen is describing in this account of how stress is realised is a stop that is both preaspirated and postaspirated simultaneously. Data from one of the Åland dialect subjects (reviewed in Ch. 4, section 4.5.3.6) show that this type of realisation is possible.

Beyond this, there is no first-hand information on preaspiration in the Senja dialect. And since Iversen’s comments give no clear indication that
preaspiration in this dialect should be regarded as normative, this question remains open. Iversen’s comments about finding preaspiration primarily in the speech of children may seem rather odd. However, a somewhat similar observation has been made by Foulkes et al. (1999) in Tyneside English (cf. section 3.7).

3.5 Swedish dialects

3.5.1 Härjedalen and Northern Dalarna

Härjedalen is a large mountainous region in central Scandinavia. Preaspiration has been reported to occur in almost the whole area. The places most often mentioned in the context of preaspiration are Storsjö, Funäsdalen, Tännäs, Hede, Vemdalen, Linsäll, Sveg and Lillhärdal, all shown on the map in Figure 3-5. Also on the map are the neighbouring villages in Northern Dalarna, Idre and Särna, where preaspiration has been reported to occur. Within Härjedalen, the boundary for the preaspiration isogloss seems to run east of Sveg, since it is found neither in Älvros nor in Överhögadal (see map).

Lundell (1879), Westin (1897) and Reitan (1930) all describe the preaspiration in the dialects of Härjedalen. Reitan provides the most complete description, which centres on the dialect in the village of Vemdalen, and the following account is based largely on his work. Reports on preaspiration in Northern Dalarna are less complete, and consist of a few remarks by Noreen (1903–7:485) and a brief discussion in Reitan (1930).

As in most of the preaspiring dialects, the dialects of Härjedalen reflect the ON geminate fortis stops as preaspirated. For the Vemdalen dialect, Reitan gives examples such as [sʰɛ̝hpɛː] ‘to release,’ [nʰɛ̝tː] ‘night,’ [bɛ̝lɛ̝n] ‘the creek’ and [bɛ̝hkː] ‘creek.’ Other areas in which Reitan reports that such preaspiration occurs are south of Vemdalen

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1 The area now belongs to Sweden, but from a linguistic perspective there is good reason to view the dialects of Härjedalen and Northern Dalarna as Norwegian rather than Swedish (cf. Reitan, 1930; Hansson, 1997).
2 Reitan uses h throughout (not superscript ʰ). Also, Reitan’s impression is that the stop retains its length when it is preaspirated. Therefore he uses a geminate (pp, tt, kk) which is represented here as a long stop.
(Hede, Linsäll and Sveg) as well as further to the west and north (Funäsdalen, Tännäs and Storsjö).¹

![Map of Härjedalen and Northern Dalarna](image)

**Figure 3-5.** Härjedalen and the Northern Dalarna (based partly on Reitan 1930:4).

The development of the ON light syllables, VC(V) (in words such as ON lok ‘lid’ and vika ‘week’), is more complicated. Generally, ON VC(V) syllables tend to become VCː(V) syllables (and not VːC(V) syllables).² This applies particularly to syllables in which the consonant was a fortis stop. In the Vemdalen dialect, these stops are not preaspirated despite the fact that they are long (i.e., occur in VCː(V) syllables). Reitan’s examples include [[skɔːtː]] ‘shot,’ [[lɔːkː]] ‘lid’ and [[dɾɔːpːo]] ‘drop (e.g., of water).’

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¹ According to Reitan, preaspiration does not occur in Lillhärdal, but he is contradicted by Westin (1897) who, more than a generation earlier, reported that preaspiration occurred there.

² Many factors affect whether a VC(V) sequence becomes VːC(V) or VCː(V) (cf. for example, Hesselman 1901 & 1902 and Riad 1992). Not surprisingly, syllables with open vowels tend to induce a VːC structure while syllables with voiceless consonants (i.e. /p t k s/) tend to induce a VCː structure. The nasal /m/ also induces a short vowel, while /n/ seems to be neutral. The development of ON VCV words was also dependent on the identity of the ending vowel and its interaction with the root vowel.
As a result, the Vemdalen dialect has three stop contrasts in word-medial position: voiced, voiceless unaspirated and preaspirated. ON \( bb, dd, gg \) are reflected as voiced (as in [\( \text{veg\ae} \)] ‘walls’), ON \( p, t, k \) as voiceless unaspirated stops, even when they have become long (as in [\( \text{vek\ø} \)] ‘week’), and ON \( pp, tt, kk \) as preaspirated stops (as in [\( \text{behk\:] \)] ‘creek’).

The Hede dialect has the same pattern as the Vemdalen dialect, but with the crucial difference that in word-final position, a lengthened \( p, t, k \) is preaspirated. Thus, in the Hede dialect, ON \( vika \) is reflected as [\( \text{vek\ø} \)] ‘week,’ but ON \( lok \) as [\( \text{løhk\:] \)] ‘lid.’ According to Reitan, both the Linsäll and the Sveg dialects appear to have the same pattern as the Hede dialect in this respect.

The dialects of Funäsdalen, Tännäs and Storsjö make no such distinction between ON geminate fortis stops and these lengthened stops. Thus ON fortis stops that are now in VC:\( (V) \) syllables in these dialects are preaspirated, whatever their historical origin. As examples, Reitan cites [\( \text{vehk\ø} \)] ‘week’ and [\( \text{løhk\:] \)] ‘lid’ from the Funäsdalen dialect.

The distribution of preaspiration in the Vemdalen dialect suggests a specific order in the development of the stops. First, the ON \( pp, tt, kk \) became normatively preaspirated, then ON VC:\( (V) \) syllables (where \( C = \) \( p, t, k \) ) became VC:\( (V) \) syllables (i.e., \( p, t, k \) were lengthened). The distribution of preaspiration in the Hede dialect suggests that earlier it had the same kind of distribution as the Vemdalen dialect, and this may be true for the Linsäll and Sveg dialects as well. However, it is also possible that this distribution reflects a direct development from ON.

A recent investigation into the realisation of fortis stops in the Vemdalen dialect was conducted by Wretling, Strangert and Schaeffler (2002). The descriptions above provided by Lundell, Westin and Reitan reflect the situation in the dialect in the first half of the 20\( ^{th} \) century. The current situation, as described by Wretling et al., is that preaspiration is still a normative feature of the Vemdalen dialect, but has become more limited in its phonological distribution in recent years. First, Wretling et al. report that a distinction was not maintained in some of the minimal pairs tested. In one further pair (/\text{lot}/ vs. /\text{lot}/), the distinction was expressed through the durational relationship of the vowel and the stop.
(V:C vs. VC:). For two pairs (/tæk/ vs. /takː/ and /ditʃ/ vs. /ditː/) preaspiration proved to be a major distinguishing factor. Durational measurements for vowel, preaspiration and occlusion showed that in the VC: words, the vowel occupied approximately one-third, the preaspiration slightly less than one-third and the closure slightly more than one-third of the entire VC: interval. In the V:C words, preaspiration duration was negligible, and the vowel occupied slightly more than half of the V:C sequence, and the occlusion slightly less than half. Wretling et al. did not investigate the lenis stops, but presumably these are predominantly voiced in the corresponding contexts.

According to Reitan (1930), the dialect of Särna in Northern Dalarna has a similar kind of distribution of preaspiration as the Hede dialect, at least in the speech of older informants. As in all preaspirating dialects, ON pp, tt, kk are preaspirated. But, contrary to the Hede dialect, instead of preaspirating word-final lengthened stops, the Särna dialect tends to preaspirate the intervocalic lengthened stops, although this is less than regular. In word-final position we get, for example, [skøtː] ‘shot’ and [føtː] ‘meat.’ In intervocalic position we get, for example, [røhkːə] ‘spade’ and [vehkːə] beside [vekːə] ‘week.’ Again, it is tempting to see this as a development from the type of distribution we find in the Vemdal dialect, but there is nothing that demands such a conclusion.

Let us turn now to preaspiration in clusters. The discussion will be limited to the Vemdal dialect, since it is there that we have the most complete description. According to Reitan, /t(t)n/, /kkj/ and /ttj/ are the only ON clusters that yield preaspiration in the Vemdal dialect. As reflexes of ON /t(t)n/, we have examples such as in [[røhtːe]] ‘to rot’ and [[vøhtː]] ‘water.’ ON /ttj/ and /kkj/ have merged into a preaspirated affricate, while /tj/ and /kj/ have merged into an unaspirated affricate. Relevant examples include [[frøːte]] ‘move’ (< ON flytja) and [[røhːe]] ‘yank’ (< ON rykkja). Thus, one can say that /tj/ and /kj/ have been treated like simple stops (not clusters) and /ttj/ and /kkj/ have been treated like geminate stops.

ON /tl/ yields a voiceless lateral (palatal under certain conditions), for example [[lːe]] ‘small’ and [[mːː]] ‘chew slowly’ (< ON mutla). ON /p(p)t/ yields a voiceless labiodental fricative, as in [[jʊːfː]] ‘deep
According to Reitan (1930:80), ON \textit{pn} yields an /fn/ cluster and ON \textit{ps} yields an /fs/ cluster, but he gives no examples of these.

In all other cases, the reflexes of stops in ON \textit{p}, \textit{t}, \textit{k} + \textit{l}, \textit{n}, \textit{r}, \textit{t}, \textit{s} clusters are voiceless and unaspirated, irrespective of vowel length. Reitan’s examples include: [kvek\textsc{ne}] ‘come to life,’ [s\textsc{v\textsc{k}\textsc{ne}}] ‘to miss,’ [\textsc{e\textsc{p\textsc{r}}\textsc{e}}] ‘apple,’ [s\textsc{\textsc{u\textsc{r}}\textsc{e}}] ‘to sip,’ [\textsc{r}\textsc{y\textsc{k\textsc{t}}\textsc{e}}] ‘yanked’ and [s\textsc{\textsc{u\textsc{r}}\textsc{s}}] ‘shears, scissors.’

Table 3–8. Reflexes of ON stops in three varieties of the Härjedalen dialect in Sweden in terms of voicing conditions. (Further explanation in text and discussion of Table 3–1.)

<table>
<thead>
<tr>
<th>ON examples\textsuperscript{1}</th>
<th>Vemdalen</th>
<th>Hede</th>
<th>Funäsdalen</th>
</tr>
</thead>
<tbody>
<tr>
<td>\textit{tala} ~ \textit{dala}</td>
<td>+ \approx</td>
<td>+ \approx</td>
<td>+ \approx</td>
</tr>
<tr>
<td>\textit{vita}</td>
<td>= *</td>
<td>= *</td>
<td>- *</td>
</tr>
<tr>
<td>\textit{skot}</td>
<td>=</td>
<td>=</td>
<td>=</td>
</tr>
<tr>
<td>\textit{átta} ~ \textit{odda}</td>
<td>- \approx</td>
<td>- \approx</td>
<td>- \approx</td>
</tr>
<tr>
<td>\textit{vanta} ~ \textit{vanda} (\textit{mn}l\textit{r})</td>
<td>- \approx</td>
<td>- \approx</td>
<td>= \approx</td>
</tr>
<tr>
<td>\textit{varta}</td>
<td>=</td>
<td>=</td>
<td>=</td>
</tr>
<tr>
<td>\textit{el\textsc{t}a} ~ \textit{elda} (\textit{lr})</td>
<td>- \approx</td>
<td>- \approx</td>
<td>- \approx</td>
</tr>
<tr>
<td>\textit{hjalpa} (\textit{lr}+\textit{pk})</td>
<td>- *</td>
<td>- *</td>
<td>= *</td>
</tr>
<tr>
<td>\textit{vatna} (\textit{mn}, \textit{tl})</td>
<td>=</td>
<td>=</td>
<td>=</td>
</tr>
<tr>
<td>\textit{vakna} (\textit{pk}+\textit{mn}l)</td>
<td>=</td>
<td>=</td>
<td>=</td>
</tr>
<tr>
<td>\textit{nöt\textsc{r}a} (\textit{rjv})</td>
<td>= *</td>
<td>= *</td>
<td>= *</td>
</tr>
<tr>
<td>\textit{vax\textsc{a}} (\textit{pk}+\textit{ts})</td>
<td>=</td>
<td>=</td>
<td>=</td>
</tr>
</tbody>
</table>

In all dialects in Härjedalen, ON \textit{lt} is reflected as a sequence of voiceless lateral and a voiceless, unaspirated stop, e.g. [sv\textsc{\textsc{h\textsc{t}}}\textsc{t}] ‘salt.’ Similarly, the \textit{r} in ON \textit{rp} and \textit{rk} sequences is reflected as either a voiceless trill or as a retroflex sibilant: e.g., [v\textsc{v\textsc{e\textsc{p}}\textsc{e}}] or [v\textsc{\textsc{v\textsc{e\textsc{p}}}\textsc{e}}] ‘lay eggs,’ and [\textsc{s\textsc{t\textsc{e\textsc{r}}}\textsc{k}}] or [\textsc{s\textsc{t\textsc{e\textsc{r}}}\textsc{k}}] ‘strong.’ ON \textit{rt} is reflected as a preaspirated retroflex stop in most of the dialects, e.g. [sv\textsc{\textsc{h\textsc{t}}}\textsc{t}] ‘black.’ The sonorant + fortis

\textsuperscript{1} Glossary: \textit{tala} ‘to speak,’ \textit{dala} ‘valleys (gen.),’ \textit{vita} ‘to know,’ \textit{skot} ‘shot,’ \textit{átta} ‘eight,’ \textit{odda} ‘points (obl.),’ \textit{vanta} ‘to need,’ \textit{vanda} ‘problem (obl.),’ \textit{varta} ‘wart,’ \textit{el\textsc{t}a} ‘to chase,’ \textit{elda} ‘fires (gen.),’ \textit{hjalpa} ‘help,’ \textit{vatna} ‘waters, lakes (gen.),’ \textit{vakna} ‘to wake up (intr.),’ \textit{nöt\textsc{r}a} ‘to shiver,’ \textit{vax\textsc{a}} ‘to grow.’
stop sequences that remain to be discussed are ON \( lp \) and \( lk \) as well as sequences of nasal + fortis stop. Sequences of these types have a voiceless sonorant only in the Vemdalen and Hede dialects.\(^1\) Thus, for the nasals we have \([\text{l}\text{m}\text{p}]\) ‘lamp,’ \([\text{f}\text{m}\text{t}]\) ‘fifth,’ \([\text{v}\text{nt}]\) ‘winter,’ \([\text{br}\text{nt}]\) ‘brown (neut.),’ \([\text{b} \text{h} \text{t} \text{nt}]\) ‘the bench’ and \([\text{b} \text{h} \text{k}]\) ‘bench.’ The laterals are voiceless flaps, e.g. \([\text{j}\text{p}]\) ‘help’ and \([\text{f} \text{k}]\) ‘people.’

Finally, Table 3–8 summarises the development of ON stops in the Härjedalen dialects as they are described by Reitan, and provides an overview of the way ON stops in different contexts are reflected in terms of voicing conditions. The conventions used in the table are explained in section 3.1 (cf. Table 3–1).

### 3.5.2 Arjeplog

Wallström (1943) describes the dialect of Arjeplog in Northern Sweden. According to his description, a distinguishing mark of the dialect is its collection of preaspirated stops. In Wallström’s account, fortis stops are preaspirated if preceded by a long vowel, e.g. \([\text{r}\text{hp}]\) ‘rope,’ \([\text{s} \text{h} \text{t}]\) ‘sweet’ and \([\text{h} \text{k}]\) ‘leak.’ Preaspiration occurs more sporadically after short vowels and in his standardised phonetic transcription of the dialect only the preaspirations occurring after long vowels are transcribed. Also, according to Wallström’s description, all sonorants are voiceless before fortis stops. The voicelessness appears to be complete and not partial as in many other dialects. Wallström’s examples include \([\text{v} \text{k}]\) ‘which,’ \([\text{v} \text{nt}]\) ‘winter’ and \([\text{h} \text{k}]\) ‘bench.’

In a recent study of the Arjeplog dialect (using data from the SWEDIA 2000 database; see Ch. 4, section 4.4.4), Stölten (2002) showed that the female speakers of the Arjeplog dialect had longer preaspirations than males. Using the same data, Wretling, Strangert and Schaeffler (2002) investigated the production of fortis stops in the

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\(^1\) This is according to Reitan (1930:67). Westin (1897) says that voiceless nasals are found in the western part of Härjedalen, as well as Linsäll, which might indicate that voicelessness in nasals has receded in its spread during the 30 odd years that separate Westin’s and Reitan’s studies. Also, Reitan is convinced that voicelessness in sonorants in the dialects of Vemdalen and Hede is a recent phenomenon, and he remarks that he finds that it is particularly noticeable in young informants. However, as we have seen, voicelessness in nasals in the Vemdalen dialect was described by Westin more than 30 years earlier, which undermines Reitan’s claim (cf. Hansson, 1997:54).
Arjeplog dialect. Their findings support Wallström’s analysis, and it seems that the dialect has kept its preaspiration patterns intact, unlike the Vemdalen dialect (cf. preceding section). Wretling et al. found that preaspirations in VːC sequences were far longer than preaspirations in VC: sequences. In VːC sequences, durations were fairly evenly distributed between vowel, preaspiration and occlusion. On average, the vowel comprised 35% of the sequence, the preaspiration 34% and the occlusion 31%. The corresponding figures for VC: sequences were 30%, 13% and 58%. Thus Wallström’s impression that preaspiration was much more prominent in VːC sequences is borne out by instrumental analysis.

There is reason to believe that preaspiration and voiceless sonorants in the Arjeplog dialect have come about through contact with the local Saami population. According to Wallström (1943:20), there were relatively few Swedish speakers living in Lappland until the beginning of the 19th century. In 1799, there were 958 Saami living in the areas of Arjeplog and Arvidsjaur, and only 247 Swedish settlers. Wallström cites evidence (albeit somewhat anecdotal) that many or most of the Swedish settlers seem to have been fluent in Saami at that time. Since the settlement of Swedish speakers in the area is so recent, and since they had such close contact with the Saami language, which had preaspiration and voiceless sonorants, there is good reason to believe that these features have been passed from Saami to the Arjeplog dialect.

### 3.5.3 The Gräsö dialect

Preaspiration in the Gräsö dialect was first noted by Manne Eriksson in his postscript notes to Schagerström’s (1949) description of the dialect in Gräsö (see map in Figure 3-6 in the following section). Eriksson divides the island into two main dialectal areas, Northern and Southern, each of which resembles the dialect directly opposite on the mainland. This reflects the fact that in earlier times communications within the island were more difficult than those across the strait to the mainland. A road connecting the northern and southern parts of the island was not built until the end of the 19th century. Eriksson also points out that there

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1 Gräsö is approximately 4 km from east to west and 25 km from north to south, and is fairly densely forested.
do occur systematic linguistic differences between different villages within the Northern dialect, particularly between Norrboda and Söderboda.

Eriksson’s remarks on preaspiration in the Grässö dialect pertain to the Northern dialect. It can be inferred from Eriksson’s discussion that he regards preaspiration as a normative feature of this dialect.\(^1\) According to Eriksson, preaspiration is generally present in fortis stops, and he does not point out any exceptions to this pattern. The examples he cites show that preaspiration occurs after both long and short vowels, for example in \(\text{[bɔːthɔ]]} \) ‘bottom’ and \(\text{[vɛːθɔ]]} \) ‘wheat’.\(^2\) However, there are no examples that show whether preaspiration occurs in other contexts (i.e., when something other than a vowel follows the stop in ON).

According to both Eriksson and Schagerström, the Northern Grässö dialect reflects both ON singleton \(b, d, g\)\(^3\) and geminate \(bh, dd, gg\) as voiceless in both word-initially and word-medially. This description is supported by Hesselman (1905:11), who comments that such stops are voiceless in Northern Uppland, where Grässö is situated.

The data analysed for the present work (see Ch. 4, section 4.4) largely confirm Eriksson’s observations. Preaspiration is generally present in intervocalic fortis stops, irrespective of whether the preceding vowel is long or short. Furthermore, preaspiration is attested in the clusters \(/kn/, /kr/, /tr/, /kl/\) and \(/kt/\). However, \(/ts/\) and \(/ks/\) clusters are not preaspirated in the Grässö dialect. As regards the lenis stops, only one subject consistently produces voiceless variants, while the others tend to produce voiced ones.

Furthermore, the data in Chapter 4 reveal that ON sequences of sonorant and fortis stop (i.e., \(m, n, l, r + p, t, k\)) are reflected as half-voiced, half-voiceless in the Grässö dialect. Thus we get, for example, \(\text{[femŋɪti]} \) ‘fifty,’ \(\text{[gɾeːŋɔi]} \) ‘green (neut.),’ \(\text{[nɭlɪt]} \) ‘all (neut.),’ \(\text{[pʰʊŋŋɪktɪɾ]} \) ‘precise,’ \(\text{[mjœɾhkv]} \) ‘to milk’ and \(\text{[bjœɾhkv]} \) ‘birches.’ The nasals and laterals are simply divided in two halves, the initial half voiced and the

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\(^1\) He even expresses surprise at the fact that Schagerström did not mention it in his account of the dialect.

\(^2\) These transcriptions have been converted from the original version (Swedish Phonetic Alphabet) to IPA notation with some minor simplifications.

\(^3\) These, one should keep in mind, did not occur in intervocalic position in ON.
latter half voiceless. As for the flap and tap, the flap and tap movements are made with voicing, followed by a h-sound (or a voiceless vocoid) before the stop closure is made.

Table 3–9. Reflexes of ON stops in the Swedish Gräsö dialect in terms of voicing conditions. Note that relatively few clusters with a stop as the first element are attested. (Further explanation in text and discussion of Table 3–1).

<table>
<thead>
<tr>
<th>ON examples</th>
<th>Gräsö Swedish</th>
</tr>
</thead>
<tbody>
<tr>
<td>tala ~ dala</td>
<td>+ =/≈</td>
</tr>
<tr>
<td>mata</td>
<td>− *</td>
</tr>
<tr>
<td>åtta ~ odda</td>
<td>− =/≈</td>
</tr>
<tr>
<td>vanta ~ vanda (mnler)</td>
<td>− =/≈</td>
</tr>
<tr>
<td>vakna (k + nler, tr)</td>
<td>−</td>
</tr>
<tr>
<td>vaxa (ks and ts only)</td>
<td>−</td>
</tr>
</tbody>
</table>

Table 3–9 summarises the development of ON stops in the Gräsö dialect, and provides an overview of the way ON stops in different contexts are reflected in terms of voicing conditions. Cf. section 3.1 (Table 3–1) for an explanation of the conventions used in the table.

3.5.4 Kökar and the Åboland archipelago

In his doctoral thesis, Karsten (1892) described preaspiration in the Swedish dialect spoken on the island Kökar, one of the southernmost inhabited islands in the Åland archipelago (see map in Figure 3–6).

According to his description, the Kökar dialect reflects the ON geminate fortis stops, pp, tt, kk, as preaspirated. Karsten’s examples include [[lɔhpa]] ‘paw,’ [[ŋŋt]] ‘night’ and [[bækpr]] ‘creeks.’ Stops that derive from ON singleton fortis stops, p, t, k, have various outcomes, depending on whether they occur in ON light or heavy syllables. For ON heavy syllables, V:C(V), the outcome in the Kökar dialect is generally also a V:C(V) syllable, in which the stop is voiceless and unaspirated, e.g. [[busk]] ‘book’ and [[gveŋk]] ‘wheat.’

1 Glossary: tala ‘to speak,’ dala ‘valleys (gen.),’ mata ‘to feed,’ åtta ‘eight,’ odda ‘points,’ vanta ‘to need,’ vanda ‘problem,’ vakna ‘to wake up (intr.),’ vaxa ‘to grow.’
2 ON light, heavy and overlong syllables are explained in more detail in the discussion of the Gudbrandsdalen dialects (section 3.4.2).
Figure 3-6. Gräsö, the Åland Isles and the Åboland archipelago. Kumlinge and Kõkar belong to the Åland Isles archipelago. Korpo, Hitis and Finby are form part of the Åboland archipelago.

For ON light syllables, the outcome depends on whether the syllable is open, VCV, or closed, VC. Those VCV syllables where the consonant is a fortis stop are reflected as VC:V syllables with a voiceless, unaspirated stop, e.g. [[vikɔ]] ‘week,’ [[droyɔ]] ‘drop’ and [[gætɔ]] ‘street.’ The fact that these stops are long, but still voiceless and unaspirated, suggests that in the Kõkar dialect, ON pp, tt, kk became normatively preaspirated before these stops became long. Otherwise, they would also have become preaspirated.

The development of ON VC syllables (closed and light) with a fortis stop is less clear, since examples of these are few and far between. It is clear, though, that the stop in such syllables is preaspirated if the preceding vowel is an [ɛ] which derives from ON i. These conditions are met in words like [[æhp]] ‘ship’ (< ON skip) and [[æht]] ‘sense’ (< ON vit). As for other vowels, Karsten’s text contains the examples [[tʰkε:k]] ‘roof’ and [[nætε]] ‘net’ (for which the forms [[nætεx]] ‘the net,’ [[nætx]] ‘nets’ and [[nætxε]] ‘the nets’ are also cited), which do not have a preaspirated stop.1

In Karsten’s description of the Kõkar dialect, the ON geminate lenis stops, bb, dd, gg, are voiced both word-medially and finally. His ex-

1 According to Hansson (1997:69) preaspiration occurs in light, closed syllables after any vowel that derives from ON i and y. This may well be so, but my search in Karsten’s thesis has, as yet, only yielded examples with an [ɛ] that derives from ON i.
amples include [[gɔbɛ]] ‘old man’ and [[ɔdː]] ‘tip, point.’ This means that in word-medial and -final position the Kökar dialect has three types of stops, voiced, voiceless unaspirated and preaspirated, as exemplified by [[gɔbɛ]], [[drɔpɔ]] and [[lɔhɔp]]. The Kökar dialect thus has close similarities to the dialect of Vemdalen in the distribution of preaspiration and types of stop contrasts found (see section 3.5.1).

Let us now consider the distribution of preaspiration in clusters. ON tj and kj are generally reflected as an unaspirated affricate, [tʃ], e.g. [[gvefɛr]] ‘to urge’ (< ON hvetja) and [[geʃɛr]] ‘to lick’ (< ON sleikja). It is difficult to find examples reflecting ON tj and kkj cluster. However, the development of -kki- sequences in, e.g., [[drɔhɛr]] ‘(have) drunk,’ suggests that such clusters would be preaspirated and that the ON distinction between kj and kkj should be upheld. The Kökar dialect also has voiced [dʒ] clusters, which most commonly reflect ON dʒ and gg + i, j as in [[bridʒɔ]] ‘pier, jetty’ (< ON bryggi). Judging from Karsten’s examples, it is possible that the Kökar dialect also upholds a distinction between ON tr and ttr clusters. Thus we find, e.g., [[jeʃtɾeṇ]] ‘the goats’ and [[gréɾeṇ]] ‘to gleam, to glitter’ vs. [[kʰvihɾeṇ]] ‘to chirp, to twitter’ and [[kʰeɾeɾeṇ]] ‘to climb.’ For ON kr and kkr, there are fewer examples. With preaspiration we find [[vəhkrɛʃt]] ‘most beautiful,’ and without preaspiration [[ɔkrɛ]] ‘fields’ and [[bɛɾkɾɛn]] ‘the books.’ A distinction between ON kl and kkl clusters is also upheld. Without preaspiration we have [[hɔkrɔnɛ]] ‘hind legs’ (< ON hɔklana)1 and [[fʰokliŋg]]2 ‘chicken,’ and with preaspiration we have, for example, [[hˈɔhkrɛɾ]] ‘sow, stitch’ and [[fihɾɛɾn]] ‘skilful.’ However, according to Karsten, ON t(t)l clusters always seem to be reflected as [l] (utterance-finally) or [l] (intervocally), e.g. [[nɛlo]] ‘nettle’ and [[fɾɛɾlɾ]] ‘to sprawl.’ I have, as yet, found no examples reflecting ON p(p)r and p(p)l clusters in Karsten’s text. “Voiced versions” of these clusters are also found, for example [[fjaɛdrɔ]] ‘feathers,’ [[hɛɾɡɾɛ]] ‘higher’ and [[ugɾɛ]] ‘owl.’

1 Karsten (1892:66) relates this to ON hɔkull ‘cape.’ This seems unlikely, especially in light of Karsten’s comment that the word is only found in the expression [[kʰomɔ pʰo hɔkɾοnɛ]] ‘get on one’s feet.’ It is more likely that this word reflects the def. pl. acc. form of ON hɔkɔll ‘ankle of hind leg.’

2 Karsten has the dento-alveolar l, not the flap l.
There are very few examples of clusters reflecting ON $k(k)n$. Without preaspiration we find $[\mathrm{fuːk}\dot{ŋ}\ddot{o}]$ ‘parishes,’ which is cited several times, and with preaspiration we find $[\mathrm{f}^{\mathrm{b}}\dot{\theta}k\dot{ŋ}\ddot{o}]$ ‘fog’ which appears once. Similarly, words reflecting ON $t(t)n$ are scarce. The words $[\mathrm{vɛt̪n}]$ ‘witness’ and $[\mathrm{vɛtn}]$ ‘the water’ are cited, both without preaspiration. There are no “voiced versions” of these clusters.

ON clusters with two consecutive stops (essentially $pt$ and $kt$), as well as $ks$ clusters, have no preaspiration in the Kökar dialect. ON $pt$ is reflected as $[f\dddot{\mathrm{b}}]$, e.g. $[\mathrm{f}^{\mathrm{b}}\dot{\theta}ɾ\dddot{\mathrm{h}}p]$ ‘bought,’ while $kt$ is reflected as $[k\dddot{\mathrm{t}}]$, as in $[\mathrm{vk}\ddot{\mathrm{t}}]$ ‘weight.’ ON $ks$ clusters are reflected variously as $[ks]$ or $[k\dddot{f}]$, e.g. $[faks]$ ‘six’ and $[vækʃ\ddot{f}]$ ‘grow.’

To sum up, the Kökar dialect has no distinction between preaspirated and unaspirated stops for /tn/, /tl/, /kt/, /pt/ and /ks/ clusters. They are always unaspirated. For /tf/, /kn/ and /kl/ there is a distinction between preaspirated and unaspirated variants, which seems to reflect an ON quantity distinction. Since these clusters also have voiced variants, there is a three-way distinction between voiced, voiceless unaspirated and voiceless preaspirated clusters, as exemplified by $[uŋɾ\ddot{\mathrm{p}}]$, $[hɔkɾ\ddot{\mathrm{ŋ}}\ddot{\mathrm{p}}]$ and $[t^{\mathrm{b}}\ddot{\mathrm{h}}ɾk\ddot{\mathrm{ŋ}}\ddot{\mathrm{p}}]$. As was pointed out above, there is also a three-way distinction in non-clusters.

The Kökar dialect also has voiceless sonorants before ON $p$, $t$, $k$. Karsten (1892:10, 37f) describes these as voiced during the initial part and voiceless in the latter part and comments that he feels that /l/ and /r/ have a greater degree of voicelessness than the nasals, but that they still are voiced at the onset. As examples of voiceless sonorants we find $[\mathrm{g}\ddot{\mathrm{v}}ɛɾ\ddot{\mathrm{h}}p\ddot{\mathrm{r}}]$ ‘to throw,’ $[\mathrm{g}^{\mathrm{b}}\ddot{\mathrm{θ}}ɾ]\ddot{\mathrm{h}}p\ddot{\mathrm{r}}]$ ‘church,’ $[\mathrm{vɛz\ddot{\mathrm{t}}}]$ ‘to starve,’ $[\mathrm{mj}\ddot{\mathrm{ŋ}}\ddot{\mathrm{h}}k]$ ‘milk,’ $[\ddot{\mathrm{v}}ɾ\ddot{\mathrm{h}}p\ddot{\mathrm{r}}]$ ‘to help,’ $[\ddot{\mathrm{v}}ɾ\ddot{\mathrm{ŋ}}\ddot{\mathrm{t}}\ddot{\mathrm{e}}]$ ‘winter,’ $[\ddot{\mathrm{v}}ɾ\ddot{\mathrm{ŋ}}\ddot{\mathrm{t}}\ddot{\mathrm{e}}]$ ‘angle,’ $[\ddot{\mathrm{f}}\ddot{\mathrm{ŋ}}\ddot{\mathrm{k}}\ddot{\mathrm{o}}]$ ‘ham, buttock’ and $[fæm\ddot{\mathrm{m}}\ddot{t}\ddot{\mathrm{ʊ}}\ddot{\mathrm{n}}]$ ‘fifteen.’ The Gräsö dialect (see section 3.5.3) has voicelessness in sonorants in such contexts which are very similar to those described for the Kökar dialect, and I have used the Gräsö data as an aid in interpreting Karsten’s transcriptions in these cases.¹ ON $rt$ is not reflected with a voiceless sonorant but

¹ Karsten uses a wedge symbol $\check{\mid}$ to indicate voicelessness in these sequences, e.g. $mjo\check{\mathrm{c}}k$. In this particular case, for instance, based on what we observe in the Gräsö dialect, my interpretation is that first a voiced flap is produced and then follows a period of preaspiration.
instead as a preaspirated or an unaspirated retroflex stop, e.g. \([ḥj]t\) ‘heart’ and \([jʊt\o]\) ‘shirt.’

To summarise the development of ON stops in the Kökar dialect, Table 3–10 provides an overview of the way ON stops in different contexts are reflected in terms of voicing conditions. The conventions used in the table are explained at the end of section 3.1, where a similar table for Icelandic is presented.

Table 3–10. Reflexes of ON stops in the Swedish Kökar dialect in terms of voicing conditions. (Further explanation in text and discussion of Table 3–1).

<table>
<thead>
<tr>
<th>ON examples(^1)</th>
<th>Kökar dialect</th>
</tr>
</thead>
<tbody>
<tr>
<td>tala ~ dala</td>
<td>+ ≈</td>
</tr>
<tr>
<td>mata</td>
<td>= *</td>
</tr>
<tr>
<td>skip</td>
<td>– *</td>
</tr>
<tr>
<td>átta ~ odda</td>
<td>– ≈</td>
</tr>
<tr>
<td>vanta ~ vanda (mnlr)</td>
<td>– ≈</td>
</tr>
<tr>
<td>vaka (nlrjv)</td>
<td>= *</td>
</tr>
<tr>
<td>keypti (pt and kt)</td>
<td>=</td>
</tr>
<tr>
<td>vaxa (ks only)</td>
<td>=</td>
</tr>
</tbody>
</table>

Finally, Karsten remarks that at the time of his investigation, only the oldest generation conforms to the patterns of preaspiration described above. Middle-aged speakers have started to apply preaspiration to stops that have secondary lengthening (e.g., \([drohpo]\) ‘drop’) and the younger generation has an increasing tendency to omit preaspiration altogether.

We now leave Kökar and consider several other locations, mainly to the north and east of Kökar, where preaspiration has been reported to occur. For these dialects the accounts are less detailed than for Kökar. According to Hultman (1894:257, 1939:253ff), apart from Kökar, ON pp, tt, kk are reflected as preaspirated in the parish of Kumlinge (i.e., the island of Kumlinge itself, as well as several smaller surrounding islands), which lies to the north of Kökar. Also, Hultman reports that east of

\(^1\) Glossary: tala ‘to speak,’ dala ‘valleys (gen.),’ mata ‘to feed,’ skip ‘ship,’ átta ‘eight,’ odda ‘points (obl.),’ vanta ‘to need,’ vanda ‘problem (obl.),’ vaka ‘to wake up (intr.),’ keypti ‘bought,’ vaxa ‘to grow.’
Kökar, in the Äboland archipelago, preaspiration occurs in the villages on Utö and Jurmo (or Söderjurmo) south of the island of Korpo, and in the parishes of Hitis and Finby (due east of Kökar). However, Hultman has no detailed descriptions of the phonological distribution of preaspiration in these dialects.

Hultman’s comments concerning preaspiration in Kumlinge are supported by examples given in two word lists compiled in the latter part of the 19th century. The lists are reviewed in Sundberg (1993:40ff). The first of these1 was compiled in 1873 by a local priest, Jakob Nordqvist. This list is a compilation of words specific to the Kumlinge dialect. Among the words Nordqvist noted one can see examples such as [skɔhτə] ‘to shovel’ and [streχtə] ‘to run.’ The second list2 was compiled in 1880 by a Petter Solstrand, a teacher from the neighbouring island of Brändö. This list pertains mainly to the Brändö dialect, but contains comments on the dialect of Kumlinge. Among these is the statement that older speakers of the Kumlinge dialect insert an \( h \) into words where Standard Swedish has none, “for example tohke instead of tokke, foht instead of fått, smoht instead of smått, fehk instead of fick, etc.” (my translation).

The picture that emerges is that preaspiration was likely more widespread in earlier times and already in the late 19th century was losing ground in the eastern Åland archipelago as well as in the Äboland archipelago. In terms of the phonological distribution of preaspiration, we can infer from Karsten’s detailed study that preaspiration in the Kökar dialect has much in common with the dialects of Härjedalen, especially Vemdalen and Hede (see section 3.5.1).

3.5.5 Central Standard Swedish (CSw)

Preaspiration in Central Standard Swedish3 (henceforth CSw) is not regarded as a normative feature of the dialect. However, as early as 1911 Millardet studied (using a kymograph) what he described as epenthetic

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1 Collection SLS 168 of the Finnish ‘Svenska Litteratursällskapet.’
2 Collection SLS 175 of the Finnish ‘Svenska Litteratursällskapet.’
3 Central Standard Swedish is the Standard variety of Swedish spoken in Central Sweden, including Stockholm.
consonants that tended to occur on vowel–stop boundaries in CSw.¹ Rositzke (1940) investigated these phenomena further, also with the aid of a kymograph. He found that his three male subjects had a tendency to produce fricatives (and sometimes affricates) on the boundary of a long, close vowel and a stop (both fortes, /p t k/, and lenes, /b d g/). His examples² include [kʰɛ̈t], [kʰɛ̈t] and [kʰɛ̈t] for kut ‘seal pup,’ [ɡʊːd], [ɡʊːt] and [ɡʊːd] for gud ‘god,’ and [bɪçt], [bɪht] and [bɪt] for bit ‘a bit, a bite.’ Rositzke did not observe this tendency for friction after any other vowels.

Rositzke also observed that his subjects tended to produce an aspiration before fortis stops, irrespective of which vowel preceded them. Rositzke gives several examples in which a non-close, long vowel (e.g., /ɛː/, /ɔː/, /øː/ and /ɑː/) is followed by a preaspirated fortis stop, for instance [pʰek] peka ‘point’ and [kʰpæt] kapet ‘the capture.’ If the stop is lenis, the vowel is simply followed by the stop silence, with no intervening aspiration. According to Rositzke’s measurements, the duration of these preaspirations varied between 20–50 ms.³ After short vowels, Rositzke simply comments that “post-vocalic aspirations […] occur sporadically before tenues [i.e., /p t k/]” and although he does not state it explicitly, one can infer from his text that he never observed a corresponding preaspiration before a lenis stop.

While Rositzke wished to attribute both the post-vocalic friction and the pre-occlusive aspiration to the same cause, it seems that two different factors contribute to the observed friction/aspiration phenomenon. On the

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¹ The claim found in some sources (e.g. Rositzke, 1940) that Lundell described preaspiration in the Standard variety of Swedish as early as 1879 is unfounded. However, Noreen (1903:400) gives a fairly detailed description of what he calls “dependent or ‘parasitic’ sound” that can occur on the boundary of a vowel and a subsequent stop:

[...] for example, the i-sound in klipp, before it is completely cut off, first changes [...] into a very short y-sound and then, as voicing diminishes with the widening of the glottis, it changes into an equally short h-sound with a y-timbre, i.e. approximately kliyhp.

(Noreen 1903:400; my translation)

² Converted here as closely as possible to the current IPA notation. The original transcriptions do not denote vowel length and postaspiration on word-initial stops.

³ Which is very much in line with the findings for CSw in Chapter 4.
one hand, speakers have a tendency to devoice the final part of a vowel before a voiceless consonant (cf. Ch. 4, section 4.2.3.2). On the other hand, speakers have a tendency to produce a friction noise at the end of long, close vowels. This can occur irrespective of whether or not a consonant follows. This latter tendency has been observed by Elert (1966; 1995), for example, who noted that the long, close vowels in Swedish (/iː/ /yː/ /uː/ and /uː/) tend to end in a consonantal articulation, citing examples such as [biˈi] [bi ‘honey bee’ and [ruˈu] roa ‘entertain’ (transcription adapted from Elert’s text).2

These phenomena, preaspiration and post-vocalic friction, do not always act independently of one another. Particularly, when a sequence of a close vowel and a voiceless consonant is produced, a preaspiration will enhance any tendency for friction by increasing the air velocity across the oral stricture.

Since preaspiration and post-vocalic friction are non-normative in CSw, there are a number of ways in which a vowel–consonant juncture can be realised. For example, the word bit ‘bite, bit (noun)’ might be variously produced as +[biːt] +[biːt] +[biːt] +[biːt]. The first and last of these examples probably represent the types of production that are most typical in CSw.

The preaspiration tendency in CSw has been investigated further by Gobl & Ní Chasaide (1988), who studied glottal abduction in sequences of vowel and fortis stop from a cross-linguistic perspective. Their study involved 11 Swedish subjects, 4 English subjects and 4 French subjects. They found that most of their 11 Swedish subjects and 2 out of 4 English subjects tended towards early glottal abduction before an unvoiced stop. The 2 remaining English subjects and all 4 French subjects seemed to synchronise glottal abduction and oral closure more tightly.

Fant et al. (1991), studying voice source characteristics, also observed the tendency in CSw towards pre-occlusive aspiration, and comment that this seems to be a feature more common in women’s speech

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1 The [?] in this case should be interpreted as a fricative rather than an approximant.

2 Similar tendencies can be observed in other languages, e.g. French and Japanese.
than in men’s.¹ My own impressionistic observations of Swedish speakers suggest that a tendency to preaspirate is quite common in Swedish, and I would agree with Fant et al. that women tend to preaspirate more than do men. In fact, this applies not only to speakers of CSw, but also to speakers of most of the main varieties of Swedish, such as Skånska, Dalmål, and Jämtkska. It should be stressed, however, that even if one can find evidence of consistent early glottal abduction in some speakers, this does not mean that preaspiration is a particularly noticeable feature of their speech.

The findings for the four CSw speakers investigated here (cf. Ch. 4.2) suggest that in CSw it is not only the stops /p t k/ that tend to be preceded by preaspiration, but also the fricatives /f/, /hj/² and /s/. This means that preaspiration is not a particular feature of stops, but a general characteristic in production of voiceless consonants.

The word-medial intervocalic lenis stops in Swedish are generally produced as fully voiced stops, although they are quite often voiced fricatives or approximants. Word-initial stops are generally voiced as well, even when they occur utterance-initially.

The contrast between /l m n/ + /b d g/ and /l m n/ + /p t k/ clusters lies mainly in the voicing of the stops. Sonorants before stops are usually fully voiced, and do not appear to have any significant tendency to become voiceless before the voiceless fortis stops. In other words, the preaspiration tendency in CSw does not extend to the sonorants in any significant degree. Also, fortis stops that follow sonorants are not more prone to be produced with postaspiration than are intervocalic stops.

### 3.6 Non-normative preaspiration in Scandinavia

As indicated in section 3.5.5, my impression is that non-normative preaspiration occurs commonly in stop production in all of Sweden, and in fact across the whole of the Scandinavian peninsula (see also Helgason 1999). Apart from the data on CSw provided in Chapter 4, there are three

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¹ This may be viewed in light of Stölten’s (2002) findings that Arjeplog females have longer preaspiration than the males, as well as the findings of Foulkes et al. (1999) that female and child speakers of Tyneside English tend to preaspirate, but not males.

² Traditionally transcribed as /hj/.
recent studies that corroborate these impressionistic observations. First, Wretling, Strangert & Schaeffler (2002) find that preaspiration is present to varying degrees in 19 different Northern Swedish dialects. Second, Tronnier (2002) has come to a similar conclusion for 15 different Southern Swedish dialects. Both of these studies are based on data collected for the SWEDIA 2000 project (Bruce et al. 1999). And third, van Dommelen (1998, 1999, 2000) has found that Norwegian speakers of differing dialectal backgrounds have a tendency to preaspirate.

Wretling et al. present findings from 19 different dialects. For each dialect, they have examined the stop production of 3 elderly male speakers, thus in total investigating the stop production of 57 subjects. Wretling et al. do not cite absolute durations in their paper, but instead report the proportion of preaspiration within the VC interval. As for segmentation criteria, Wretling et al. specify that VC sequences were divided into three segments: vowel, preaspiration and consonant. Further segmentation criteria are not indicated. Thus it is not indicated whether breathiness was included as part of the preaspiration, nor is it clear whether the end of the closure or the end of the subsequent release constitutes the end of the consonant.

Not unexpectedly, Wretling et al. report the (proportionally) longest preaspirations in the Vemdalen and Arjeplog dialects (see sections 3.5.1 and 3.5.2), which both happen to be included in their survey. On average, the preaspiration of three Vemdalen speakers comprises approximately 17% of the VC interval and in the Arjeplog dialect the corresponding figure is 23%.¹ These means, however, are somewhat misleading, since in actuality preaspiration is utilised for contrastive purposes. Thus in VC: syllables with non-back vowel, preaspiration comprises approximately 30% of the VC interval, while in other syllable types there is no preaspiration whatsoever. In the Arjeplog dialect the situation is reversed, since preaspiration occupies more of the VC interval in V:C syllable than in VC: syllables. Thus in V:C syllables preaspiration comprises 23–41% of the VC interval, while in VC: syllables it comprises approximately 10–20%.

¹ Wretling et al. present their findings in bar-charts instead of tables. Therefore all figures cited from their paper are approximate.
For the remaining 17 dialects, Wretling et al. report proportional pre-aspiration durations of only 0.5–6%. Four dialects have proportional pre-aspiration durations of 4–6%, a further four around 3–4%, five dialects around 2.5% and the remaining four 1% or less. Proportional durations of approximately 5% should not be disregarded. First, one should note that only male speakers are analysed, and it is my impression, as well as that of Fant et al. (1991), that female speakers tend to preaspirate more than do male speakers. Note also that only mean durations are cited, which may obscure both contextual variation (such as the difference in preaspiration duration between V:C and VC: syllables) as well as individual variation, and since only three speakers represent each dialect, the results may easily be skewed. In my view, finding that elderly male speakers of several dialects have, on average, 4–6% preaspiration in VC intervals should be taken as an indication that non-normative preaspiration in these dialects can be a significant factor in stop production for some speakers, just as it is in CSw (cf. section 3.5.5).

Tronnier (2002) presents findings from 15 different dialects, and investigates 10–12 speakers from each dialect, i.e. a total of more than 150 subjects. She examines four test words, two with V:C syllables (tak ‘roof’ and låt ‘song’) and two with VC: syllables (tack ‘thanks’ and lott ‘share’). The test words were elicited verbally without naming the target word, and once the subjects identified and uttered the target word, they were to repeat it up to five times. Thus each target word is spoken in isolation. Information on segmentation criteria is not provided.

Tronnier provides data of two kinds. First, she has data on the frequency of occurrence of preaspiration for each word in each dialect (i.e., how often preaspiration was detected for each word). For tak she reports a frequency of occurrence ranging from 1–50% (median = 20%) for the different dialects. For låt, the range is 21–89% (median = 65%). For tack the range is 2–78% (median = 31%) and for lott the range is 41–98% (median = 70%). According to Tronnier, preaspiration occurs far more frequently for låt and lott than for tak and tack. Still, there seems to be a high degree of correlation between frequency of occurrence of preaspiration in different word types for the different dialects (i.e., if, for
example, in a particular dialect, tack is relatively frequently preaspirated, it is likely that tak, låt and lott are as well).

Second, Tronnier presents data on mean durations for the preaspirated stop tokens of each dialect. For tak, pre aspiration durations in the different dialects range from 23–70 ms (mean = 44 ms); for låt from 15–51 ms (mean = 39 ms); for tack from 18–53 ms (mean = 38 ms); and for lott from 19–54 ms (mean = 41 ms). Thus the difference in preaspiration duration between different word types is not very large.

In terms of preaspiration duration, these findings are consistent with those from CSw presented in Chapter 4. However, unlike Tronnier’s study, the CSw findings do not indicate particular contextual differences in the frequency of occurrence of preaspiration, such that particular vowels or stops should induce preaspiration more or less frequently than do others. And as with the study of Wretling et al., one should note that since mean durations for each word and each dialect are presented, individual variation is obscured. However, since up to 12 speakers represent each dialect in Tronnier’s study, there is less danger that the absence or presence of preaspiration in a particular speaker skews the results for his/her dialect.

Lastly, we turn to van Dommelen’s (1998, 1999, 2000) studies of preaspiration in Norwegian. Van Dommelen (1999) investigated the durational properties of VC intervals in the words lake ‘brine’ and lage ‘to make’ in the speech of 24 Norwegian subjects. The dialectal background of the subjects varied. Of the 24 subjects, 5 were from areas that van Dommelen (ibid: p. 2038) claims are “traditionally regarded to have preaspiration” (2 from Rogaland, 2 from Stavanger and 1 from Northern Gudbrandsdalen). Van Dommelen treats these speakers as a single group (Group I in Table 3–11). Of the remaining subjects, 12 had a “Trøndelag background,” and 7 “spoke dialects from regions south of Trondheim.” These 19 speakers were treated as one group (Group II in Table 3–11). The duration of the vowel, the breathy part of the aspiration, the preaspiration proper and the closure were measured. Van Dommelen’s results are given in Table 3–11.
Table 3–11. The findings of van Dommelen (1999) for mean durations (in ms) of vowel, breathiness, preaspiration and occlusion in the Norwegian word *lake*. The ɦ-symbol indicates the period of breathy aspiration observed, while ʰ indicates voiceless aspiration. Standard deviations are given in parentheses.

<table>
<thead>
<tr>
<th></th>
<th>Vowel</th>
<th>ɦ</th>
<th>ʰ</th>
<th>Closure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I (n =25)</td>
<td>177 (30)</td>
<td>22 (10)</td>
<td>58 (28)</td>
<td>126 (19)</td>
</tr>
<tr>
<td>Group II (n = 95)</td>
<td>163 (30)</td>
<td>23 (13)</td>
<td>25 (10)</td>
<td>117 (27)</td>
</tr>
</tbody>
</table>

The speakers in Group I (from areas defined by van Dommelen as being “traditionally regarded to have preaspiration”) have, on average, more than 30 ms longer preaspirations than the Group II speakers. The duration of the breathy portion is similar for both Groups. Thus preaspiration as measured from the onset of breathiness to stop closure is 80 ms on average for Group I and 48 ms for Group II. Van Dommelen stresses that there is much individual variation in the data. Thus, the average duration of the breathy portion ranges from 10–59 ms for the 24 speakers. Similarly, the average duration of preaspiration proper ranges from 13–87 ms.

The results obtained by van Dommelen are very much in tune with the results of Wretling et al. on Northern Swedish dialects. Wretling et al. also included speakers from dialects that had earlier been described as having preaspirated stops and these speakers have much longer preaspirations (on average) than do the remaining speakers. In terms of absolute preaspiration duration, however, comparisons between the results of van Dommelen and Wretling et al. are difficult to make since Wretling et al. only present proportional durations.

Comparing the results of van Dommelen and Tronnier we find that the absolute duration of preaspiration is somewhat longer for Group II in van Dommelen’s study (48 ms) than for the subjects of Tronnier’s study (40 ms). Here, one should note three differences between the studies, which make direct comparisons of these figures more difficult. First, the subjects in Tronnier’s study have a more varied dialectal background than those in Group II in van Dommelen’s study. Second, in Tronnier’s study, only those instances with some degree of preaspiration are included in the calculation of preaspiration duration. And third, Tronnier
does not give her segmentation criteria, which makes it uncertain how much of the breathy portion of the preaspiration has been included in the measurement.

Taken together, the findings of van Dommelen, Tronnier and Wretling et al. suggest that non-normative preaspiration does occur in the speech of many speakers across Scandinavia to such a degree that it is notable even when results from many subjects are pooled together. Further investigations of Scandinavian dialects, highlighting individual variation rather than mean preaspiration durations, are warranted. This will also allow better estimates of whether preaspiration should be considered as normative or non-normative in individual dialects. It would be of special interest to obtain information on Norwegian dialects other than those covered in van Dommelen’s (1999) study, in order to obtain a clearer picture of how commonly speakers of different Norwegian dialects tend to preaspirate.¹

3.7 Tyneside English

Docherty & Foulkes (1999) and Foulkes, Docherty & Watts (1999) have examined sociophonetic variation in Tyneside English, the dialect spoken in Newcastle-upon-Tyne in Northern England. One aspect of their research concerns the mapping of stop variants in different phonetic contexts. Docherty & Foulkes (1999) investigated the stop production of 16 subjects. The subjects were divided into equal-sized groups of older males and younger males and older females and younger females. The older subjects were aged between 45–67, and the younger between 15–27. Docherty & Foulkes describe one of the pre-pausal stop variants as being produced with “a period of fricative energy before the stop gap.”²

They found that this variant occurred in 70% of the pre-pausal stop

¹ In his textbook of phonetics (intended for Norwegian university students), Endresen’s (1988:43) includes a short explanation of preaspiration and gives examples of some of the languages and dialects where it is found. Citing, for instance, Saami, Scots Gaelic, Icelandic and the Norwegian dialects in Jæren and Gudbrandsdalen, he adds that also “in, for example, the Tromsø dialect, a weak preaspiration can be heard.” (Endresen 1988:43; my translation). This stray comment indicates that one may expect to find that preaspiration does occur in Norwegian dialects other than those covered in van Dommelen’s study.

² In later papers they have referred to these stop variants as preaspirated.
tokens for the group of younger females. For younger males, this variant occurred in 35% of the tokens. In the speech of the older speakers, this variant is far less frequent. For the older females, it occurred in 23% of the tokens, and for the older males in only 2%. It may be noted that Docherty & Foulkes (1999) also examined the stop production of an identical sample of Derby speakers and found no signs of “extended frication” in those data.

Foulkes, Docherty & Watts (1999) investigated the speech of four Newcastle children, aged 2;0–4;0. They found that in pre-pausal positions, preaspirations were particularly prone to occur, although they were also occasionally observed word-medially. With data for all four children pooled, pre-pausal stops were found to be preaspirated in 85 out of 126 cases.

Combined, the findings of these two studies suggest that preaspiration is a characteristic of the Newcastle dialect. They are very reminiscent of Iversen’s account of the Senja dialect described in section 3.4.4, and may also be connected with observations to the effect that preaspirations in CSw are more common in the speech of females than males. Docherty & Foulkes (1999) offer a sociophonetic explanation to the phenomenon, claiming that the age stratification in the data suggest that there is a change in progress where females are “leading the way.” However, there may be a more general physiological mechanism underlying this apparent gender- and age-specific distribution in preaspiration occurrence. This will be discussed further in Ch. 5, section 5.3.

3.8 Celtic languages

3.8.1 Scots Gaelic

In many Scots-Gaelic dialects, Common Gaelic p, t, k are reflected as preaspirated stops. In some dialects, though, the preaspiration has become a velar fricative, and thus the stops are reflected as [xp], [xt] and [xk]. Hansson (1997) provides an overview of the geographical distribution of these variants, based on the works of Clement (1983), Borgstrøm (1974), Ó Murchú (1985) and Oftedal (1956).
Dialects that have the preaspirated reflexes for all the stops are those found furthest to the northwest, on the island of Lewis as well as on the northwestern rim of the Scottish mainland, i.e. in the western parts of Sutherland and in parts of Ross-shire (area 1 in Figure 3-7). South of these areas, on Harris, North Uist, Skye, and in the western part of Inverness on the mainland, p and t are reflected as preaspirated, but k as [xk] (area 2 in Figure 3-7). In much of the remaining Scots-Gaelic speaking area, Common Gaelic p, t, k are reflected as [xp], [xt] and [xk] sequences (area 3 in Figure 3-7). Still, in the southern part of Argyll, as well as in the northern part of Perthshire, p and t are reflected as [p] and [t] and only k is reflected as [xk] (areas marked as 4 in Figure 3-7).
Investigations of preaspiration duration in Scots Gaelic have been conducted by Ní Chasaide & Ó Dochartaigh (1984) as well as Ladefoged et al. (1999). Ní Chasaide & Ó Dochartaigh measured the duration of preaspiration for three speakers, one from Lewis, one from Harris and one from North Uist.¹ Impressionistically, they found that preaspiration in the Harris dialect was the weakest of the three, ranging from “a period that we can only describe as silence—that is with no audible friction—to a weak glottal fricative” (ibid:142) In the other two dialects, they felt that the preaspirations were similar to those in Icelandic, and that, as suggested by the geographical overview earlier, the velar stop was preceded by homorganic fricative rather than preaspiration proper. Their impressions were confirmed by their instrumental investigation. The Lewis subject had the shortest preaspiration duration, ranging from approximately 90 to 140 ms, depending on context. The Harris and North Uist subjects had considerably longer preaspirations, ranging from approximately 90 to 170 ms (these measurements include the breathy portion as well as the voiceless portion of preaspiration).

Ladefoged et al. measured the duration of preaspiration in 6 male speakers from the island of Greater Bernera and vicinity, on the western side of Lewis. They found that the mean duration of preaspiration² was approximately 105 ms before both dentals and velars, and slightly under 80 ms before palatalised stops. Before labial stops, mean preaspiration duration was only approximately 50 ms.

Neither study gives measurements of vowel duration, so the durational relationship between vowel and preaspiration is uncertain for Scots Gaelic.

As for the lenis stop series, these have been characterized as voiceless word-initially, -medially and -finally by all researchers (e.g., Borgstrøm 1940, Oftedal 1956, Gillies 1993, Ladefoged et al. 1999). Ní Chasaide & Ó Dochartaigh measured specifically the degree of voicing in word-medial lenis stops. In all dialects, closure durations were

¹ Information about age and sex is not provided, nor is there information about the number or nature of test words. Measurements for ˈVC and ˈVCV syllables are given, seemingly reflecting the reading of a list of monosyllabic and disyllabic words.

² The criteria used for measurements are not specified, so it is not certain how much of the breathy portion of the preaspiration is included in these measurements.
approximately 140–150 ms in 'VC syllables, and approximately 80–90 ms in 'VCV syllables. For both contexts, the Harris speaker had less than 10 ms of voicing in the initial part of the stop closure, and the North Uist speaker had 15–20 ms of voicing. For the Lewis speaker, the initial 25 ms of the stop closure were voiced in 'VC syllables, which means that there is voicing during less than 20% of the closure. In 'VCV syllables, the Lewis speaker had approximately 35 ms of voicing, and since the closure duration was much shorter in this context, this means that approximately 40% of the stop closure is voiced.

According to Oftedal (1956:99), sonorants can be voiceless before Old Norse1 and Common Gaelic p, t, k (see also Ó Baoill 1980 and Gillies 1993). However, information on their geographical distribution and phonetic realisation is scarce. Some information on the phonological distribution of voiceless sonorants in the Leurbost dialect is provided by Oftedal. It is clear from his description that all laterals (dental, alveolar and palatal) are voiceless throughout before fortis stops. As for nasals, Oftedal reports that the facts are more complex. A distinction between voiced and voiceless sonorants is not clear-cut in all cases, since even before lenis stops the nasals seem to become partially devoiced (ibid:99, 138f). However, Oftedal emphasizes that labial, dental and velar nasals can occur as completely voiceless before stops. R-sounds also occur as voiceless before stops, seemingly as [ɾ] before /p/ and /k/, and as a retroflex sibilant [ʂ] before /t/ (Oftedal 1956:137, Gillies 1993:163).

3.8.2 Irish

Ni Chasaide & Ó Dochartaigh (1984) investigated the speech of a single speaker of Irish. This speaker comes from the town of Gaoth Dobhair (see map, Figure 3-7), but information about age and sex is not provided, nor is there information about the number or nature of test words. Measurements for 'VC and 'VCV syllables are reported, seemingly reflecting the reading of a list of monosyllabic and disyllabic words. As for the method of measurement, both the breathy portion and the voiceless portion are included and reported.

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1 Because of the numerous Old Norse loan-words in Common Gaelic, Oftedal includes the Old Norse stops in his account of Gaelic stop development.
According to Ní Chasaide & Ó Dochartaigh, preaspiration is not a feature traditionally associated with Irish, and it had not been previously noted or described phonetically. Impressionistically, they describe it as “barely audible” and feel that it is a “very weak glottal fricative or period of silence, somewhat similar to the Lewis varieties” (cf. the preceding section on Scots-Gaelic). The durational measurements show an average preaspiration duration of approximately 90 ms for stops in both 'VC and 'VCV syllables.

Ní Chasaide & Ó Dochartaigh also investigated voicing in the lenis stop series in corresponding contexts. For 'VC sequences, closure duration was approximately 140 ms, and for 'VCV sequences approximately 105 ms. For both 'VC and 'VCV sequences, they found that the initial 40% of the stop closure has voicing, and was otherwise voiceless. This is somewhat similar to their findings on the Lewis dialect in the preceding section.

Voiceless sonorants also seem to occur in Irish, according to Wagner (1964:292f). In Donegal Irish, he claims that an older -llt- vs. -lt- and -nnt- vs. -nt- distinction is expressed through complete voicelessness of the former in both pairs. He also claims that such voicelessness is found in the Connaught dialect and sporadically in the Munster dialect. Sonorant voicelessness in Irish does not seem to have been noted by other linguists.

### 3.9 Saami

The Saami languages are spoken across the northern part of the Scandinavian peninsula (approximately from Røros and Idre in the south and northwards) up to the Kola peninsula in the northeast (Hansson, 1997). With regard to preaspiration, the following language groupings are found to be convenient:

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1 The form *Saami* is used here, but *Sami, Sámi* and *Sápmi* are also found in the literature. Forms with *Lapp-* have become pejorative in many languages, but the term *Lappic* still seems to be used for the Saami language family as a whole.
1. South Saami (Southern & Ume Saami)
2. North Saami (Northern, Pite & Lule Saami)
3. Skolt Saami
4. Kola Saami (Ter & Kildin Saami)
5. Inari Saami

Apart from Inari Saami, all of the Saami languages have preaspirated stops. As in the Nordic and Celtic languages, preaspirated stops generally emerge as a reflex of older long stops. However, unlike Northern Germanic and Celtic languages, preaspiration in the Saami languages does not reflect a distinction between Proto-Saami fortis and lenis stops, since Proto-Saami had no such distinction. Instead, an older distinction between short and long stops is now often reflected as a distinction between unaspirated and preaspirated stops (Hansson 1997:149f). Another feature of most Saami languages is consonant gradation. Reconstruction suggests that consonant gradation resulted in overlong stops at one time, which have become preaspirated in most Saami languages. With regard to the phonological distribution of preaspiration in the Saami languages, it is practical to discuss separately the development of the Proto-Saami stop quantity contrast on the one hand, and the overlong stops that come about through consonant gradation on the other.

In simplified terms, one can say that in all Saami languages except Kola Saami and Inari Saami the Proto-Saami stop quantity contrast is reflected as an unaspirated (short) vs. preaspirated (long) stop. The phonetic realisation of the preaspiration in these stops varies. Information for Southern and Ume Saami is so scarce that no description can be offered. In Northern, Pite and Lule Saami, preaspiration duration seems to differ between dialects, and is variously described (impressionistically) as [ʰ], [h] and [hˑ], depending on dialect and phonological context (cf. Hansson 1997:151f; citing Sammallahti 1971, 1977, Ravila 1932 and Itkonen 1971). For Skolt Saami, Korhonen (1973:18; cited in Hansson 1997:156) uses [ʰ] to denote preaspiration. Skolt Saami data provided by McRobbie-Utasi (1999) will be discussed below.

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1 This sweeping generalisation ignores the fact that to a large extent the Proto-Saami short stops have been lenited and are reflected as voiced fricatives.
The development of overlong stops in all Saami languages (except Southern Saami) is posited as a result of older long stops that occurred in the strong grade (i.e., when followed by an open syllable). These are reflected as preaspirated in those Saami languages that have consonant gradation (except for Inari Saami). In Northern Saami, these preaspirations are described as long, i.e. [hː], in most dialects (cf. Hansson 1997:151f; citing Sammallahti 1971 and Itkonen 1971). In Kola Saami, in which only overlong stops (i.e., long Proto-Saami stops in the strong grade) have become preaspirated, preaspiration has been described as half long, [hr] (Kildin Saami), or long, [hː] (both Kildin and Ter Saami; cf. Hansson 1997:158; citing Korhonen 1981 and Bańczerowski 1969).

Measurements of preaspiration duration have been made for Skolt Saami (McRobbie-Utasi 1999). The test words were disyllables embedded in frame sentences. Two subjects were recorded. In terms of absolute duration, sequences of vowel and preaspirated stops in Grade II disyllables are shorter than those in Grade III disyllables. Durations for both syllable types are given in Table 3–12 (ibid:106–108).

<table>
<thead>
<tr>
<th></th>
<th>Vowel</th>
<th>Preaspiration</th>
<th>Closure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade II</td>
<td>175 (15)</td>
<td>63 (11)</td>
<td>193 (31)</td>
</tr>
<tr>
<td>Grade III</td>
<td>148 (11)</td>
<td>92 (20)</td>
<td>270 (29)</td>
</tr>
</tbody>
</table>

Note that although Grade III syllables are longer overall, the vowel in such syllables is still shorter than in Grade II syllables. McRobbie stresses that generally in Skolt Saami, the ratio between the vocalic and the consonantal portions of the syllable are a better measure of quantity than absolute durations. This is in keeping with findings from, e.g., Swedish (Bannert 1979), Icelandic (Pind 1986), Lule Saami (Engstrand

1 Grade II disyllables = the first syllable of disyllabic words, where the stop is a Proto-Saami short stop in the strong grade or a Proto-Saami long stop in the weak grade.
Grade III disyllables = the first syllable of disyllabic words, where the stop is a Proto-Saami long stop in the strong grade, i.e. an overlong stop.
Voicelessness in sonorants is also a feature of the Saami languages. Older stages of Saami seem to have made a distinction in stop quantity when stops followed a sonorant (e.g., \(^*_{-lt}\)- vs. \(^*_{-ltt}\)-). In North and South Saami, this distinction is now reflected as voiced vs. partially voiceless sonorant before a voiceless stop. In some cases, an emergent (i.e., epenthetic) vowel is produced between the sonorant and the stop. In these cases, when the context “should” yield a voiceless sonorant, one gets instead a preaspiration following the emergent vocoid, e.g. [tor\(^{oh}\)ka] ‘deer-calf leather shirt’ (Sammalahti 1977; cited in Hansson 1997:152). In Skolt Saami, such devoicing only occurs if the sequence in question occurs in a strong grade syllable. This is true of the Kola Saami languages as well, but it should be noted that historically nasals did not occur in contexts that yielded voicelessness, and thus the Kola Saami languages do not have voiceless nasals.

Engstrand (1987b) investigated preaspiration and sonorant voicelessness in the speech of 7 Lule Saami speakers. In Lule Saami, sonorant + stop sequences often lead to the production of an emergent vowel, particularly in Grade III words. As a result, older sonorant + stop sequences yield word pairs such as [pa:\(laka:w\)] ‘follow the path’ vs. [pa:\(lahkan\)] ‘(give as) salary,’ as well as word forms with voiceless sonorants, such as [pa:\(lka:w\)] ‘(paid) salary.’ Engstrand measured several words of this type and his findings indicate that there is a great deal of individual variation in the way in which older sonorant + stop sequences are reflected. In Grade II words, most subjects tend to produce a partially voiceless lateral before both older short and long stops, although two subjects actually produce an emergent vocoid followed by a preaspiration. Some speakers still seem to uphold a distinction between the two types of stops through the duration of the preaspiration, historically long stops being reflected with longer preaspirations than historically short stops. But, as Hansson (1997:155) points out, there is little or no contrast between the two types of stop for some speakers. In Grade III words, 4 of the 7 subjects make a distinction between preaspirated and unaspirated stops, producing preaspirated variants with quite long preaspirations (usually in

1987a), Estonian (Engstrand & Krull 1994) and Finnish (ibid.). The potential significance of durational ratios was discussed in section 3.2.2.
excess of 100 ms), and unaspirated variants without preaspiration. The remaining 3 subjects do not seem to differentiate between two stop types in Grade III words, although they do produce emergent vowels where appropriate.

Inari Saami stands out among the Saami languages in that it does not have preaspirated stops, but instead has postaspirated stops in those environments in which Northern Saami has preaspiration or voiceless sonorants. Postaspiration in Nordic dialects will be addressed in Chapter 4, section 4.5.

3.10 Conclusion

For the main part, this chapter has been a survey of the phonological distribution of preaspiration in the Northwestern Europe. It has also been the aim to extract as much information as possible regarding the phonetic expression of preaspiration in the Nordic dialects considered. In the next chapter (Chapter 4), we shall consider phonetic data from some of the areas that have been discussed here, particularly with regard to the quantitative and qualitative aspects of preaspiration production.

The dialectal descriptions reviewed in Chapter 3, as well as the data analysis presented in Chapter 4, show that: (i) the ON fortis vs. lenis contrast is maintained in all the dialects considered here (and, in fact, in virtually all the mainland Scandinavian dialects); (ii) the phonological distribution of preaspiration is highly dialect-specific; and (iii) the stop contrasts are expressed in a variety of different ways in the these dialects. In Chapter 3, the focus has been primarily on comparing dialects in terms of phonological contrast. However, some insights into the phonetic expression of these contrasts have also been gained. An overview of the major contrasts and an estimate of their phonetic expressions given in Table 3–13. As in previous tables in this chapter, the over-view indicates voicing conditions in stops (see discussion of Table 3–1) without being overly elaborate with phonetic detail. A more comprehensive summary and discussion of the contents of Chapters 3 and 4 combined is given in Ch. 4, section 4.6. Chapter 5 offers a more detailed discussion of the possible phonetic expression of these stop contrasts in ON.
Table 3–13. Reflexes of ON postvocalic and postsonorant stops in different Nordic dialects in terms of voicing conditions.

<table>
<thead>
<tr>
<th>Old Norse</th>
<th>Examples of words</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sec. length. p, t, k vi</td>
<td>'week' = = = + =</td>
</tr>
<tr>
<td>Sec. length. p, t, k + # lo</td>
<td>'lid, cover' = – – – + +</td>
</tr>
<tr>
<td>ð, g hla</td>
<td>'barn, to load' = ≈ = ≈ = ≈</td>
</tr>
<tr>
<td>pp, tt, kk á</td>
<td>'eight' – – – – – – + +</td>
</tr>
<tr>
<td>bb, dd, gg o</td>
<td>'tip, point' = = = =</td>
</tr>
<tr>
<td>m, n + p, t, k va</td>
<td>'need, lack' – + – – – – = – – – + +</td>
</tr>
<tr>
<td>m, n + b, d, g va</td>
<td>'problem (obl.) = = = =</td>
</tr>
<tr>
<td>lt e</td>
<td>'follow' – +</td>
</tr>
<tr>
<td>lp, lk hja</td>
<td>'help' – + – – – – – – – – – + + –</td>
</tr>
<tr>
<td>rt va</td>
<td>'wart' – –  – – – – – – – – – + + –</td>
</tr>
<tr>
<td>r + p, k ve</td>
<td>'lay eggs' – – – – – – – – – – – + + –</td>
</tr>
</tbody>
</table>

Legend:  + postaspirated;  = unaspirated;  – preaspirated;  ≈ voiced;  | indicates phonological variants;  ⁄ indicates “free” variants.
4 PREASPIRATION – DATA

In this chapter, data on the production of stops from several Nordic languages are examined. The aim is two-fold. First, to get an overview of the durational characteristics of stop production in some of the dialects considered, particularly Central Standard Swedish (henceforth CSw) and Faroese. Second, to obtain information on the variation in the expression of stops and stop contrasts. In general, the emphasis is on the production of preaspirated stops, but other stop types are also examined.

Four Nordic language communities are considered. We begin with CSw, spoken mostly in Central Sweden, especially the Stockholm area. For CSw, phonetic variation in the production of both lenis and fortis stops is examined, and durational aspects of preaspiration and postaspiration in word-initial and -medial positions are analysed. A similar analysis of duration and phonetic variation for Tórshavn Faroese is then presented. Next, data for the Northern Gräsö dialect of Swedish are considered, mainly emphasising phonetic variation. A limited durational analysis is also presented. Finally, some durational aspects of stop production in the dialect of Western Åland are investigated.

This overview of the stop production in different Nordic language communities allows us to make some cross-linguistic comparisons. Of particular interest are the similarities observed in the durational characteristics of preaspiration in CSw and Faroese. These results are unexpected, especially in light of the fact that preaspiration in CSw is non-normative while preaspiration in Faroese is normative.

4.1 Method

4.1.1 Speech materials

The bulk of the data analysed in Chapter 4 is from unscripted (spontaneous) speech. There are two main sources for these data. The CSw
and Tórshavn Faroese data were elicited using map-tasks (Anderson et al. 1991). The materials for the Swedish Northern Gräsö and Western Åland dialects were obtained from the SOFI\textsuperscript{1} archives (see section 4.1.1.2), which contain, among other things, collections of recordings of Swedish dialects. These two sets of data are described in more detail below.

In addition to the map-task and SOFI data, read speech data for six Gräsö subjects were analysed. These data come from the SWEDIA database (Bruce et al. 1999). A further description is given in section 4.5.4. Lastly, read speech data for one Western Åland subject were recorded and analysed. These data are described in section 4.6.3.1.

4.1.1.1 Map-task data — CSw and Tórshavn Faroese

The map task data for CSw were recorded in a sound-treated room at the phonetics lab at Stockholm University. These data are thus free of room echo. The Faroese data were recorded on location in the Faroes, where a sound-treated room was not available. Therefore, the Faroese data contain moderate levels of room echo. This affects the analysis of voicing in stops, particularly with regard to voice offset in preaspiration.

Apart from the recording location, all aspects of the recordings for the two languages were identical. Spontaneous speech interaction between the subjects was elicited using map-tasks. The same map-tasks were used for both languages. For each language, four subjects were recorded. The subjects were recorded in pairs (while engaged in a map-task) on separate channels. To reduce overlap between channels, the subjects were placed facing away from one another, at a distance of approximately 2 metres. The data were recorded on a Technics SV 260 A DAT recorder, using Sennheiser MKE2 microphones. The microphones were mounted on a headset so that they were placed approximately 2.5 cm out and to the side of the corner of the subject’s mouth. The CSw map-task data were transliterated and word-labelled by the author. The Faroese map task data were transliterated and word-labelled by a native Faroese speaker\textsuperscript{2}. Segmentation of the relevant stop data was carried out by the

\textsuperscript{1} Språk- och folkminnesinstitutet.

\textsuperscript{2} A student of Faroese language and literature at the University of the Faroes.
4.1.1.2 SOFI data — Gräsö and Western Åland

The speech materials analysed for the Swedish Gräsö and Western Åland dialects were obtained from the SOFI archives (maintained by Department of dialectology at the Institute for Dialectology, Onomastics and Folklore Research in Uppsala, Sweden). These recordings consist of on-location interviews with subjects, carried out in the 1960’s and 70’s. This material, therefore, consists of unscripted (spontaneous) speech. The interviews were carried out in the subjects’ own homes, by various interviewers. The recordings differ in quality depending on the resonance characteristics of the recording location, as well as the level of background noise. Information on individual subjects and their recordings is provided in sections 4.5.1 (Gräsö) and 4.6.3.1 (Åland).

The SOFI data were transliterated and word-labelled partly by the author and partly by a native Swedish speaker1. Segmentation of the relevant stop data was carried out by the author.

4.1.2 Segmentation and measurement criteria

Lisker and Abramson (1964) introduced voice onset time, VOT, as a parameter for describing the voicing conditions in the production of a stop. VOT is a measure of when voice onset occurs relative to a stop’s release. A negative VOT implies that voicing is initiated before the stop is released, which means that the stop will be voiced or have a voicing lead. A positive VOT implies that voicing is initiated after the stop is released, which leads to the production of a postaspirated stop. As a parallel to this, voice offset time, VOffT, has been used to describe the timing relations of voice offset relative to the stop closure gesture when preaspiration is produced (cf., e.g., Engstrand 1987b, Pind 1982, 1995).

The measurements of the present data have made use of VOT and VOffT with a small modification. Through auditory analysis of the preaspiration data, it has become clear that a full voice offset does not have to occur to achieve a preaspiration percept. Instead, it seems that intro-

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1 A student of linguistics at Stockholm University.
ducing breathiness into the voice quality prior to a stop is a cue that signals whether the stop is fortis or lenis.

This is demonstrated in Figure 4–1. This is an example from the CSw data (see section 4.2), but such stop productions also occur in the other data as well. In this example, subject FS produces *vackra* ‘beautiful’ with a sequence of a half-open, half-front vowel and a velar stop. In this case, glottal abduction is initiated approximately 65 ms before full voice offset is achieved, but there are only approximately 15–20 ms of voiceless friction noise. In auditory analysis, the preaspiration percept is quite distinct, and cannot be attributed to the short period of voiceless friction noise only. This has prompted the use of modal voice offset as a determinant for the onset of preaspiration. Thus in all measurements made in the data analysed in Chapter 4, preaspiration duration is measured as the interval between modal voice offset and stop closure, i.e. mVOffT (modal voice offset time).

Figure 4–1. An example of the segmentation of a sequence of a vowel and a fortis stop in CSw. Vowel (V) duration is defined as the interval from vowel onset to modal voice offset. Preaspiration (Pr) duration is the duration of the interval between modal voice offset and stop closure, i.e. mVOffT. Occlusion (O) duration is the interval between stop closure and stop release. (Subj. FS: [.u]rvackra [symboler... ‘Really beautiful symbols…’)
Figure 4–2. An example of the segmentation of postaspiration. Postaspiration duration is defined here as mVOT, i.e. the duration of the interval between stop release and modal voice onset. (Subj. FS: [...]...v[i] till [tet…] ‘...we (come) to the tent…’)

A similar tendency for a time lag between voice onset and modal voice onset has also been noted, although this does not seem to be as common. One such example is given in Figure 4–2, in which voice onset occurs approximately 30 ms before full modal voice is initiated. For the sake of uniformity, the same criteria are applied to the measurement of postaspiration as for preaspiration. Therefore, in all measurements in the present data, postaspiration duration is defined as the interval between stop release and modal voice onset, i.e., as modal voice onset time, mVOT.

For comparison, Figure 4–3 illustrates the production of unaspirated fortis stops in CSw. Subject MP (see section 4.2.1) produces two instances of a dental fortis stop and one instance of a bilabial lenis stop. Both fortis stops are produced as voiceless unaspirated, and there is no sign of a change from modal to breathy voice before either closure. After both closures, there is a release interval of approximately 25 ms, after which modal voicing commences quite abruptly. In fact, apart from the more forceful release, there does not seem to be much difference in the voicing conditions before and after the two voiceless dental stops and the voiced bilabial stop.
Figure 4–3. An example of a sequence in which there is (i) minimal separation between modal voice offset and voice onset and (ii) minimal separation between modal voice onset and voice onset. (Subj. MP: [gār m]otorbāte[n rak|t...]'...the speedboat goes straight...’)

Occlusion duration is measured as the interval between stop closure and stop release (see Figure 4–1). In the following discussion, the terms occlusion duration and stop duration are used interchangeably to indicate the duration of the stop’s closure phase. Vowel duration is defined as the interval between vowel onset (established with traditional criteria) and modal voice offset. Thus for example, in Figure 4–1, vowel duration does not extend from vowel onset to voice offset, but only to modal voice offset.

4.1.3 A note on the graphical presentation of durational data

The durational analysis presented in the following sections centres on the ratio of preaspiration (Pr) to the combined duration of vowel and preaspiration (VPr), i.e. the Pr/VPr ratio. Simply put, this ratio indicates how much of the vowel + preaspiration interval is taken up by preaspiration. This ratio has been found to be central in the perception of preaspiration in Icelandic (Pind 1993, 1995, 1998; see further discussion of Pind’s findings in section 3.2.2). The graphs presenting durational data in
the present work display VPr duration on the x-axis and Pr duration on the y-axis (see, e.g., CSw data in Figure 4–8). This type of graphical presentation has been chosen with a view to highlighting how the Pr/VPr ratio changes with increased VPr duration. The reasoning behind this choice is outlined below.

The most direct way of presenting the duration measurements would be to plot V durations against Pr durations. This would yield a simple graph in which all data points measured are directly represented. However, presenting the data with this simple type of graph makes it more difficult to assess and compare data points in terms of VPr duration. Particularly, this type of graph makes it difficult to assess at a glance how the Pr/VPr ratio changes with VPr duration. Presenting VPr duration on the x-axis and Pr/VPr ratio on the y-axis would make estimating such changes in the Pr/VPr ratio much more straightforward. However, presenting the data in such a way has the disadvantage that information about the absolute duration of preaspiration would be lost, or at least very difficult to retrieve.

The solution adopted here is to plot VPr duration on the x-axis and Pr duration on the y-axis. In such a graph it is relatively easy to assess how the Pr/VPr ratio changes with VPr duration, while at the same time keeping information on absolute durations. However, since Pr is being plotted partly against itself, these graphs should not in any way be taken as measures of statistical correlation between V duration and Pr duration. The primary goal with this type of presentation is to make the ratio between Pr/VPr assessable without losing the advantage of displaying absolute durations.

Finally, in order to make cross-language comparisons easier, the type of graph described above is used for all graphs in which durational data for preaspiration are presented. Efforts have also been made to present all such graphs in the same scale and size for all dialects and subjects considered.
4.2 Central Standard Swedish (CSw)

4.2.1 Method and subjects

The CSw data come from four subjects, three females (GT, CK and FS) and one male (MP). Subjects GT and FS are in their forties and MP and CK in their thirties. The total recording time was 20–30 minutes per subject. The amount of material analysed for each subject varies. For GT, approximately 4.3 minutes of uninterrupted speech\(^1\) were analysed, comprising a total of 870 words; for CK 9.5 minutes, 2045 words; for MP 10.8 minutes, 2554 words; and for FS 10.3 minutes, 2401 words. A rough estimate of speech rate was obtained by dividing the total number of vowels\(^2\) uttered with the total uninterrupted speaking time. By this rough estimate, GT utters 5.05 syllables per second, CK 4.95, MP 6.00 and FS 5.38. Further information regarding recording and segmentation procedures is given in section 4.1.

4.2.2 Word-initial fortis stops

4.2.2.1 Data overview

The CSw data yielded a total of 457 tokens of word-initial fortis stops. No post-pausal stops are included in this analysis. An overview of the data is provided in Table 4–1. Of the 457 tokens, 46 were excluded in the following analysis. In 26 cases the exclusions are due to a frication of the stop (i.e., a stop closure is not produced). The remaining cases are excluded for a variety of reasons, such as laughter during production, external noise etc. For subject GT, 44 occurrences were included in the analysis, while 5 were excluded. For subject CK, 86 tokens were included and 4 excluded. For subject MP, 154 tokens were included and 23 excluded. And for subject FS, 127 tokens were included and 14 excluded. Thus, a total of 411 occurrences of word-initial stops were examined and are included in the following analysis.

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\(^1\) What is referred to here as uninterrupted speech is the total speaking time for a subject, with no pauses included. Thus, for example, if a speaker utters *There is something...on the wing*, the pause between *something* and *on* is not counted as part of the speaking time.

\(^2\) Instances in which a vowel is “deleted” phonetically, for example when *vatten* is pronounced as *ʍ[vtɛn]*, are included in the total number of vowels.
Table 4–1. Overview of the data on word-initial fortis stops analysed for the four CSw subjects.

<table>
<thead>
<tr>
<th></th>
<th>GT</th>
<th>CK</th>
<th>MP</th>
<th>FS</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stop closure</td>
<td>44</td>
<td>86</td>
<td>154</td>
<td>127</td>
<td>411</td>
</tr>
<tr>
<td>Fricative</td>
<td>2</td>
<td>2</td>
<td>17</td>
<td>5</td>
<td>26</td>
</tr>
<tr>
<td>Laughter etc.</td>
<td>3</td>
<td>2</td>
<td>6</td>
<td>9</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>49</td>
<td>90</td>
<td>177</td>
<td>141</td>
<td>457</td>
</tr>
</tbody>
</table>

In total, then, 46 cases (approximately 10% of the data) were excluded from the durational analysis. This is a fairly low figure given that the data are from spontaneous speech. One can conclude that the CSw subjects in this experiment generally tended to produce word-initial stops with a full stop closure.

4.2.2.2 Postaspiration duration

The duration of postaspiration (Po), measured as the time lag from release to modal voice onset (mVOT; cf. section 4.1.2), varied considerably. As indicated in the box-and-whisker plot (Figure 4–4), the measurements ranged between approximately 10–90 ms (disregarding outliers and far outliers), with the bulk of the variation contained within the interval 30–65 ms.

In Table 4–2, the data on word-initial fortis stops have been divided into three main groups with regard to the placement of the stop. First, there are content words with primary lexical stress (e.g. palmer ‘palm trees,’ tennis ‘tennis’ and kust ‘coast’). Second, there are function words with primary lexical stress (e.g. på ‘on,’ till ‘to,’ kan ‘can, is able to’). And third, there are lexically unstressed syllables in content words (e.g. parasollet ‘the parasol,’ taverna ‘pub,’ kompassros ‘compass rose’; underscores indicate the syllable with primary lexical stress). These three groups will henceforth be referred to as tennis type, till type and taverna type words respectively.

On average, initial stops in tennis type words had longer postaspirations than in till type words (see Table 4–2). A two-tailed t-test indicates that this is significant for 3 out of 4 subjects, FS, CK and MP (p < 0.02, p < 0.01 and p < 0.001 respectively). However, the difference was not
very large, since postaspiration was approximately only 7–9 ms shorter on average in till type (i.e., function) words than in tennis type (i.e., content) words.

Figure 4–4. The range of postaspiration durations for word-initial fortis stops for the four CSw subjects.¹

The mean postaspiration duration of initial stops in taverna type words was slightly shorter than in tennis type words for 3 of the 4 subjects, but t-tests do not indicate that the differences are significant. The difference was even smaller than that observed between the tennis type and the till type words (i.e., content vs. function words). It should be noted that there are far fewer tokens for the taverna type words than for the other categories, which affects the significance in the t-tests.

There were also differences in mean postaspiration duration between subjects. For tennis type words, subject FS had the highest mean, 58 ms. GT and MP had similar mean durations, 46 and 44 ms respectively. CK

¹ The notched box shows the median (central line) and the lower and upper quartiles (lower and upper box boundaries). The box thus comprises 50% of the observed data. The notched area shows the confidence interval around the median. The dotted-line (i.e. whisker) connects the nearest observations within 1.5 IQRs (inter-quartile ranges) of the lower and upper quartiles. The vertical line to the left of the box shows the 90% percentile range. The diamond in that line shows the mean and the 95% confidence interval around the mean. Crosses (+) and circles (○) indicate outliers, observations more than 1.5 IQRs (near outliers) and 3.0 IQRs (far outliers) from the quartiles.
had an intermediate mean of 52 ms. For *till* type words, this pattern is repeated. FS had the highest mean, 50 ms, GT and MP had the lowest, 38 ms and 37 ms respectively, and CK had an intermediate mean of 45 ms.

Table 4–2. Mean postaspiration duration (Po), in ms, for word-initial fortis stops in three different word groups (see text) and for all four CSw subjects. Standard deviations are given within parentheses and the number of tokens in italics.

<table>
<thead>
<tr>
<th></th>
<th>GT</th>
<th>CK</th>
<th>MP</th>
<th>FS</th>
</tr>
</thead>
<tbody>
<tr>
<td>**Po</td>
<td>n</td>
<td>Po</td>
<td>n</td>
<td>Po</td>
</tr>
<tr>
<td>tennis</td>
<td>44 (18) 17</td>
<td>52 (11) 43</td>
<td>46 (14) 67</td>
<td>58 (14) 66</td>
</tr>
<tr>
<td>till</td>
<td>38 (13) 23</td>
<td>45 (13) 38</td>
<td>37 (14) 71</td>
<td>50 (19) 50</td>
</tr>
<tr>
<td>taverna</td>
<td>58 (20) 4</td>
<td>40 (6) 5</td>
<td>44 (13) 16</td>
<td>55 (11) 11</td>
</tr>
</tbody>
</table>

An analysis of the relationship of stop closure duration and postaspiration duration did not reveal any correlation between the two. This is perhaps not surprising, since stop closure duration varies greatly in the present data. One source for this variability is the fact that the context preceding the stops may contain any type of segment, a vowel, a sonorant, a stop or a fricative. Also, since the data are from unscripted (spontaneous) speech, factors such as prominence and speech rate are not controlled for. As a result, closure durations range from being practically absent (which can occur when a word-final nasal precedes a word-initial stop) to extending to several hundred ms.

The data do not indicate that there are systematic differences in mean postaspiration duration between the different places of articulation (labial, dental and velar). Again, this is perhaps to be expected, since the material is from spontaneous speech and thus, for example, the number of tokens for each stop category, their stress conditions etc. are not controlled for. Analysis of the stop types with a further breakdown of the material (e.g., into content and function words) does not yield statistically valid results, since each category has such a small number of tokens. These data are therefore not very useful in examining the possible differences in the duration of closure and aspiration between different places of articulation.
Several spectrographic examples of postaspirated stops are given in the following section on preaspiration and sonorant devoicing in word-initial fortis stops.

4.2.2.3 Preaspiration duration and sonorant voicelessness

The data on preaspiration before word-initial fortis stops in Central Standard Swedish (CSw) are a subset of the data on word-initial fortis stops analysed in the preceding section. In all, 147 occurrences of post-vocalic, word-initial fortis stops were analysed (these are found in sequences such as bara tittar, jag kommer, med palmer)\(^1\). Of these, 38 were from subject CK, 18 from GT, 45 from MP and 46 from FS.

The data indicate that for three of the four speakers, CK, GT and MP, there was almost no tendency for preaspiration before word-initial fortis stops. FS had a slight preaspiration before such stops in 21 of the 46 occurrences, usually consisting of a breathy voice offset ranging between approximately 10–35 ms. Thus, although a slight tendency to preaspirate such stops was observed, it was not the dominant pattern, and was hardly noticeable in auditory analysis when it did occur.

\(^1\) In some function words, word-final consonants are almost never realised in spontaneous speech. For example, the first person pronoun jag is typically pronounced as [jɛ] or [jɛː] and the preposition med ‘with’ is pronounced as [me] or [meːː], even when the following word begins with a vowel. Therefore, these are treated as not having a final consonant in this analysis.
Figure 4–5 shows two examples of a word-initial fortis stop in FS’s speech, the first of which has a mVOftT of 35 ms. Complete voice offset does not occur until after the stop closure is made, so the preaspiration is comprised only of breathiness in the vowel. This is one of the longest preaspirations found before a word-initial stop in the CSw material. By comparison, FS’s word-medial preaspirations are much longer, up to 120 ms (see section 4.2.3.2).

Figures 4–6 and 4–7 contain examples of the more usual, non-preaspirated word-initial fortis stops found in FS’s speech (as well as in that of the other three subjects). As before, voice offset does not occur until after the stop closure. Modal voice is maintained until the stop closure is made.

![Figure 4–7. Subj. GT: [...spo]rre på en tupp un[gefü.] ‘...hind-claw of a rooster approximately.’ Note the voiceless friction noise on the juncture of [n] and [t].](image)

The data on postsonorant, word-initial fortis stops are also a subset of the data on word-initial fortis stops analysed in the preceding section. In all, 111 occurrences were analysed (these are found in sequences such as väl tänka, vatten pā etc.)¹ Of these, 17 are from subject CK, 11 from GT, 43 from MP and 40 from FS. In approximately 75% of these cases, the preceding sonorant is /n/. In the remaining cases it is /m/ or /l/.

¹ Since /r/ very often has no clear phonetic correlates when produced in such contexts, it is not included among the sonorants. The sonorant category therefore comprises /m/, /n/ and /l/, while /r/ is discussed separately.
The data indicate that there is little tendency for voicelessness in sonorants preceding word-initial fortis stops for any of the subjects. Several instances have been noted, though, in which a slight frication noise occurs on the nasal–stop juncture. The most straightforward interpretation of this noise is that it is a short period of voicelessness before the full stop closure. The noise is quite hard to notice in auditory analysis, and can be confusing when it shows up on a spectrogram, as in Figure 4–7.

4.2.3 Word-medial and word-final fortis stops

The data on CSw word-medial and word-final have been divided into five main groups, according to (i) the syllable type in which the stops occur, (ii) whether they occur in content or function words, and (iii) the syllable’s type of lexical stress. Table 4–3 displays an overview of these groups. The first group (exemplified by the word båten) contains content words in which a fortis stop occurs in a VːC syllable with primary or secondary lexical stress. Examples of such words include djup ‘deep,’ båtar ‘boats,’ segelbåt ‘sail boat,’ rakt ‘straight,’ and spikrakt ‘straight as an arrow (lit. “nail”).’ In spikrakt the first syllable has primary stress and the second syllable has secondary stress. The target syllable in these examples appears in boldface. Such words will henceforth be referred to as båten type words.

Table 4–3. Words used to represent the different word categories discussed in connection with the CSw data analysis.

<table>
<thead>
<tr>
<th>Word type exemplifier</th>
<th>Lexical stress</th>
<th>Syllable type</th>
<th>Content vs. function</th>
</tr>
</thead>
<tbody>
<tr>
<td>båten</td>
<td>prim./sec.</td>
<td>VːC(C)</td>
<td>content</td>
</tr>
<tr>
<td>mot</td>
<td>prim.</td>
<td>VːC</td>
<td>function</td>
</tr>
<tr>
<td>vatten</td>
<td>prim./sec.</td>
<td>VːC:/VCC</td>
<td>content</td>
</tr>
<tr>
<td>att</td>
<td>prim.</td>
<td>VːC:/VCC</td>
<td>function</td>
</tr>
<tr>
<td>norrut</td>
<td>unstressed</td>
<td>VːC</td>
<td>cont./func.</td>
</tr>
</tbody>
</table>

The second group (exemplified by mot ‘against’) contains function words in which a fortis stop occurs in a VːC syllable. There are only three words in the data at hand that have been assigned to this group.
(although there are several tokens of each). The words are mot ‘against,’ åt ‘(un)to’ and utan ‘without, instead’ and will henceforth be referred to as mot type words.

The third group (exemplified by vatten ‘water, lake’) contains content words in which a fortis stop occurs in a VC: syllable with primary or secondary lexical stress. Such conditions are met in words such as upp ‘up,’ vatten, fortsätter ‘continues’ and bukt ‘bay.’ These words will be referred to as vatten type words.

The fourth group (exemplified by att ‘that, to (inf. marker)’) contains function words in which a fortis stop occurs in a VC: syllable. There are five words (each with several tokens) in the present data that have been assigned to this group: att, ett ‘a (indef. article),’ också ‘also,’ nåt ‘something,’ and liksom ‘like.’ Such words will be referred to as att type words.

The fifth, and last, group (exemplified by norrut ‘northwards’) contains words in which a fortis stop occurs in a lexically unstressed syllable. There are both content and function words in this group and the syllable type may be either VːC or VCː. Examples of such words include: norrut, havet ‘the sea,’ kommit ‘(have) come’ and inät ‘inwards.’ Such words will henceforth be referred to as norrut type words.

In some cases, a stop that occurs word-medially in a postvocalic context is excluded from the analysis. This applies to contexts in which the stop occurs after a morpheme boundary (e.g. in påtår ‘second helping’ andotaliga ‘many, uncountable’) and in which the stop occurs before a stressed vowel (e.g. hotell ‘hotel’ and afrikanskt ‘African’). These types of context trigger the production of the type of stop that occurs word-initially rather than word-medially.

4.2.3.1 Data overview

In total, the five word types discussed in the preceding section yielded 1051 sequences of CSw word-medial and word-final vowel + fortis stops (see Table 4–4). In 960 cases, the subjects produced a full stop closure, allowing measurements of preaspiration and, if a vowel followed, postaspiration. In 48 cases, the subjects did not produce a full closure, which made it impossible to obtain measurements of pre- and post-aspiration. In a further 29 cases, no identifiable stop correlates were
produced and in 9 cases there were no identifiable correlates for the vowel preceding the stop. Lastly, 5 cases were discarded for reasons such as laughter, hesitation or external noise.

Table 4–4. Overview of the word-medial and word-final stop data analysed for the four CSw subjects.

<table>
<thead>
<tr>
<th></th>
<th>GT</th>
<th>CK</th>
<th>MP</th>
<th>FS</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stop closure</td>
<td>107</td>
<td>237</td>
<td>357</td>
<td>259</td>
<td>960</td>
</tr>
<tr>
<td>Fricative</td>
<td>1</td>
<td>10</td>
<td>19</td>
<td>18</td>
<td>48</td>
</tr>
<tr>
<td>Incomplete stop</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>14</td>
<td>29</td>
</tr>
<tr>
<td>Incomplete vowel</td>
<td>0</td>
<td>1</td>
<td>6</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Laughter etc.</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>372</td>
<td>330</td>
<td>266</td>
<td>388</td>
<td>1051</td>
</tr>
</tbody>
</table>

There are no major differences between the subjects in their tendency for producing fricatives, or for producing vowels or stops in such a way that it becomes impossible to measure preaspiration duration. Incidentally, it seems that these CSw speakers have much less of a tendency to produce variants associated with hypo-speech (such as stops without stop closures or vowels without oral aperture) than do speakers of Faroese and Icelandic. The same tendency was also noted for the data on CSw word-initial stops (see section 4.2.2.1 above).

4.2.3.2 Preaspiration duration

Table 4–5 gives the mean durations of vowel (V), preaspiration (Pr; measured as mVOffT, cf. section 4.1.2), occlusion (O) and the combined duration of the three (VPrO). In the last column, the number of instances that had 5 ms or more of preaspiration (np) and the total number of instances measured (n) are indicated. These measures are given for the word types båten, vatten, att and norrut. Measures for the word type mot are not included, since these occurred infrequently and do not yield meaningful statistics in most cases.

In terms of mean durations, the male subject, MP, generally has shorter durations than do the three female subjects. For example, considering VPrO durations for vatten type words, MP’s mean duration is 152 ms, while it ranges from 220 to 230 ms for the remaining subjects. For
båten type words, MP’s mean VPrO duration is 156 ms, CK and FS have a mean duration of 209 ms and 217 ms respectively, and GT has an intermediate value of 175 ms. The shorter overall durations of MP are also reflected in the duration of the individual elements (V, Pr and O). Probably, MP’s shorter durations reflect that his speech rate is faster than for the three female subjects (cf. section 4.2.1).

Table 4–5. Mean durations (in ms) of Vowel, Pr(easpiration) and O(cclusion) for four word types with word-medial and word-final stops and for all four subjects. In the last column, \( n_p \) indicates the number of occurrences in which preaspiration was at least 5 ms long, and \( n \) indicates the total number of occurrences. Standard deviations are given within parentheses.

<table>
<thead>
<tr>
<th></th>
<th>V</th>
<th>Pr</th>
<th>O</th>
<th>VprO</th>
<th>( n_p/n )</th>
</tr>
</thead>
<tbody>
<tr>
<td>GT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>båten</td>
<td>96 (28)</td>
<td>8 (12)</td>
<td>72 (31)</td>
<td>175 (49)</td>
<td>16/39</td>
</tr>
<tr>
<td>vatten</td>
<td>97 (25)</td>
<td>20 (20)</td>
<td>104 (97)</td>
<td>220 (113)</td>
<td>25/39</td>
</tr>
<tr>
<td>att</td>
<td>65 (23)</td>
<td>1 (2)</td>
<td>48 (16)</td>
<td>114 (25)</td>
<td>1/10</td>
</tr>
<tr>
<td>norrut</td>
<td>75 (16)</td>
<td>2 (4)</td>
<td>79 (29)</td>
<td>156 (37)</td>
<td>4/17</td>
</tr>
<tr>
<td>CK</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>båten</td>
<td>115 (51)</td>
<td>19 (21)</td>
<td>75 (56)</td>
<td>209 (109)</td>
<td>42/73</td>
</tr>
<tr>
<td>vatten</td>
<td>105 (30)</td>
<td>38 (23)</td>
<td>90 (60)</td>
<td>233 (94)</td>
<td>77/84</td>
</tr>
<tr>
<td>att</td>
<td>53 (24)</td>
<td>5 (12)</td>
<td>57 (23)</td>
<td>115 (44)</td>
<td>5/28</td>
</tr>
<tr>
<td>norrut</td>
<td>125 (58)</td>
<td>28 (24)</td>
<td>83 (34)</td>
<td>236 (102)</td>
<td>32/43</td>
</tr>
<tr>
<td>MP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>båten</td>
<td>95 (29)</td>
<td>6 (11)</td>
<td>55 (25)</td>
<td>156 (53)</td>
<td>50/144</td>
</tr>
<tr>
<td>vatten</td>
<td>72 (17)</td>
<td>10 (14)</td>
<td>70 (40)</td>
<td>152 (55)</td>
<td>38/95</td>
</tr>
<tr>
<td>att</td>
<td>55 (19)</td>
<td>1 (2)</td>
<td>52 (32)</td>
<td>108 (41)</td>
<td>4/43</td>
</tr>
<tr>
<td>norrut</td>
<td>71 (22)</td>
<td>3 (6)</td>
<td>56 (31)</td>
<td>130 (46)</td>
<td>16/69</td>
</tr>
<tr>
<td>FS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>båten</td>
<td>120 (43)</td>
<td>30 (23)</td>
<td>67 (26)</td>
<td>217 (75)</td>
<td>92/108</td>
</tr>
<tr>
<td>vatten</td>
<td>95 (27)</td>
<td>45 (26)</td>
<td>90 (49)</td>
<td>230 (79)</td>
<td>85/90</td>
</tr>
<tr>
<td>att</td>
<td>66 (11)</td>
<td>14 (15)</td>
<td>39 (14)</td>
<td>118 (21)</td>
<td>6/12</td>
</tr>
<tr>
<td>norrut</td>
<td>101 (42)</td>
<td>27 (19)</td>
<td>71 (31)</td>
<td>199 (79)</td>
<td>37/45</td>
</tr>
</tbody>
</table>

As for preaspiration duration (Pr), the subjects CK and FS have far longer means than GT and, especially, MP. MP’s mean preaspiration durations range from 1 to 10 ms for the different word types, and GT’s durations from 1 to 20 ms. CK’s mean preaspiration durations range between 5–38 ms, and FS’s means, which are by far the longest, range from 14 to 45 ms.
To examine effects of syllable structure (V:C vs. VC:) on duration, the durational ratios between vowel, preaspiration and occlusion are perhaps most informative. This is especially relevant for the word types båten and vatten, which tend to occur in stressed positions. In Table 4–6 the durational data for these two word types have been normalised (i.e., VPrO duration for all subjects = 100%) and the durational data for each element (V, Pr and O) is presented as a percentage of the whole.

Table 4–6. Normalised durational data for (V)owel, (Pr)easpiration and (O)clusion for the word types båten and vatten. The percentages are rounded, and thus the combined percentage does not always equal 100%.

<table>
<thead>
<tr>
<th>Subject</th>
<th>V</th>
<th>Pr</th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>båten</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V:C(C)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GT</td>
<td>55%</td>
<td>4%</td>
<td>41%</td>
</tr>
<tr>
<td>CK</td>
<td>55%</td>
<td>9%</td>
<td>36%</td>
</tr>
<tr>
<td>MP</td>
<td>61%</td>
<td>4%</td>
<td>35%</td>
</tr>
<tr>
<td>FS</td>
<td>55%</td>
<td>14%</td>
<td>31%</td>
</tr>
<tr>
<td><strong>vatten</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VC:/VCC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GT</td>
<td>44%</td>
<td>9%</td>
<td>47%</td>
</tr>
<tr>
<td>CK</td>
<td>45%</td>
<td>16%</td>
<td>39%</td>
</tr>
<tr>
<td>MP</td>
<td>47%</td>
<td>6%</td>
<td>46%</td>
</tr>
<tr>
<td>FS</td>
<td>41%</td>
<td>19%</td>
<td>39%</td>
</tr>
</tbody>
</table>

All subjects express a difference between syllable types as a difference in the ratio of vowel and occlusion. In V:C(C) syllables, vowels are 9–14 percentage points longer than vowels in VC:/VCC syllables. Differences in occlusion duration are not as large. In VC:/VCC syllables, occlusions are 3–11 percentage points longer than occlusions in V:C(C) syllables. Preaspiration ratios are also larger in VC:/VCC syllables than in V:C(C) syllables, but this difference is fairly small. Incidentally, these differences between long and short vowels, and between the following long and short consonant, are appreciably smaller than usually reported in connection with more formal speaking styles (see, e.g., Elert 1964).

Differences in vowel ratio between subjects are fairly small. Most notably, the vowel ratios for MP seem to be shifted upwards slightly relative to the other subjects. Occlusion ratios sometimes seem to com-
plement preaspiration ratios, such that when preaspiration ratios are high, occlusion ratios are low and vice-versa.

A feature of the results presented in Table 4–5 are the large standard deviations for the mean durations. As a specific example, we can take CK’s occlusion duration in *vatten* type words. Her mean occlusion duration is 90 ms with a standard deviation of 60 ms. There are numerous examples of this, which suggests that mean durations are not the most meaningful way of representing the data. There are mainly two concerns here. First, mean durations may conceal bipolar distributions in the data. For example, a mean preaspiration duration of 3 ms may suggest that the measurements were clustered around 3 ms. However, a closer look at the data might reveal that in actual fact most of the measurements were 0 ms, while a few were 10 ms or more, i.e. a bipolar distribution. A more serious concern is that mean durations effectively eliminate the structured variation that may be inherent in the data. Thus covariation in the durational characteristics of, for example, vowel and occlusion or vowel or preaspiration cannot be inferred from mean durations.

The reason for the high standard deviations in these data has to do with the fact that the speech is unscripted and spontaneous, which implies that speech rate, sentence position, prominence and phonetic context cannot be controlled for. Also, in some cases, the data analysis itself contributes to increased standard deviations. This is particularly true for measurements of occlusion duration, since a distinction between VC and VCC syllables is not made. This means that “genuinely” long stops (as in *vatten* /vat:en/) are grouped together with stops in clusters (*plats* /plats/) in which the occlusions are usually shorter.

A representation of the data in which each measurement is displayed is more meaningful in terms of accounting for the variability in the expression of vowel + stop syllables. In the data at hand, the main emphasis is on the durational relationship between vowel and preaspiration, which has been shown to play a central role in the perception of preaspiration in Icelandic (cf. section 3.2.2). Thus Figure 4–8 plots the duration of preaspiration against the combined duration of vowel and
preaspiration for lexically stressed syllables for the four subjects.\(^1\) The filled circles represent data points in VC and VCC syllables (i.e., the word types vatten and att). The unfilled triangles represent data points in V:C syllables (i.e., the word types båten and mot).

From Figure 4–8(a) it is evident that GT does not tend to preaspirate to any great degree, and in fact, most of the observed instances have a preaspiration duration of 0 ms. However, one can detect a weak tendency for preaspiration duration in VC and VCC syllables (i.e., the word types vatten and att) to increase with increased VPr duration. Thus it seems that as vowel duration reaches approximately 80 ms, preaspiration is much more likely to occur than at vowel durations below 80 ms.

Figure 4–8(b) plots the data for subject CK in the same fashion. CK shows a much stronger tendency to preaspirate than GT, especially in VC and VCC syllables. The preaspirations increase in duration as vowel duration increases, and at vowel durations of 100 ms and beyond, preaspirations are almost always produced. At durations above 120 ms, preaspirations typically account for 50\% or more of the VPr duration in VC and VCC syllables. In V:C(C) syllables, preaspirations are similar in terms of absolute duration, but occupy a much smaller portion of the total VPr duration. Also, the VPr duration for CK has a much wider range than in GT’s data.

Figure 4–8(c) plots the vowel and preaspiration data for MP. Preaspirations are rarely longer than 40 ms, and most of the data points have 0 ms of preaspiration. Also, the range of VPr durations in the data for MP is more limited than in CK’s data. Thus MP and GT seem to behave in similar ways, and quite differently from CK.

The data for FS in Figure 4–8(d), however, follow the pattern of CK. FS has the longest preaspiration durations of all the CSw subjects. In VC and VCC syllables, preaspirations are always produced when vowel length exceeds 80 ms. At VPr durations of 100 ms, preaspiration generally takes up approximately 50\% of the total VPr duration. At VPr

---

\(^1\) Since preaspiration duration is partly being plotted against itself, the trend lines in these graphs should not be taken to show statistically valid correlations (cf. section 4.1.3). However, they do provide a visual indication of how preaspiration duration changes as a function of the duration of the vowel + preaspiration sequence.
Figure 4–8(a–d). Preaspiration duration plotted against the combined duration of vowel and preaspiration in lexically stressed word-medial syllables for all four CSw subjects. The filled circles represent data points in VC and VCC syllables (i.e., the word types *vatten* and *att*). The unfilled triangles represent data points in V:C(C) syllables (i.e., the word types *båten* and *mot*).
durations exceeding 120 ms, preaspiration typically takes up 60–70% of the total VPr duration. Thus it is evident that for FS, preaspirations occupy a greater part of the total VPr sequence than for any of the other CSw subjects.

4.2.3.3 Postaspiration duration

The data regarding postaspiration duration (measured as mVOT; see section 4.1.2) in word-medial stops are a subset of the data used in the preceding section on word-medial and word-final stops. We now consider only sequences with a V:CV or a VC:V structure. Examples of such words include kneppigare ‘more difficult,’ motorbåten ‘the speed boat’ and nyckeln ‘the key.’

Sequences in which a word boundary comes between the stop and the subsequent vowel are not considered (e.g., mitt under ‘straight below’). Also, since V:CV and VC:V occur so rarely in function words, the following results relate only to content words.

Table 4–7. Mean durations (in ms) of Vowel, Pr(easpiration), O(clusion) and Po(staspiration) for four word types and for all four subjects. In the last column, npr indicates the number of occurrences in which preaspiration was at least 5 ms long, and n indicates the total number of occurrences. Standard deviations are given within parentheses.

<table>
<thead>
<tr>
<th></th>
<th>V</th>
<th>Pr</th>
<th>O</th>
<th>VPrO</th>
<th>Po</th>
<th>npr/n</th>
</tr>
</thead>
<tbody>
<tr>
<td>GT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>båten</td>
<td>91</td>
<td>6</td>
<td>75</td>
<td>172</td>
<td>27</td>
<td>9/23</td>
</tr>
<tr>
<td>vatten</td>
<td>91</td>
<td>22</td>
<td>135</td>
<td>249</td>
<td>20</td>
<td>13/19</td>
</tr>
<tr>
<td>CK</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>båten</td>
<td>109</td>
<td>17</td>
<td>80</td>
<td>206</td>
<td>23</td>
<td>16/31</td>
</tr>
<tr>
<td>vatten</td>
<td>97</td>
<td>37</td>
<td>116</td>
<td>249</td>
<td>21</td>
<td>28/32</td>
</tr>
<tr>
<td>MP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>båten</td>
<td>94</td>
<td>7</td>
<td>57</td>
<td>158</td>
<td>28</td>
<td>36/83</td>
</tr>
<tr>
<td>vatten</td>
<td>69</td>
<td>12</td>
<td>87</td>
<td>167</td>
<td>29</td>
<td>16/37</td>
</tr>
<tr>
<td>FS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>båten</td>
<td>107</td>
<td>30</td>
<td>67</td>
<td>205</td>
<td>32</td>
<td>42/52</td>
</tr>
<tr>
<td>vatten</td>
<td>90</td>
<td>37</td>
<td>101</td>
<td>227</td>
<td>28</td>
<td>42/46</td>
</tr>
</tbody>
</table>

Table 4–7 gives mean durations of vowel, preaspiration, occlusion and postaspiration in V:CV and VC:V sequences for the four CSw subjects. Since these data are, to a considerable extent, drawn from the

1 Note that the letter combination ck represents a C: rather than a consonant cluster.
same data as the results presented in the preceding section, the durations of vowel, preaspiration and occlusion are very similar to those in Table 4–5. These durations will not be discussed further here.

From Table 4–7 it appears that postaspiration duration is much more constant than is preaspiration duration (i.e., has lower standard deviations) and is also less variable between word types. For bâten type words, mean postaspiration duration for the different informants ranges from 23 to 32 ms, and for vatten type words from 20 to 29 ms. The corresponding figures for preaspiration are 6–30 ms and 12–37 ms. Also, differences in mean postaspiration duration between subjects are fairly small in comparison to preaspiration duration.

4.2.3.4 Phonetic variation in word-medial fortis stops

In previous sections, we have seen that various types of friction are associated with the production of preaspiration. In Faroese, for example (see section 4.3.3), beyond glottal friction, both place of stop articulation and maximal vowel constriction constitute potential sources of friction in the production of preaspiration. This friction seems to be an active enhancement of the preaspiration noise, rather than a fortuitous effect or by-product of speech production.

In the CSw data, the subjects who preaspirate also tend to produce friction that can be associated with the place of the stop closure. However, these subjects do not seem to produce the type of friction that can be associated with maximal dorsal constriction in the vowel, as in Faroese. Also, the friction produced by the CSw subjects does not seem to be enhanced or prolonged in the same way as in the speech of the Faroese subjects.

In the CSw data, preaspirations that occur after open and mid vowels are characterised by mostly glottal friction, with only slight friction originating at the place of articulation for the stop. This is exemplified by the production of FS (Figure 4–9) and CK (Figure 4–10) of the word vattnet ‘the water.’ In FS’s case, modal voice offset occurs approximately 45 ms before full voice offset. Noise spreads gradually down through the vowel spectrum, indicating that the glottis is spreading fairly slowly as it opens. The time lag between full voice offset and onset of stop closure is approximately 30 ms. The total preaspiration duration is therefore approxi-
mately 70 ms. Just before the stop closure is made, one can detect a very short (approximately 10 ms) period of dental friction.

In CK’s production of the same word, modal voice offset occurs approximately 40 ms before full voice offset. The glottis seems to spread more rapidly at the beginning of the preaspiration than in the case of FS. The time lag between full voice offset and stop closure is approximately 20 ms, and consists mostly of dental friction. The total preaspiration duration is thus approximately 60 ms. These two cases are fairly typical
of FS’s and CK’s productions of word-medial fortis stops that occur after stressed mid or open vowels in content words.

When preceded by a close, front vowel, preaspirations in CSw are characterised by palatal or postalveolar friction. In Figure 4–11, FS produces the word *ytterligare* ‘another, additional,’ in which a close vowel is followed by a dental stop. There is a time lag of approximately 30 ms between modal voice offset and full voice offset, most of which is characterised by breathy voice. Just before full voice offset occurs, the
noise becomes audibly postalveolar in character, which can be seen as a compromise between the places of articulation of the vowel and the stop. Likewise, in CK’s production of *sticker* ‘juts out’ (Figure 4–12) a period of breathy voice is followed by palatal friction, as one might expect in the context of a sequence of a close front vowel and a prevelar stop.

In Figures 4–13 and 4–14, we see examples of bilabial friction in FS’s production of the words *tupp* ‘rooster’ and *hjortarna* ‘the deer (pl.)’. In the first case, the friction can be attributed to the combined effect of rounding and the imminent bilabial closure. In the second case, involving a postalveolar stop closure, the labiality is due only to the rounding of the vowel.

As we saw in the durational analysis, GT and MP tend not to pre-aspirate fortis stops to the same degree as do CK and FS. Nevertheless, the voice offset preceding a fortis stop can be a correlate of the fortis vs. lenis distinction in their speech. This can be seen by comparing MP’s production of a fortis stop in Figure 4–15 and a lenis stop in Figure 4–16. In Figure 4–15, the glottis appears to start spreading approximately 25 ms before the oral closure, and one can detect a slight breathiness just before the closure is made. This is in contrast with the transition between vowel and stop in Figure 4–16, in which the vowel retains full modal voice throughout its production. The presence of this slightly early voice
offset is perceptually salient when contrasted with a vowel with full modal voice.

All the CSw subjects tend to produce friction in the transition phase between a close front vowel and an occlusion. In Figure 4–17, MP produces the sequence *djupa viken* ‘deep bay.’ In the first word, there is a rapid voice offset before the stop closure that does not cause any breathiness in the vowel. In the second word, the narrow escape channel of the close front vowel causes a friction noise to be produced before the closure of the prevelar stop. The narrow escape channel causes air velocity to increase, which facilitates voice offset. Thus a brief interval of breathiness may be present, which is obscured by the friction noise. It should be noted that such intervals of voiced friction count as preaspiration in the measurements of the CSw data.

4.2.3.5 Postsonorant fortis stops

In the CSw data, fortis stops in word-medial, postsonorant position (e.g. in words such as *valpar* ‘puppies,’ *vinter* ‘winter’ and *björk* ‘birch’) are fairly rare. Sequences of nasal + fortis stop are the most common, and the data contain a total of 66 such occurrences in stressed syllables in content words (see Table 4–8). Data from the function words *inte* ‘not’ and *sånt* ‘such things’ are not included. For lateral + fortis stop sequences, there are 39 such occurrences (here the function word *alltså* ‘so, that is’ and the phrase *helt enkelt* ‘simply’ are excluded). For r-sound + fortis stop there are 21 such occurrences in the data (there are no function words in the data with such sequences).

Table 4–8. Frequency of occurrence of sonorant + fortis stop sequences occurring after stressed vowel in content words for the four CSw subjects. Sequences of r-sound + fortis stop do not include /rt/ sequences, which are instead treated as postalveolar stops.

<table>
<thead>
<tr>
<th></th>
<th>GT</th>
<th>CK</th>
<th>MP</th>
<th>FS</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nasal + fortis stop</td>
<td>8</td>
<td>20</td>
<td>20</td>
<td>18</td>
<td>66</td>
</tr>
<tr>
<td>Lateral + fortis stop</td>
<td>6</td>
<td>12</td>
<td>10</td>
<td>11</td>
<td>39</td>
</tr>
<tr>
<td>R-sound + fortis stop</td>
<td>1</td>
<td>3</td>
<td>11</td>
<td>6</td>
<td>21</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>35</td>
<td>41</td>
<td>35</td>
<td>126</td>
</tr>
</tbody>
</table>
As regards nasal + fortis stop sequences, none of the CSw subjects seem to have any general tendency towards producing an interval of voicelessness in the nasal. However, as indicated in section 4.2.2.3, in which sequences of nasal + fortis stop that occur across a word boundary were discussed, one can often detect a slight friction noise on the boundary of a nasal and an occlusion that is indicative of voicelessness. Importantly, the duration of these periods of voicelessness and the frequency with which they occur are not in any way comparable to the frequency of occurrence and duration of postvocalic preaspiration.

Figure 4–18. Subj. FS: [...vackra buktk]anten ‘…beautiful bay contour…’

Figure 4–19. Subj. CK: [...] strunta i [dom...] ‘ignore them’

Figure 4–18 shows one such sequence produced by subject FS. The friction noise is visible just before the stop closure is made and is approximately 25 ms in duration. This represents one of the longer periods of voiceless nasality found in the CSw data. In Figure 4–19, CK produces a nasal + fortis stop sequence in which no detectable voicelessness.

All subjects show some tendency towards producing friction in a lateral before a fortis stop, especially before dentals. Figure 4–20 gives an example of a very short friction noise produced by FS in her production of the word kälke ‘sleigh.’ In the speech of both CK and FS, such friction is often concomitant with voice offset, such that a voiceless lateral fricative is produced. An example of this is provided in Figure 4–21, in which FS produces the word tältet ‘the tent’ (see also Figure 4–30, in which CK
produces an /lt/-sequence). MP also tends to produce fricated laterals, but they do not tend to be voiceless. There are too few occurrences of such sequences in GT’s speech for any pattern to be detectable. Probably, the tendency for friction and voicelessness is caused by increased air velocity as the constriction for the lateral is made. The fact that the male subject seems less prone to voicelessness than the female subjects might be attributable to gender differences in vocal fold physiology (cf. brief discussion in Ch. 5, section 5.3).

Sequences of /rp/ and /rk/ are infrequent in the data. (Note that /rt/ is treated as a postalveolar stop rather than a sequence of sonorant and stop; as such it tends to be preaspirated in the same way as other fortis stops.) The former are represented by only 2 instances and the latter by 19. Therefore, it is difficult to discern any definite trends in the speech of each subject. Of the six instances produced by FS, three have a clear period of voicelessness or breathy voice before the stop closure is made. Figure 4–22 shows one of these instances, in which she produces the word *kyrka* ‘church’ with a largely voiceless tap. Other instances are produced with a voiced alveolar approximant or fricative instead of a tap.

MP tends to have neither friction nor voicelessness in such sequences. Figure 4–23 shows his production of the word *snörper* ‘closes up, ties off’ in which an alveolar tap is followed by stop closure (with an intermittent vocoid), and there is no indication of an early voice offset. In
most of the remaining instances he produces an voiced approximant and not a tap.

Figure 4–22. Subj. FS: [...] nog] kyrka [vad] ‘…probably a church, right?’

Figure 4–23. Subj. MP: [som] snörper a[v…] ‘which closes up…’

Postaspiration duration (measured as mVOT, see section 4.1.2) of postsonorant stops seems to be similar to that in postvocalic contexts. Thus it ranges between 10–40 ms. Generally, the perceptual impression of the release is that of a lenis stop rather than a fortis stop.

4.2.4 Comparison of word-initial and word-medial stops

In section 4.2.2.2, results of measurements of postaspiration duration in word-initial fortis stops were discussed. In this section, we compare those findings with those on postaspiration duration in word-medial fortis stops discussed in section 4.2.3.3. The relevant data are displayed in Table 4–9.

For all subjects, postaspiration is considerably longer in word-initial fortis stops (i.e. in tennis, till and taverna type words) than in word-medial fortis stops (båten and vatten type words). This applies irrespective of stress, i.e. tennis and till type words (in which a stressed vowel follows the stop) have similar postaspiration duration as taverna type words (in which an unstressed vowel follows the stop). The latter thus have much longer postaspirations than do word-medial fortis stops that occur before lexically unstressed vowels (båten and vatten types).
Table 4–9. Mean postaspiration duration (in ms; measured as mVOT) of word-initial and word-medial fortis stops for all four CSw subjects. The words in the leftmost column refer to word types, as explained in the text.

<table>
<thead>
<tr>
<th></th>
<th>GT Po n</th>
<th>CK Po n</th>
<th>MP Po n</th>
<th>FS Po n</th>
</tr>
</thead>
<tbody>
<tr>
<td>tennis</td>
<td>44 17</td>
<td>52 43</td>
<td>46 67</td>
<td>58 66</td>
</tr>
<tr>
<td>till</td>
<td>38 23</td>
<td>45 38</td>
<td>37 71</td>
<td>50 50</td>
</tr>
<tr>
<td>taverna</td>
<td>58 4</td>
<td>40 5</td>
<td>44 16</td>
<td>55 11</td>
</tr>
<tr>
<td>båten</td>
<td>27 23</td>
<td>23 31</td>
<td>28 83</td>
<td>32 52</td>
</tr>
<tr>
<td>vatten</td>
<td>20 19</td>
<td>21 32</td>
<td>29 37</td>
<td>28 46</td>
</tr>
</tbody>
</table>

These results are similar to those obtained by Löfqvist (1976; see also Löfqvist 1981), who studied the durational characteristics of read nonsense words in frame sentences spoken by 4 Swedish subjects with differing dialectal backgrounds.

Table 4–10. An excerpt from Löfqvist’s (1976) findings on occlusion and aspiration duration in nonsense words spoken by 4 Swedish subjects. The equivalent word type categories used for the data in Table 4–9 are given within parentheses.

<table>
<thead>
<tr>
<th></th>
<th>Occl. dur.</th>
<th>Postasp. dur.</th>
</tr>
</thead>
<tbody>
<tr>
<td># CV:</td>
<td>138</td>
<td>47</td>
</tr>
<tr>
<td>≈ tennis</td>
<td></td>
<td></td>
</tr>
<tr>
<td># CV:</td>
<td>127</td>
<td>32</td>
</tr>
<tr>
<td>≈ taverna</td>
<td></td>
<td></td>
</tr>
<tr>
<td># V:C</td>
<td>171–188</td>
<td>15–16</td>
</tr>
<tr>
<td>≈ båten</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

An excerpt of Löfqvist’s (1976) findings is presented in Table 4–10. Löfqvist found that fortis stops in word-initial position before a stressed vowel (comparable to our tennis type category) had a mean postaspiration duration of 47 ms. Word-medial stops following a stressed vowel (comparable to our båten type) had a mean postaspiration duration of only 15–16 ms. Word-initial stops before a lexically unstressed vowel

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1 Löfqvist separates the nonsense words with this syllable structure into two types, depending on whether they are produced with accent 1 (acute) or accent 2 (grave). Occlusion durations differ somewhat between the two categories: 171 ms for accent 1; 188 ms for accent 2. Aspiration durations are almost identical, though: 16 ms for accent 1; 15 ms for accent 2.
(comparable to our *taverna* type) had an intermediate mean postaspiration duration of 32 ms.

Löfqvist also found that the duration of the occlusion was longer for stops that followed a stressed vowel than for stops that followed an unstressed vowel. Thus, aspirations tended to be shortest when the occlusions were long. Given this tendency, Löfqvist leans towards attributing this difference in degree of aspiration to differences in closure duration. He says:

 [...] one can argue that the loss of aspiration in Swedish voiceless stops in certain positions is due to an increase in the duration of the oral closure. This is evident from the fact that closure duration is longer for the unaspirated allophones and also because the interval from implosion to peak glottal opening can vary without any concomitant changes in aspiration for these sounds; the glottis is still in a position suitable for voicing to occur at the release since the glottal opening and closing gestures are executed during the occlusion. (Löfqvist 1976:29)

This explanation yields a specific prediction. There should be an inverse relationship between closure duration and postaspiration duration in the CSw spontaneous data. Specifically, this relationship should be evident when one plots postaspiration duration against closure duration for stops in *båten* and *vatten* type words. However, Figures 4–24 and 4–25 show that this prediction is not borne out by the data. In Figure 4–24, postaspiration duration is plotted against closure duration for all intervocalic stops in *båten* type words, and in Figure 4–25 for *vatten* type words. In both figures, results from all subjects (GT, CK, MP and FS) are pooled. Keep in mind, here, that postaspiration duration in these CSw data is measured as mVOT, not just VOT (see section 4.1.2), and thus the aspiration durations reported are generally longer than in Löfqvist’s study. In neither word type is there any correlation between closure duration and postaspiration duration. For *båten* type words $r^2 = 0.0302$ and for *vatten* type words $r^2 = 0.0027$. In fact, postaspiration durations seem to be fairly constant across different closure durations for both word types.

Note also that the closure durations reported by Löfqvist are far greater than the closure durations in our CSw data. This is almost cer-
tainly due to the fact that the CSw data are from unscripted (spontaneous) speech while Löfqvist’s data are from read nonsense words embedded in frame sentences. These durational differences between the two studies yield an interesting comparison. Löfqvist proposes that mean occlusion durations of 138 ms (word-initial stops) induce postaspirations that are relatively long (\( \bar{x} = 47 \) ms) while mean occlusion durations of 171–188 ms induce postaspirations that are quite short (\( \bar{x} = 15–16 \) ms). However, closure durations in \( \text{båten} \) type words in the CSw data, which seldom exceed 120 ms and are thus much shorter than the word-initial stops in Löfqvist’s experiment, still do not have any significant degree of aspiration. So, not only is there no inverse correlation between postaspiration duration and closure duration, but the short closure durations in the CSw should yield far greater postaspirations than those observed as well.

**Figure 4–24.** Postaspiration duration plotted against closure duration for word-medial fortis stops in \( \text{båten} \) type words. Results for all subjects are pooled.

**Figure 4–25.** Postaspiration duration plotted against closure duration for word-medial fortis stops in \( \text{vatten} \) type words. Results for all subjects are pooled. Three outlying data points are not displayed.
The CSw data have shown that word-initial stops (tennis, taverna) differ from word-medial stops (båten, vatten) in both the degree of post-aspiration and the degree of preaspiration. Although both preaspiration and postaspiration have to do with the timing of supralaryngeal gestures relative to glottal gestures, there is no simple way in which the production of a preaspirated word-medial stop can be derived from the production of a postaspirated word-initial stop. It is therefore proposed here that we should not attribute the difference to an “automatic process” of some sort, by which medial stop variants are derived from initial stop variants. Instead, the different stop variants observed in word-initial and word-medial positions are contextually conditioned (allophonic) variants that differ in fundamental ways in terms of articulatory organisation.

4.2.5 Postvocalic voiceless fricatives

The production of word-medial and word-final postvocalic fricatives shows very similar characteristics, in terms of voice offset, to the production of fortis stops in the same contexts. Both CK and FS have considerable preaspiration before /s/, as can be seen in CK’s (Figure 4–26) and FS’s (Figure 4–27) production of the word västerut ‘westwards.’ As before fortis stops, voice offset is initiated before the oral stricture is made, resulting in an interval of breathy voice. However, neither CK nor FS tends to reach complete voice offset before the sibilant friction becomes dominant.

One can also detect slightly early voice offsets in the speech of GT and MP. In Figure 4–28, GT produces the word sydvästra ‘southwestern,’ but the period of breathy voice before the onset of the sibilant is much shorter than in the preceding cases. In Figure 4–29, MP produces västerut, and again, the breathy period is very short. These four examples are fairly representative of the way in which the subjects produce a sequence of vowel + /s/ after stressed vowels in content words.

Postvocalic /ʃ/ and /ɕ/ are very infrequent in data, but from the few examples available they seem to follow much the same pattern as does the production of postvocalic /s/.
4.2.6 Word-initial lenis stops

The production of word-initial lenis stops is quite uniform for all four subjects. First, we consider word-initial, prevocalic lenis stops in content words, as in the words börja ‘begin’ and dal ‘valley.’ When such stops occur utterance-initially, all subjects tend to produce a stop with a considerable voicing lead. In Figure 4–30, for example, CK produces the word deltat ‘the delta’ with a voicing lead of approximately 70 ms in the utterance-initial stop. Figure 4–31 is an example of MP’s production of
In Figure 4–30, Subj. CK: [deltats […] ‘The delta’s…’] The utterance-initial lenis stop has a voicing lead. Note that this spectrogram also has an example of a partially voiceless lateral fricative, as well as a breathy offset before the stop in the final unstressed syllable.

Unlike content words, function words do not tend to have a voicing lead utterance-initially. An example is given in Figure 4–33, in which FS produces dår utterance-initially without any voicing lead. This type of production is the most common one for all subjects. However, instances in which such stops have a voicing lead do occur as well, as in the example in Figure 4–34, in which FS produces another instance of the word dår, this time with a voicing lead of approximately 75 ms in the initial stop.

In utterance-medial position, a vast majority of the word-initial lenis stops occurs in a context with voicing on both sides. In practically all these cases, the stop is voiced, both in content and in function words.
GT’s production of *dungar* ‘groves’ (Figure 4–35) and FS’s production of *börjar* ‘begins’ (Figure 4–36) are examples of such word-initial stops.

Typically, voicing weakens towards the end of the stop as subglottal and supraglottal pressure are equalising. In some cases, voicing will cease towards the end of the stop closure phase to be reinitiated upon release. The bilabial voiced stop in Figure 4–36 provides an example of this. Figure 4–36 also provides an example of a voiced, word-initial stop in the function word *då* ‘then.’

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Figure 4–31. Subj. MP: *golf [ill...]* ‘Golf to...’

Figure 4–32. Subj. GT: *bassäng* ‘Swimming-pool.’

Figure 4–33. Subj. FS: *där har jag* [...] ‘There I have...’

Figure 4–34. Subj. FS: *där var de*[n...]* ‘There it was...’
4.2.7 Word-medial lenis stops

Like word-initial lenis stops, the word-medial lenis stops in the CSw data are predominantly voiced in voiced contexts, both in VːC and in VCː syllables. Figures 4–37 through 4–40 are examples of lenis stops in intervocalic position. In Figures 4–37 and 4–38, MP produces two instances of the word söder ‘south (of).’ The first of these contains a fairly typical short voiced lenis stop. In the second example the stop is lenited, and produced as an approximant. Such lenitions are frequent (cf. Engstrand & Lacerda 1996) and occur in the speech of all four subjects, especially in VːC syllables.

In VCː syllables, the production of a stop usually involves a fully voiced stop closure. However, as in some of the cases involving word-initial lenis stops discussed in the preceding section, there is a tendency for voicing to die out due to decreased transglottal air flow. Understandably, this tendency increases with increased stop duration. This is exemplified by FS’s production of two VCː syllables, one in the word krabbor ‘crabs’ (Figure 4–39) and one in the word nuddar ‘(you) touch’ (Figure 4–40). In the first example, the lenis stop is fully voiced, but one can still detect a slight decrease in the strength of voicing while the stop closure is being maintained. In the second example, the stop closure is longer, and approximately 110 ms into the stop closure voicing is no longer maintained, and a voiceless interval of approximately 40 ms
follows. Possibly, place of articulation may also play a role in the difference observed between these two examples. The former stop is bilabial and thus has greater potential for active cavity expansion than the former, dental stop (Ohala 1983).

In a sequence of a nasal and a lenis stop, the velic closure is typically made shortly before the stop is released, and in many cases one cannot see that a complete velic closure is made at all. In Figure 4–41, GT produces a word-medial sequence of a nasal and a lenis stop, as well as a
word-initial lenis stop preceded by a nasal. A weak release is produced in both cases, but it is not clear that a full velic closure is made. In the example in Figure 4–43, there is a relatively gradual transition from nasal to stop. Velic closure appears to take place approximately 20 ms prior to stop release.

Figure 4–41. Subj. GT: [...på st]randen dä[r...] ‘...on the shore there...’

Figure 4–42. Subj. CK: [...eller] under eller v[ad...] ‘...or under or...’

Figure 4–43. Inf. GT: [...för] regelbunden [så...] ‘...too regular so...’

The absence of a velic closure is quite clear in Figure 4–42, in which CK produces the word under ‘under, below.’ Here, there is also no clear release spike, and the velopharyngeal passage is open throughout the production of the oral closure. It should be noted, incidentally, that post-
nasal /d/ is dropped completely (i.e., normatively) in many Swedish dialects. Thus the phonetic variation in the production of nasal + lenis stop sequences in CSw contains parallels to a sound change that has occurred in Swedish dialects.

4.2.8 Summary and discussion

In light of these findings for Central Standard Swedish (CSw), one can argue that the characterisation of the fortis ~ lenis stop contrast as voiced vs. voiceless is rather misleading or, at best, incomplete. To be sure, lenis stops in voiced contexts (both word-initially and word-medially) are predominantly voiced. However, they are very frequently expressed as fricatives and approximants, with strongly reduced tongue or lip movements. We have also seen that at the beginning of utterances, lenis stops tend to have a voicing lead which, however, tends to be absent in function words. These two sources of variation, lenition in intervocalic contexts and utterance-initial voicelessness, could be attributed to articulatory reduction, or hypo-speech (cf., e.g., Lindblom 1990). Thus, speakers may undershooting articulatory targets.

The variation in the phonetic expression of fortis stops cannot be attributed to articulatory reduction to the same extent. Fortis stops have variable articulatory organisations, depending on context. In word-initial position, as well as before stressed vowels in any word position, fortis stops tend to be postaspirated, and there is very little tendency for pre-aspiration. Also, postaspiration in word-initial position occurs irrespective of whether or not the following vowel has lexical stress. By contrast, word-medial fortis stops, particularly in VC: syllables, tend to be preaspirated in the speech of two of the subjects, and mostly unaspirated in the speech of the two remaining subjects. None of the subjects tends to post-aspirate such stops to any significant degree.

This variation in fortis stops cannot be attributed to hypo-articulation. From an articulatory point of view, the two main types of fortis stops involve a difference in timing relations between glottal and supralaryngeal gestures. For postaspirated stops, there is a very short time lag (or none at all) between modal voice offset and stop closure, while there is a considerable time lag between stop release and modal voice onset.
(i.e., short mVOffT and long mVOT). For unaspirated and preaspirated stops, there is often a considerable time lag between modal voice offset and stop closure, but not between stop release and modal voice onset (i.e., long mVOffT and short mVOT). Such a difference in timing relations cannot be attributed to articulatory reduction, and there is no reason to assume that preaspirated stops are derived from postaspirated stops by some type of articulatory or aerodynamic mechanism. At the same time, this does not mean that articulatory and/or aerodynamic factors are irrelevant in an explanation of why some CSw speakers exploit preaspiration (see Ch. 5).

Other aspects of variation in fortis stops can be attributed to hypophonetics. For example, instances in which the fortis are fricated and do not have a full stop closure can be seen as articulatory reduction. Also, the within-speaker variation in the amount of postaspiration or preaspiration produced may be a function of the hyper-hypo continuum.

Lastly, it may be suggested that postaspiration in CSw fortis stops functions as a boundary marker (i.e., a “Grenzensignal,” cf. Trubetzkoy 1962:255), marking the onset of a word or a stressed syllable. Likewise, the absence of postaspiration, and the concomitant presence of preaspiration for some speakers, signals the absence of a word boundary (“negatives Grenzensignal,” ibid.) and indicates that the following vowel is unstressed. In CSw lenis stops, there does not seem to be such a functional division between word-initial and word-medial positions.

4.3 Tórshavn Faroese

In this section, the stop production of four Tórshavn Faroese speakers is analysed, both from a quantitative and a qualitative point of view. First, in order to make it easier to refer to stops in different contexts, they will be designated to specific word types (section 4.3.2.1). Then, some problems regarding the phonological distribution of preaspirated stop variants in Faroese are addressed. These problems become evident when the literature on Faroese preaspiration is reviewed (cf. section 3.3). The approach adopted here is to analyse the stop duration data without making a priori assumptions as to their phonological status as fortis or lenis stops (sections 4.3.2.3 and 4.3.2.4). Section 4.3.2.4 also
contains an analysis of data on the proportional duration of preaspiration (i.e. the duration of preaspiration in relation to, e.g., the preceding vowel) for the four Faroese subjects. This allows us to compare the durational aspects of preaspiration production in Faroese with that of, for example, Central Standard Swedish. Lastly, section 4.3.3 contains a discussion of the variation in the production of preaspirated stops in Faroese.

4.3.1 Method and subjects

The Faroese data come from four subjects, two male (SG and EI) and two female (MS and BJ), all speakers of the Tórshavn dialect. SG, EI and BJ are in their thirties and MS in her forties. Spontaneous speech interaction between the subjects was elicited using map tasks. The subjects were recorded in pairs, with EI and MS as one pair and SG and BJ as another. The material was transliterated by a native speaker of Tórshavn Faroese. Since Faroese orthography is not a good predictor of phonemic representation, the transliterations were converted from orthographic to phonemic representations using a grapheme-to-phoneme conversion program.¹

The total recording time was 20–35 minutes per subject. The amount of material analysed for each subject was for EI, approximately 9.5 minutes of uninterrupted speech², comprising 2344 words: for MS 9.5 minutes, 2179 words; for SG 8.4 minutes, 1961 words; and for BJ 13.2 minutes, 2950 words. A rough estimation of speaking rate indicated that, EI uttered 6.37 syllables per second, MS 5.65, SG 5.82 and BJ 5.65 (cf. section 4.2.1 on how this estimate was obtained). Further details on the recording procedure and segmentation criteria were given in section 4.1 above.

4.3.2 Word-medial and word-final postvocalic stops

4.3.2.1 Stop and context classification

In this section, Faroese stops and the contexts in which they occur are categorised on the basis of three variables (see Table 4–11). This will

¹ This program was developed in connection with a project on developing a Faroese text-to-speech synthesis system (cf. Helgason & Gullbein, 2002).
² Cf. section 4.2.1.
make it easier to refer to stops in specific contexts when the durational measurements are discussed. First, the stops are classified as fortis or lenis in accordance with the Area 1 distribution of preaspiration in Faroese (see Ch. 3, section 3.3 and Table 3–3). Second, the stops are assigned to one of two main syllable types, V:C and VC: / VCC.\(^1\) The length marks indicate that the distinction involves both vocalic and consonantal quantity, but the data show that the contrast is expressed mainly through vowel duration (cf. section 4.3.2.5). Note that in clusters, stops followed by a voiced consonant are treated separately from stops followed by a voiceless consonant. In other words, a distinction is made between VCC and VC\(\tilde{C}\) syllables. Third, stops occurring in content words are distinguished from stops that occur in function words.

Table 4–11. Words used to represent the different word categories discussed in connection with the Faroese data analysis.

<table>
<thead>
<tr>
<th>Exemplifying word</th>
<th>Stop category</th>
<th>Syllable type</th>
<th>Word type</th>
</tr>
</thead>
<tbody>
<tr>
<td>átta (\ddag [\ddag t\ddag i\ddag \ddag]) (^2) ‘eight’</td>
<td>fortis</td>
<td>VC:</td>
<td>cont. word</td>
</tr>
<tr>
<td>oddur (\ddag [\ddag o\ddag d\ddag r\ddag]) ‘point, tip’</td>
<td>lenis</td>
<td>VC:</td>
<td>cont. &amp; func.</td>
</tr>
<tr>
<td>hatta (\ddag [\ddag h\ddag t\ddag t\ddag \ddag]) ‘that’</td>
<td>fortis</td>
<td>VC:</td>
<td>func. word</td>
</tr>
<tr>
<td>vatnið (\ddag [\ddag v\ddag a\ddag t\ddag n\ddag i\ddag \ddag]) ‘the water’</td>
<td>fortis</td>
<td>VCC</td>
<td>cont. word</td>
</tr>
<tr>
<td>fjallið (\ddag [f\ddag j\ddag a\ddag l\ddag i\ddag \ddag]) ‘mountain’</td>
<td>lenis</td>
<td>VCC</td>
<td>cont. &amp; func.</td>
</tr>
<tr>
<td>seks (\ddag [s\ddag e\ddag k\ddag s\ddag]) ‘six’</td>
<td>fortis</td>
<td>VCC(\ddag)</td>
<td>cont. word</td>
</tr>
<tr>
<td>fótur (\ddag [f\ddag ó\ddag t\ddag r\ddag]) ‘foot.’</td>
<td>lenis</td>
<td>V:C</td>
<td>cont. &amp; func.</td>
</tr>
<tr>
<td>matur (\ddag [m\ddag æ\ddag t\ddag r\ddag u\ddag t\ddag]) ‘food’</td>
<td>fortis</td>
<td>V:C</td>
<td>cont. word</td>
</tr>
<tr>
<td>hvat (\ddag [k\ddag v\ddag æ\ddag h\ddag t\ddag]) ‘what’</td>
<td>fortis</td>
<td>V:C</td>
<td>func. word</td>
</tr>
<tr>
<td>radari (\ddag [r\ddag æ\ddag d\ddag æ\ddag r\ddag i\ddag]) ‘radar’</td>
<td>lenis</td>
<td>V:C</td>
<td>cont. word</td>
</tr>
</tbody>
</table>

To make it easier to refer to the relevant combinations of these variables, a specific word will be chosen to represent a given category. Not all possible combinations of these variables are exemplified, since many occur very infrequently in the data, or not at all. The exemplifying words

\(^1\) V:C syllables do in fact occur, but since they are infrequent in the data at hand they will not be discussed much here.

\(^2\) The \(\ddag\) is used to indicate putative pronunciation examples that do not actually occur in the data (cf. Ch. 3, section 3.1).
are discussed below, and an overview of the words and the variables they represent is given in Table 4–11.

The word átta *[ɔhtɔ] ‘eight’ is used to represent word-medial fortis stops in VC: syllables. For the corresponding lenis stops, the word oddur *[ɔdɔːɹ] ‘point, tip’ will be used. The orthographic forms are indicative of the historical roots of these stops in the ON geminates pp, tt, kk and bb, dd, gg respectively. As we shall see, fortis geminates in function words are less likely to be preaspirated than are fortis geminates in content words. This applies particularly to the demonstrative pronouns hetta ‘this’ and hatta ‘that’ and the indefinite pronoun okkurt ‘something’, which are frequent in the data. The most frequent, hatta, is used to repre-

To exemplify fortis stops in the onset of stop + sonorant clusters, the word vatnið *[vɔntɔɹ] ‘water, lake’ is used. The corresponding lenis stop is exemplified by fjallið *[fjɔɹɿɹ] ‘the mountain.’ The fortis stops in such clusters have their origins in ON pp, tt, kk + l, r, m, n clusters as well as t, k + n and tl clusters. In the data at hand, the majority of the lenis stops in such clusters come from ON ll and nn, i.e., geminate dental or alveolar laterals and nasals that have undergone “pre-stopping” and become *[t̚l] and *[n̚n] respectively.¹ The Old Norse cluster rn, which usually becomes *[n̚n], is also a source for such clusters.

As we saw in section 3.3, the phonological distribution of preaspira-

tion in V:C syllables has not been established in the literature. The repre-

1 Changes similar to this have occurred in various Nordic dialects, as well as in Saami and Scots Gaelic, and thus constitute an areal feature like preaspiration. Further abroad, a similar change seems to have occurred in the Pama-Nyungan language Arabana-Wangganguru (cf. Hercus 1973; see also Helgason 1997 and discussion of pre-stopped nasals in Ladefoged & Maddieson 1996, p. 129f).
‘food’ is used, and for function words the interrogative pronoun hvat ‘what.’ The lenis stop in such contexts will be exemplified by radari ‘radar.’

In ON, there does not seem to have been a fortis vs. lenis stop contrast in VːC syllables. Thus words exemplified by fotur, matur and hvat had their origins in stops that were usually represented orthographically as p, t, k. When b, d, g occurred in the spelling in such contexts, they probably represented voiced fricatives. With the advent of loan words in Faroese, postvocalic b, d, g have become part of the spelling norms. Whether this coincides with the emergence of a fortis vs. lenis contrast in VːC syllables is a matter of speculation.

Finally, a stop + voiceless consonant is exemplified by the word seks ‘six.’ Such contexts do not have a fortis vs. lenis contrast. The example word is transcribed here with a preaspiration, but the data show that stops in such contexts are variously produced as fricatives without a stop closure, as voiceless unaspirated stops, or as preaspirated stops. The most frequently occurring clusters of this type in the data come from ON ks/x, k(k)t and g(g)t.

Syllables with primary and secondary lexical stress are grouped together in this analysis. Thus the analysis does not, for example, make a distinction between the t’s in bátur ‘boat’ and seglbátur ‘sail boat’. With regard to the t, both are treated as matur type words. Also, although a stop in an exemplifying words is usually intervocalic, the words occurring in the data are not necessarily followed by a vowel. For example, the word mitt ‘middle’ may occur utterance-finally or before a word starting with a consonant, but it still belongs to the átta word type.

Some stops that occur in a word-medial, postvocalic context were excluded from the analysis. This applies to stops that occur after a morpheme boundary (e.g., skattakista ‘treasure chest’) and stops that are in the onset of a stressed syllable (e.g., mobil ‘mobile’). Both types of context trigger the production of the type of stop that occurs word-

1 However, the spelling is not a good indicator of the fortis vs. lenis contrast in VːC syllables, since some borrowings are spelt with p, t, k despite being lenis, for example sleta ‘sleigh.’ Thus, for VːC syllables, one should note that even if the exemplifying word for fortis has t and the one for lenis has d, other lenis words may have p, t, k in their spelling.
initially rather than word-medially. Also, the neuter definite article eitt, the preposition and infinitive marker at and the negation ikki were not included in this analysis, since they are rarely produced with a stop closure. Similarly, the word veit in the phrase eg veit ikki ‘I don’t know’ was excluded since it is very rarely produced with a full stop closure.1

4.3.2.2 Data overview

A total of 1356 instances of word-medial, postvocalic stops were analysed. Of these, 843 were produced with a complete stop closure (see Table 4–12, rightmost column). In these cases, it was possible to measure preaspiration duration. In the remaining 513 instances, it was not possible to obtain the relevant measurements for various reasons. First, in 318 cases a full stop closure was not produced and instead the subject produced a voiced or voiceless fricative. Second, in 86 cases there was no correlate in the acoustic signal that could be identified as reflecting the production of a stop. Third, in 83 cases, the vowel preceding the stop was too breathy, creaky or short to allow an estimate of voice offset. And fourth, a further 25 instances had to be discarded for reasons such as external noise, hesitation during word production and the speaker’s own laughter.

Table 4–12. An overview of the word-medial, postvocalic stop data analysed for the four Faroese subjects.

<table>
<thead>
<tr>
<th></th>
<th>EI</th>
<th>MS</th>
<th>SG</th>
<th>BJ</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stop closure</td>
<td>202</td>
<td>226</td>
<td>154</td>
<td>261</td>
<td>843</td>
</tr>
<tr>
<td>Fricative</td>
<td>110</td>
<td>39</td>
<td>86</td>
<td>83</td>
<td>318</td>
</tr>
<tr>
<td>Incomplete stop</td>
<td>24</td>
<td>22</td>
<td>15</td>
<td>25</td>
<td>86</td>
</tr>
<tr>
<td>Incomplete vowel</td>
<td>26</td>
<td>32</td>
<td>7</td>
<td>18</td>
<td>83</td>
</tr>
<tr>
<td>Laughter etc.</td>
<td>10</td>
<td>11</td>
<td>4</td>
<td>1</td>
<td>26</td>
</tr>
<tr>
<td>Total</td>
<td>372</td>
<td>330</td>
<td>266</td>
<td>388</td>
<td>1356</td>
</tr>
</tbody>
</table>

For subject EI, 372 word-medial, postvocalic stops were analysed (see Table 4–12). Of these, 202 (54%) had a full stop closure, 110 (30%) were realised as a fricative without a stop closure, 24 (6%) did not have a

1 Typically, the phrase eg veit ikki is produced as [iˈʋɪtɪ].
clear stop correlate, 26 (7%) had a vowel that did not allow for a measurement of voice offset, and 10 (3%) were discarded for other reasons. For subject MS, 330 word-medial stops were analysed, of which 226 (68%) had a full stop closure, 39 (12%) were realised as a fricative, 22 (7%) had no clear stop correlate, 32 (10%) did not allow for a measurement of voice offset, and 11 (3%) were discarded for other reasons. For subject SG, 266 word-medial stops were analysed, of which 154 (58%) had a stop closure, 86 (32%) had a fricative, 15 (6%) did not have a clear stop correlate, 7 (3%) did not allow for a measurement of voice offset, and 4 (1%) were discarded. Finally, for subject BJ, 388 word-medial stops were analysed, of which 261 (67%) were realised with a full stop closure, 83 (21%) as a fricative, 25 (6%) did not have a clear stop correlate, 18 (5%) did not allow for a measurement of voice offset, and only 1 instance had to be discarded.

Both male subjects, EI and SG, realise a stop without a full stop closure in almost a third of the cases. The female subjects do this to a lesser degree, but it is still clear that all subjects share this tendency. This should be considered in connection with the tendency for all subjects to produce preaffricated instead of preaspirated stops (cf. section 4.3.3).

4.3.2.3 Fortis vs. lenis

In total, 843 stops with a complete stop closure were analysed for the four subjects (see Table 4–12). For 534 of these cases, no preaspiration was registered. The remaining 309 instances were produced with varying degrees of preaspiration, ranging from approximately 5 to 160 ms. Since the production of a fricative instead of a stop closure is so frequent (318 instances), these will also be considered here.

In the following discussion, stops produced with less than 15 ms of preaspiration will be referred to as unaspirated and stops with more than 15 ms will be referred to as preaspirated. While such a temporal criterion for the presence of preaspiration is necessary, the 15 ms limit is somewhat arbitrary. One of the aims of this investigation is to determine how well the fortis and lenis stop categories (as defined by the Area 1 distribution; cf. Ch. 3, section 3.3) predict the degree of preaspiration in stop production. Unlike the binary phonological fortis vs. lenis division, the degree of preaspiration is a continuous variable that provides no natural
separation line between preaspirated and unaspirated stops. Thus, when preaspiration duration is intermediate, and the stop is neither clearly unaspirated nor clearly preaspirated, there is no way of determining whether the speaker intended to produce a fortis or a lenis stop. Either such cases must be omitted from analysis, or a division line is created between unaspirated and preaspirated. Here, the latter alternative was chosen.

Figure 4–44 shows the number of occurrences of different types of stop production for all word types. The results for all four subjects are pooled. The length of each bar (i.e., the x-axis) indicates the number of observations made for the different word categories. Phonetic categories are coded using a grey-scale in each bar. The leftmost, dark-grey segments indicate the number of unaspirated stops, i.e. stops produced with less than 15 ms of preaspiration; the white segments indicate the number of stops produced as fricatives without a stop closure; and the light-grey segments indicate the number of preaspirated stops, i.e. stops produced with more than 15 ms of preaspiration.

![Figure 4–44. The number of occurrences of the three main stop variants for all word types considered, coded on a grey-scale (see text). Results from all subjects have been pooled.](image-url)
All subjects considered, for lenis stop word types, i.e. *oddur, fjallið, fótur* and *radari*, only 20 of 552 instances are preaspirated. Usually, these preaspirations can be attributed to the narrow escape channel in the production of close vowels, which results in a friction noise and induces voicelessness. In this way, preaspiration in these word types can be seen as a “by-product” of the speech production process. For the fortis stop word types *átta* and *vatnið*, the results are reversed. Only 23 of 280 instances are unaspirated. For all the word types mentioned so far, there is obviously a very strong correspondence between unaspirated and lenis on the one hand and between preaspirated and fortis on the other. It should be noted, though, that the production of a fricative without a stop closure occurs quite commonly for almost all word types, especially those with intervocalic stops.

The fortis vs. lenis distinction is less clear-cut for the remaining word types (*matur, hatta, hvat* and *seks*). The production of stops in these word types will be discussed further in the following section, in which the fortis stop production of each subject is analysed in more detail.

4.3.2.4 Preaspiration duration

In this section, the production patterns of each subject are analysed in more detail, particularly the durational relationship between vowel and preaspiration. This will allow us to compare the production of fortis stops in Faroese with that in other Nordic languages. We begin with SG’s data and then look at each subject, BJ, EI and MS, in turn. The data discussed for these subjects are summarised in Table 4–13 and in Figure 4–45(a–d). For ease of exposition, we shall refer to the word types *átta, hatta, vatnið, seks* and *matur* as fortis stop word types. These are the word types that should be preaspirated according to the Area 1 distribution of preaspiration. Conversely, the word types *oddur, fjallið, fótur* and *radari* will be referred to as lenis stop word types.

The phonological distribution of preaspiration in SG’s speech is largely in accordance with the Area 1 distribution (see section 3.3). The distribution of the three main stop variants in SG’s fortis stop word types is given in Table 4–13. There are 44 occurrences of *átta* type words, of which 8 are unaspirated (i.e., preaspiration < 15 ms), 29 are preaspirated
(i.e., preaspiration > 15 ms), and 7 are produced as fricatives without a stop closure. Function words of the hatta type—which we would expect to be preaspirated since SG seems to have the Area 1 distribution—tend not to be in SG’s speech. Only 3 cases are preaspirated, while 13 cases are unaspirated. In addition to this, there are 35 instances of hatta type words that SG produces as a fricative without a stop closure. Thus, fricatives are, in fact, the dominant pattern for the production of stops in such words. For the vatnið type, all 7 occurrences are preaspirated. There are only 2 occurrences of the word type seks in SG’s data, one with a preaspirated stop and the other with a fricative. As for the matur word type, there are 14 preaspirated cases and 4 unaspirated cases. In addition to this, there are 13 cases in which a fricative is produced.

Table 4–13. The number of occurrences of the three main stop variants, unaspirated (i.e., Pr < 15 ms), fricative, and preaspirated (i.e., Pr > 15 ms) in fortis stop word types in the Faroese data (see text).

<table>
<thead>
<tr>
<th></th>
<th>átta</th>
<th>hatta</th>
<th>vatnið</th>
<th>seks</th>
<th>matur</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SG</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pr &lt; 15 ms</td>
<td>8</td>
<td>13</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Fricative</td>
<td>7</td>
<td>35</td>
<td>0</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>Pr &gt; 15 ms</td>
<td>29</td>
<td>3</td>
<td>7</td>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>44</td>
<td>51</td>
<td>7</td>
<td>2</td>
<td>31</td>
</tr>
<tr>
<td><strong>BJ</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pr &lt; 15 ms</td>
<td>7</td>
<td>12</td>
<td>3</td>
<td>4</td>
<td>15</td>
</tr>
<tr>
<td>Fricative</td>
<td>18</td>
<td>19</td>
<td>3</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>Pr &gt; 15 ms</td>
<td>44</td>
<td>0</td>
<td>8</td>
<td>2</td>
<td>14</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>69</td>
<td>31</td>
<td>14</td>
<td>6</td>
<td>44</td>
</tr>
<tr>
<td><strong>EI</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pr &lt; 15 ms</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>Fricative</td>
<td>34</td>
<td>44</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Pr &gt; 15 ms</td>
<td>31</td>
<td>10</td>
<td>14</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>68</td>
<td>58</td>
<td>16</td>
<td>4</td>
<td>18</td>
</tr>
<tr>
<td><strong>MS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pr &lt; 15 ms</td>
<td>2</td>
<td>8</td>
<td>1</td>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td>Fricative</td>
<td>6</td>
<td>17</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pr &gt; 15 ms</td>
<td>40</td>
<td>8</td>
<td>13</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>48</td>
<td>33</td>
<td>15</td>
<td>6</td>
<td>17</td>
</tr>
</tbody>
</table>
Figure 4–45(a) plots preaspiration ($Pr$) duration against the combined duration of vowel and preaspiration ($VPr$) for SG’s fortis stop word types. The filled circles indicate data points in VC: and VCC syllables. In such syllables, the stop is always preceded by a phonologically short vowel. The word types included in this group are átta, vatnið, hatta and seks. The unfilled triangles indicate data points in matur type words. In such words, the stop occurs in a VːC syllable, and is therefore preceded by a phonologically long vowel.

For both types of context (VCː/ VCC and VːC), we observe that as vowel duration increases, so does preaspiration duration. The trend lines can be used as guides to estimate the $Pr/VPr$ ratio, i.e., how much of the vowel + preaspiration interval is comprised by preaspiration.¹ Consider, for example, the word types represented by filled circles (i.e., stops in VC: syllables). At $VPr$ durations of 200 ms, $Pr$ is likely to be slightly over 100 ms and thus preaspiration comprises roughly 50% of the vowel + preaspiration interval. This proportion remains fairly constant as $VPr$ duration increases.

Subject BJ has a phonological distribution of preaspiration similar to that of SG, but seems to adhere to the Area 1 distribution less rigidly than he does. The distribution of the three main stop variants in BJ’s fortis stop word types is given in Table 4–13. There are 69 occurrences of átta type words, which predominantly have preaspirated stops. There are 44 preaspirated cases, 18 fricative cases, and 7 cases are unaspirated. However, no preaspiration is registered for BJ’s 31 instances of hatta type words. Instead, there are 19 instances of hatta type words in which BJ produces the stop as a fricative without a stop closure, and 12 cases in which there is a stop closure but little or no preaspiration. Again, therefore, fricatives are the dominant pattern for the production of stops in the hatta word type. As for vatnið type words, 8 cases are preaspirated, 3 are produced as fricatives and 3 are unaspirated. There are 6 occurrences of seks type words in BJ’s data, 4 instances with a $ks$

¹ Since preaspiration duration is partly being plotted against itself, the trend lines should not be taken to show statistically valid correlations (cf. section 4.1.3 above). However, they do provide a visual indication of how preaspiration duration changes as a function of the duration of the vowel + preaspiration sequence.
Figure 4–45(a–d). Preaspiration duration plotted against the combined duration of vowel and preaspiration in lexically stressed syllables for all four Faroese subjects. The filled circles indicate data points in VC: and VCC syllables (i.e., the word types åtta, vatnìð and hatta). The unfilled triangles represent those V:C(C) syllables in the speech of SG and BJ that tend to be preaspirated.
cluster and 2 instances with a $kt$ cluster. All 4 $ks$ clusters lack preaspiration, while both $kt$ clusters are preaspirated. In $matur$ type words, BJ generally tends to preaspirate her stops. However, following $^+[e:]$, a stop is almost never preaspirated. Thus she produces $eta$ ‘to eat,’ $tekur$ ‘takes (vb.),’ and $sentimetur$ ‘centimeter’ without preaspiration before the relevant stop. Table 4–13 above is therefore misleading with regard to her data. In fact, 12 of the 15 unaspirated stops occur after an $^+[e:]$. Of the 14 preaspirated instances, only one occurs after an $^+[e:]$. Therefore, in BJ’s speech, words with a sequence of $^+[e:] + \text{stop}$ should be regarded as $fótur$ rather than $matur$ type words. Another way to look at this is to say that $^+[e:]$ should be grouped with the close vowels rather than the non-close vowels.

Figure 4–45(b) plots $Pr$ duration against $VPr$ duration for fortis stop word types in BJ’s data. The filled circles indicate data points in VC: and VCC syllables (the word types $áttta$, $vatnið$, $hatta$ and $seks$). The unfilled triangles indicate only those V:C syllables that tend to be preaspirated (i.e. the word type $matur$, excluding the 13 cases in which $^+[e:]$ precedes the stop). As in SG’s data, we observe that $Pr$ duration increases with increased $V$ duration in BJ’s data. As a result, preaspiration comprises a fairly constant proportion of the $VPr$ duration. In fact, for VC:/VCC syllables, this proportion increases as durations increase. Thus if $VPr$ duration is 80 ms, $Pr$ duration is around 30 ms, i.e. less than 40% of the $VPr$ duration. At $VPr$ durations of 160 ms, $Pr$ duration is likely to be around 90 ms, i.e. slightly more than 55% of $VPr$ duration.

We turn now to subject EI. Unlike the previous two subjects (SG and BJ), the distribution of preaspiration in EI’s speech matches the Area 2 distribution of preaspiration (cf. Ch. 3, section 3.3 and Table 3–3). This means that preaspiration in his speech occurs only in VC: syllables and never in V:C syllables.

Table 4–13 above showed the distribution of the three main stop variants in EI’s fortis word types. For the $áttta$ word type, EI produces a preaspirated stop in 31 cases and a fricative without a stop closure in 34 cases, but he produces an unaspirated stop only 3 times. The word type $hatta$ is not as distinct from the $áttta$ word type as it is in the speech of SG and BJ. For EI, 10 occurrences of $hatta$ are preaspirated and 4 are
unaspirated. In a further 44 instances, the stop is realised as a fricative without a stop closure. Thus, as for the previous subjects, the fricative is the dominant exponent for stops in such words. In the word type vatnið, the preaspirated variant is dominant, with 14 occurrences. There are no unaspirated instances, and only 2 cases of a fricative production. There are 4 occurrences of the seks word type. Of these, 3 are produced as fricatives, there is 1 instance of a preaspirated stop, and no unaspirated instances. In words of the matur type, EI never has preaspirated stops. Of a total of 18 occurrences, there are 15 unaspirated variants, and 3 instances of a fricative production.

In Figure 4–45(c), Pr duration is plotted against VPr duration for EI’s stops in VC:/VCC syllables (word types átta, hatta, vatnið and seks). Since stops in V:C syllables are not preaspirated, these are not included. As we observed for the first two subjects, Pr duration increases with increased VPr duration. The trend line suggests that the Pr/VPr ratio is approximately 50% across the range of observed durations.

Subject MS has a phonological distribution of preaspiration very similar to that of EI, and thus, as a rule, does not preaspirate stops in V:C syllables. In the word type átta, preaspiration is the dominant pattern (see Table 4–13). She produces a preaspirated stop in 40 cases, a fricative in 6 cases and an unaspirated stop in 2 cases. For the hatta word type, there are 8 preaspirated and 8 unaspirated instances. Again, the fricative variant, is most frequent, with 17 instances. For the vatnið word type, 13 of 15 cases are preaspirated, 1 is unaspirated and 1 is a fricative. As for the seks word type, 4 of 6 instances are preaspirated and the remaining 2 unaspirated. The preaspirated instances include 3 ks clusters.

Figure 4–45(d) plots Pr duration against VPr duration for MS’s stops in VC:/VCC syllables (word types átta, hatta, vatnið and seks). As for EI, stops in V:C syllables are not plotted. The tendency observed for the previous subjects—that preaspiration duration increases in step with VPr duration—is repeated in MS’s data. The trend line suggests that at VPr durations of 80 ms, Pr duration is likely to be approximately 40 ms, i.e., Pr duration is about 50% of the VPr duration. At VPr durations of 120 ms, Pr duration is likely to be around 95 ms, i.e., approximately 60% of the VPr duration.
4.3.2.5 Postaspiration duration

Instances in which a vowel follows a sequence of a vowel + stop make it possible to estimate the amount of postaspiration produced in the stop, as well as the amount of preaspiration. Data relating to such sequences will now be discussed. These data are a subset of the data discussed above, in which all vowel + stop sequences were considered, irrespective of what followed.

Table 4–14 shows the mean durations of vowel (V), preaspiration (Pr), occlusion (O) and postaspiration (Po). Data for all stops (but not the palatal affricate) and all subjects have been pooled. Results are given for four syllable categories: VC: syllables with a fortis stop (áttu and hatta type words); VC: syllables with a lenis stop (oddur type words); V:C syllables with a fortis stop (matur type words); and V:C syllables with a lenis stop (fótur type words).\(^1\) The number of observations for each category is given in the last column.

There are relatively few observed instances of intervocalic stops in these data. Therefore, giving mean durations for individual subjects would not yield much reliable information. In part, the reason for this is that in more than 25% of cases, vowels after stops do not display clear vocalic correlates. This is especially frequent when a sonorant follows the vowel. For example, høvdinum ‘the head (dat.)’ has a “canonical”

\(^1\) This fortis vs. lenis division is made on the basis of the Area 1 stop distribution (cf. Ch. 3, section 3.3).
representation is \(+[\text{høtnøn}]\), but is more commonly produced as \(+[\text{høtnøn}]\).

The results summarised in Table 4–14 indicate that fortis stops have longer postaspirations than do lenis stops, at least in VC: syllables. For fortis stops the mean duration of postaspiration in VC: syllables is 32 ms, compared to 22 ms for lenis stops. A t-test indicates that this difference is significant at \(p < 0.001\).

Also, we can infer from Table 4–14 that the overall duration of VC: syllables is similar for lenis and fortis stops. Thus, seemingly, the presence of preaspiration cuts equally into the duration of the preceding vowel and the following closure. That overall preaspiration duration is very short in V:C fortis syllables (\(matur\) type words) can be attributed to the fact that not all subjects preaspirate in such syllables. Since data for all subjects have been pooled, this bipolar distribution is obscured. The mean duration of the overall syllable in \(hatta\) type words is much lower than for other syllables. However, it is primarily the preaspiration, and partly the closure, that are shortened while the vowel seems to be as long as for other VC: syllables.

One may also note that the closure duration for both V:C and VC: syllables is similar. Thus it seems that the quantity distinction (V:C vs. VC:) in Faroese vowel + stop sequences is signalled more through differences in vowel duration than differences in stop duration.

### 4.3.3 Phonetic variation in Faroese preaspiration

Preaspirations in Faroese vary in the type of friction with which they are produced. There seem to be mainly three factors that contribute to this variation. First, the spectral characteristics of preaspiration proper (i.e., glottal friction) are dependent on those of the preceding vowel. When following an [a], the following preaspiration will assume spectral characteristics similar to those of [a], and when following [i], it will be similar to [i]. In this respect, then, preaspiration behaves like any other \(h\)-sound.

Second, oral friction originating at the place of articulation of the stop is often produced just before the stop closure is reached. In most cases, this friction is short and can be seen as a by-product of the stop
closure gesture. As the escape channel is being closed, air velocity increases and friction is unavoidably created at the place of the closure. However, the duration of this friction is sometimes far greater than can be justified by seeing it as a mere by-product of the closure gesture.

Third, a fricative with a place of articulation corresponding roughly with the place of maximal dorsal constriction in the vowel is produced. If the vowel is front and close, the friction will be palatal. If the vowel is open and central or back (e.g., [ɛ] or [ɔ]) one often observes (both auditorily and in spectral analysis) uvular friction, sometimes combined with a pharyngeal stricture. If such a stricture is made, it tends to be maintained throughout much of the production of the preaspiration, and appears to be a way of enhancing the otherwise weak glottal friction.

To designate any of these types as a typical or representative preaspiration production of preaspiration in Tórshavn Faroese would be misleading. The different sources of variation interact to produce various results, many of which are illustrated below.

Figure 4–46. Subj. EI: *skatturinn* ‘The treasure is…’

Figure 4–47. Subj. BJ: *[…er] mitt* ‘…is in the middle…’

A common pronunciation for a sequence of an open vowel and a dental fortis stop involves a vocalic interval, an interval of breathiness or aspiration, an interval of friction originating at the stop’s place of articulation, and finally a stop closure. Such a sequence is depicted in Figure 4–46. As glottal abduction is initiated during the production of the vowel ([ɛ]), the amplitude in the upper reaches of the vowel spectrum dimin-
ishes sharply. This point is referred to here as modal voice offset (see section 4.1.2). The glottal aperture increases rapidly in this case, and the amplitude weakening spreads to the lower frequencies. Full voice offset follows, but sometimes with a considerable delay. In the present example, full voice offset occurs approximately 25 ms after modal voice offset. Gradually, as the tongue blade forms the dental closure, the fricative noise increases. The resulting [θ]-like sound is approximately 15 ms long in the example in Figure 4–46.

After close vowels, especially close front vowels, the oral friction noise is much more obtrusive, and often suppresses the glottal friction noise altogether. In Figure 4–47, a sequence of a close front vowel and a dental stop is produced. Here, modal voice offset occurs more than 50 ms before voice offset and thus the lag between modal voice offset and voice offset is much greater than in the previous example. At the very onset of the preaspiration, the friction noise can be attributed to the narrow escape channel of the vocalic stricture. Then, the friction noise gradually increases in intensity and in frequency range, as the tongue blade moves towards a prepalatal laminal closure. In this case, it is difficult to attribute the stricture for the friction to either vowel constriction or stop closure separately. The articulators involved in the production of the vowel and the stop closure, the tongue dorsum and the tongue blade, cannot act independently of one another. The combination of a close front vowel and a dental stop produces a palato-alveolar constriction. The resulting friction is therefore neither clearly palatal nor dental, but can rather be characterised as coming from a stricture that extends from the palatal to the dental region.

In a sequence of a back vowel and a velar stop, the tongue dorsum is responsible for both the vocalic constriction and the stop closure constriction. As a result, the place of articulation tends to be further back than for a velar stop that follows a central or a front vowel, and the vowel tends to be slightly raised. When such stops are preaspirated, as in the example in Figure 4–48, the glottal friction is often modified by a uvular or pharyngeal constriction. Since the dorsal constriction in such sequences contains both the vocalic and consonantal configurations, the
fricative constriction cannot be attributed to either one separately, but can instead be seen as a combination of the two.

Figure 4–48. Subj. BJ: *eg rokni við*…‘I figure…’

Figure 4–49. Subj. BJ: EI: […eitt] *vatn* [tú…] ‘…a lake you…’

In a sequence of a back, open vowel and a dental stop, as in Figures 4–49 and 4–50, it is easier to identify the source of the friction, since the maximal constriction for the vowel and the place of articulation for the stop are so distinct. In Figure 4–49, modal voice offset and full voice offset are nearly simultaneous. During the initial 50 ms of preaspiration, the friction is glottal. Towards the end, during the last 15 ms of friction, the closure gesture leaves its mark in the form of a mirrored release.

Figure 4–50. Subj. EI: […eitt] *vatn* [har…] ‘…a lake here…’

Figure 4–51. Subj. SG: […ella] *bakka*[r ella…] ‘…or hills or…’
In Figure 4–50 (in which the same speaker produces another instance of the same word) the friction noise begins as glottal, then becomes uvular and the whole latter part of the friction noise is produced as a uvular trill. The uvular striations are clearly visible in the spectrogram. Since this friction has nothing to do with the stop’s place of articulation, one can possibly attribute it to the maximal constriction in the vowel. One could also see this friction as an “enhancement” of the weaker glottal friction.

In Figure 4–51, the vowel is followed by an approximately 40 ms period of aspiration, with no apparent supralaryngeal constriction. Then, a velar constriction is formed and maintained for about 60 ms. The velar constriction could be attributed to the stop’s place of articulation, but bearing in mind the previous examples of the production of vatn, in which uvular friction was produced, this account may be too simplistic. Possibly, one should attribute this friction to the combined effect of the vocalic environment and the stop’s place of articulation. It should also be noted that the duration of the velar constriction in this example makes it unreasonable to see it as merely a by-product of the closure gesture.

In Figure 4–52, a sequence of a half-open, back, rounded vowel and a dental stop is produced, so again, we can separate the friction associated with the vowel from that associated with the stop. The friction noise
is glottal during the first 50 ms. Then, there follows a period of clearly dental friction for about 85 ms before the stop closure is reached. Given its duration, this dental friction cannot be seen as a simple by-product of the stop closure gesture. Rather, as in the preceding example, it seems to be an “enhancement” of the preaspiration friction.

![Figure 4–53. Inf. BJ: [...sovörðið] slott e[lla...]'…some sort of palace or…’](image)

Sometimes, both sources of supralaryngeal friction—the preceding vowel and the following stop—are present in the production of preaspiration. One such example is given in Figure 4–53. The vowel is back and half-open, and the stop is dental. Shortly after glottal abduction is initiated (15–20 ms), a uvular stricture is formed. Some striations are visible, which indicates movement in the uvula. This uvular stricture is maintained for approximately 55 ms. Then a dental stricture is formed, and maintained for approximately 60 ms, until a full dental closure has been made.

Preaspiration before affricates invariably involves a period of palatal friction similar to that after close front vowels. In some cases the friction is short and can be seen as a by-product of the closing gesture, e.g. in the example in Figure 4–54. In most cases, though, the friction is more sustained, and is sometimes as long as the period of friction that occurs after the release, as in the example in Figure 4–55. In both examples (4–54 and 4–55), the affricate is preceded by an open or half-open central vowel, but velar, uvular or pharyngeal friction is not produced.
The emphasis here has been on instances in which preaspiration is enhanced through oral friction. However, there are also many cases in which preaspiration is weak or absent. These cases can almost always be attributed to hypo-articulation (Lindblom 1990), and are concomitant with reduced duration in the syllable as a whole.

Summarising, we can say that there is a considerable degree of variation in the production of Faroese preaspiration. The friction produced can be purely glottal, but is usually accompanied by a short period of oral friction occurring just before an oral closure is achieved. These short periods of oral friction can be seen as by-products of the stop closure gesture. However, in many cases one observes that a considerably longer supralaryngeal friction is produced as well as, or instead of, glottal friction.

The duration of these gestures makes it impossible to see them as fortuitous by-products of the closure gesture. Instead, it seems that the preaspiration is being “enhanced” by a supralaryngeal stricture. Speakers seem to achieve these enhancements by extrapolating either from stop place of articulation or maximal vowel stricture. Such an enhancement can be regarded as a process of fortition, since a weak glottal friction is replaced by a more intense, and thus more audible, oral friction. Finally, in some cases the glottal friction is short and weak or even audibly absent. This behaviour seems to be primarily a hypo-speech effect.
4.3.4 Summary and discussion

As regards the phonological distribution of preaspiration, the contradictory accounts of previous works (cf. discussion in Ch. 3, section 3.3) partly reflect a lack of uniformity among informants in the phonological distribution of preaspirated variants. This lack of a clearly defined standard might be the result of the complex dialectal situation in the Faroes, especially in Tórshavn. There has been a great influx of people with differing dialectal backgrounds to Tórshavn in recent years and, in addition, Faroese lacks a standard (‘received’) pronunciation. Therefore it is not surprising that the current situation does not reflect complete phonological uniformity.

The durational data show that preaspiration, manifested as various types of friction, constitutes an essential cue to the distinction between VC: syllables with fortis vs. lenis stops. The subjects behave in similar ways with regard to how much of the vowel + preaspiration sequence is comprised by preaspiration in VC: syllables. Generally, preaspiration starts to manifest itself when vowel duration exceeds 40 ms. When the combined duration of vowel + preaspiration reaches 80 ms, the preaspiration is typically around 40 ms. And, as the combined duration of vowel + preaspiration reaches 160 ms, one can expect preaspiration durations in the order of 80–100 ms.

In Faroese, unlike Icelandic, preaspiration can also occur in V:C syllables. However, only two of the four Faroese subjects distinguish between two types of stops in such contexts, but only if the vowel is non-close. The available data are therefore scant. However, they do suggest that while absolute preaspiration durations in V:C syllables are not much shorter than in VC: syllables, the preaspirations comprise slightly less of the combined vowel + preaspiration sequence (i.e., their Pr/VPr ratio is lower). A similar trend is observed in the CSw data (cf. section 4.2.3.2) and the Gräsö data (cf. section 4.5.4).

Lastly, the production of preaspiration in Faroese displays a high degree of contextual variation. This variation seems to be conditioned by the height, openness and degree of rounding of the preceding vowel as well as the place of articulation of the subsequent stop. This variation manifests itself as periods of supralaryngeal friction, with variable
durations. Very short periods of friction tend to occur just before the stop closure is made, and can be accounted for as by-products of the stop closure gesture. In this sense, they are relatively fortuitous effects of the speech production process. However, more extended periods of friction are often produced, which cannot be seen as fortuitous effects but instead could be viewed as enhancements of the weak glottal friction noise.

4.4 The Northern Gräsö dialect

The aims of this analysis of the Northern Gräsö dialect are threefold. The first is to determine the phonological distribution of preaspiration in the dialect. This is necessary since there exists no study of Gräsö preaspiration. Second is to map the phonetic variation in stop production, particularly for fortis stops. The third aim is to establish the durational characteristics of Gräsö preaspiration.

The phonological distribution of preaspiration in the Gräsö dialect has already been dealt with in Chapter 3, section 3.5.3. The remainder of this section on the Gräsö dialect will therefore be devoted to the analysis of phonetic variation and duration.

4.4.1 Method and subjects

The analysis of the Gräsö dialect involves two different sets of data. First, interviews with three Gräsö speakers (AM, female; FJ, male; and JM, male) have been obtained from the SOFI archives (see section 4.1.1.2). All three speakers were more than 60 years of age at the time of the recording. These unscripted data are used for the analysis of phonetic variation in stop production in the dialect. Although the stop production of all three subjects has been used as a basis for analysis, most of the spectrographic examples come from one subject, JM. The reason for this is that the sound quality of JM’s data is far superior to any of the other SOFI material analysed here, mainly because there is very little room echo present in JM’s recordings. This is particularly important in the context of an acoustic analysis of preaspirated stops, since such an echo tends to make it more difficult to separate the effects of the echo

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1 The SOFI references to these recordings are as follows: AM = Bd 7476; FJ = Bd 4145; JM = Bd 3314.
from the preaspiration noise itself. Also, an echo may make it more difficult to determine voice offset, irrespective of whether it occurs before or after a stop closure is made. In the present data, such echo effects have been considered during segmentation so this should not affect the quantitative analysis to any significant degree.

The second set of data comes from the SWEDIA 2000 database (Bruce et al. 1999). These data, described further in section 0 below, are used for a durational analysis of preaspiration.

4.4.2 Fortis stops

As in almost all Nordic dialects, the ON word-initial fortis stops are reflected as postaspirated in the Gräsö dialect. An example of a postaspirated dental stop is given in Figure 4–56. Typically, the duration of a postaspirated stop in the onset of a content word is 40–60 ms, although they can be considerably shorter (see Figure 4–71) or longer (see Figure 4–72). Predictably, the duration of postaspiration seems to correlate with, for example, stress and place of articulation.

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In word medial position, ON fortis stops are reflected as preaspirated, both in VC: and in V:C syllables. In stressed VC: syllables in content words, preaspirations are typically 40–60 ms in duration, as in the example in Figure 4–56. The range of preaspiration durations seems greater than that of postaspirations. In the example in Figure 4–57, the
preaspiration duration is approximately 70 ms, and in the example in Figure 4–72 it is well over 100 ms. For subject JM, a handful of cases have a preaspiration duration in excess of 150 ms.

In stressed VːC syllables in content words, preaspirations are slightly shorter than in VC: syllables, typically 30–50 ms in duration, as in the example in Figure 4–58. The example in Figure 4–59 is slightly longer, approximately 80 ms. Again, however, one can find durations in excess of 150 ms.
Many instances of word-medial fortis stops in both VC: and V:C syllables seem to lack preaspiration (see, e.g., Figure 4–60). Short preaspiration duration is particularly associated with unstressed syllables or syllables with low prominence. Similar tendencies are found in both Icelandic (cf. Helgason 1991) and Faroese.

Figure 4–62. Subj. AM: [...] skött spaka(rna). ‘…and handled the levers.’

Figure 4–63. Subj. FJ: [...] gick sjöv attnet upp mycket [då...]'…the (sea)water level rose a lot, then…’

As explained earlier, the majority of the Gräsö examples shown here are from the speech of JM, because of the superior sound quality of his recordings. Figures 4–62 and 4–63 give examples of preaspirations in the speech of the other two subjects, AM and FJ. Preaspiration durations in
these examples are roughly as indicated above, ranging from approximately 30–60 ms. In both figures, the echo in stop closures from a preceding vowel is quite marked. Note particularly the strong echo given off by the mid open vowel at the onset of Figure 4–63, which continues well into the stop’s closure phase.

As Faroese, Gräso preaspirations assimilate to their surroundings. For example, in Figures 4–56, 4–57 and 4–59 the preaspiration is coloured, in some degree, by the place of articulation of the following stop closure. In Figures 4–56 and 4–57, only the final portion of the preaspiration is produced with such friction. In Figure 4–59, the velar friction is motivated by the fact that both the preceding vowel and the following stop closure have velar components. To this is added the labiality of the preceding vowel. In Figure 4–58, where a mid front unrounded vowel is followed by a dental stop, there is no apparent friction of this kind. Looking at Figures 4–56 through 4–59, one can also observe that there is no postaspiration present in these stops but only a release noise.

As Faroese and the Western Åland dialect, there is a tendency for stops to be produced without full stop closure, which leads to friction. In the Gräso data, this is quite noticeable in the speech of FJ, but occurs to a much lesser extent in the speech of AM and JM. One example of this type is given in Figure 4–61.

Figure 4–64. Subj. JM: [...] alldeles[ grönt de[t.] ‘…absolutely green it (was)…’
In the Gräsö dialect, the sonorant in ON $m$, $n$, $l + p$, $t$, $k$ sequences is reflected as half-voiced, half-voiceless before fortis stops. This is illustrated in Figures 4–64 through 4–67. In the case of nasals, the description is simple. In function words, the first half of the nasal is voiced and the latter half voiceless. The exact proportions vary, but typically the voiced and voiceless intervals are equally long. This pattern applies to all places of articulation, labial (Figure 4–66), dental (Figures 4–64 and 4–67) and velar (Figure 4–65).

Figure 4–65. Subj. FJ: [...eh] **sjunker o[ch...]** ‘...eh, sinks and...’

Figure 4–66. Subj. JM: [...*hundra*-fentio [tjog] ‘...hundred and fifty scores...’

Figure 4–67. Subj. JM: [...det här] **inte [ej]** ‘not this one, no...’

Figure 4–68. Subj. JM: [...no]*g inte m[er...] ‘...probably not more...’
Figure 4–69. Subj. JM: [...]slog vjilt det. ‘...cut wild (grass), it...’

Figure 4–70. Subj. AM: [dom m]jölka [ju...] ‘...they milked...’

Figure 4–71. Subj. JM: [...man] torka [ute.] ‘you dry outside...’

Figure 4–72. Subj. JM: [...]blev] torrt då [...] ‘...became dry, then...’

Figure 4–67 provides an example of the function word inte ‘not,’ produced with a half-voiced nasal. This occurs fairly rarely, however, and inte is usually produced with a predominantly voiced nasal, as in Figure 4–68. A parallel ‘anomaly’ occurs in Icelandic. The negation ekki ‘not’ has a “strong form” *[ɛhɪ] (with preaspiration) and a “weak form” *[ɛɪ] or *[ɛɪ], without preaspiration. The strong form is associated with prominence and the weak form with the absence of prominence (Helga-son 1991). A similar case can be made for inte in the Gräsö dialect, i.e.,
that the presence of a voiceless nasal indicates a strong form and that a voiced nasal indicates a weak form.

As in many Scandinavian dialects, the lateral in ON lp and lk sequences is reflected as a retroflex flap in the Gräsö dialect. ON lt sequences, however, are reflected as a lateral approximant or fricative followed by a dental stop. Both types of lateral are, like the nasals, half-voiced. An example of an lt sequence is given in Figure 4–69. In this case the voiced and voiceless portions are neatly separated, but the
voiced portion is often heavily fricated. Figure 4-70 shows an example of a half-voiced flap. In effect, the production of such sequences involves a fully voiced flap followed by an aspiration (i.e., [h]). The example in Figure 4-70 can thus be transcribed quite accurately as [mɪŋɐɾhɑkɛ].

The production of rp and rk sequences is quite similar. Figure 4-71 has an example of an rk sequence. First, a voiced alveolar approximant is produced, and then an aspiration. ON rt is reflected simply as a preaspirated retroflex stop in the Gräsö dialect, as shown in the example in Figure 4-72. In both examples of r + stop sequences the preaspiration is fricated, but this should be interpreted as a correlate of the surrounding articulations rather than as a feature of r + stop sequences.

Fortis stops + sonorant clusters are preaspirated like other fortis stops in the Gräsö dialect. Examples of such clusters are given in Figures 4-73 through 4-76. Not all possible clusters are represented in the data. However, all clusters present are preaspirated, both in VCC syllables (see, e.g., Figure 4-73) and in VːCC syllables (see Figure 4-74).

When a sibilant follows a stop in the Gräsö dialect, the stop is not preaspirated. Examples of this are given in Figures 4-77 and 4-78. In both cases a voiceless unaspirated velar stop is produced, reflecting an ON x. The latter example has a great deal of echo that may, at first sight, look like an aspirative noise, but in actual fact the occlusion phase is quite silent. Note that CSw speakers who preaspirate do so in sequences
of this type as well. Remarkably, therefore, the only systematic difference in the phonological distribution of preaspiration between Gräsö speakers and CSw speakers lies in the presence vs. absence of preaspiration in these contexts.

### 4.4.3 Lenis stops

ON lenis stops are generally reflected as phonetically voiceless in the Gräsö dialect. This applies to both word-initial and word-medial lenes, as well as lenes in clusters. Examples of lenis stops in VC syllables are given in Figures 4–79 and 4–81 (note that the durational difference between the stops in the two cases is not phonemic). Note that the example in Figure 4–79 has some echo at the onset of the stop that may look like preaspiration at first sight. Figure 4–80 has an example of a lenis stop in a V:C syllable. In all three examples, the stops are voiceless.

![Figure 4–79. Subj. AM: [...och] gädda [och...J ´...and pike and...´](image)](image)

![Figure 4–80. Subj. JM: [...körde] vägen [och...] ´...drove along the road and...´](image)

Stops of this type often have a short voicing lag (see Figures 4–73 and 4–84, for example), and in some cases a lenis stop is voiced throughout, especially if the stop is short (see Figures 4–68 and 4–82). This occurs quite commonly for subject FJ. In this respect, the voiceless lenes in the Gräsö dialect (which reflect ON bb, dd, gg, b, d, g and *β/v, *ð, *ɣ) are quite similar to the Faroese (and Icelandic) lenes, which reflect ON bb, dd, gg and p, t, k.
For lenis stops, it is quite common that a full stop closure is not produced, leading to the production of a voiced fricative or approximant. In this respect, then, the Gräsö dialect is not unlike other Swedish dialects. An example of a lenis velar stop produced in this fashion is given in Figure 4–82. Finally, Figures 4–83 and 4–84 show examples of lenis stops in clusters. Like lenis stops in other positions, these are usually voiceless.

Figure 4–81. Subj. JM: [...skull]e lägga u[pp] ‘…should raise a …’

Figure 4–82. Subj. JM: [...se]n ligger det en... ‘…then there lies a…’

Figure 4–83. Subj. JM: [...anna]n bonde [i...] ‘…another farmer in…’

Figure 4–84. Subj. JM: [...mindre]odling[ar som...] ‘…smaller plantations that…’
On the whole, the fortis vs. lenis contrast in the Gräsö dialect is phonetically similar to the fortis vs. lenis contrast in Faroese. In effect, this contrast does not really involve the stop occlusion itself, but instead voicing conditions in the preceding segment. This is the case irrespective of the origin of these stops. For example, lenis stops in Icelandic and Faroese VːC syllables have their origins in ON fortis stops. In the Gräsö dialect, the lenes in VːC syllables go back to ON voiced fricatives. Despite this, there is no obvious difference in the production of these stops in the two languages. In both cases, the preceding vowel has modal voice throughout, the stop occlusion is voiceless and the release is fairly short with little or no postaspiration.

4.4.4 Preaspiration duration — SWEDIA 2000 data

In this section, the fortis stop production of six male Gräsö speakers is analysed with regard to duration. The data form part of the SWEDIA 2000 database (Bruce et al. 1999), which contains recordings from more than 100 Swedish dialects (see also Ch. 3, section 3.6). The data analysed here consist of isolated monosyllabic and disyllabic target words, seven with VːC syllables (e.g., gata ‘street’) and six with VCː syllables (e.g., flytta ‘to move’). The test words were elicited verbally by an interviewer without naming the target word. Once the subjects identified and uttered the target word, they repeated it up to five times. The subjects are categorised into “older” and “younger” speakers, the older speakers being more than 55 years of age and the younger between 20–35 years of age. The data were segmented according to the procedures outlined in section 4.1.2.

The range of preaspiration durations in these target words for the six subjects are indicated in the box-and-whisker plots in Figure 4–85 (see also Table 4–15). It is apparent that the three older males had considerable preaspirations in both VːC and VCː syllables, although the durations were shorter in VːC syllables. Of the younger subjects, only YM1 had durations comparable with those of the older subjects. The durations of the remaining two subjects, especially YM3, were far shorter.
Table 4–15. Mean preaspiration duration with standard deviations (SD) for fortis stops in VːC and VCː syllables for the six male Gräsö subjects. OM stands for elderly speakers, and YM stands for younger speakers. Also indicated are Pr/VPr ratios, and the number of tokens (n).

<table>
<thead>
<tr>
<th>Subject</th>
<th>Syll. type</th>
<th>Pr dur.</th>
<th>SD</th>
<th>Pr/VPr</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>OM1</td>
<td>VːC</td>
<td>64</td>
<td>17</td>
<td>0.23</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>VCː</td>
<td>70</td>
<td>21</td>
<td>0.29</td>
<td>26</td>
</tr>
<tr>
<td>OM2</td>
<td>VːC</td>
<td>43</td>
<td>19</td>
<td>0.17</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>VCː</td>
<td>62</td>
<td>22</td>
<td>0.30</td>
<td>28</td>
</tr>
<tr>
<td>OM3</td>
<td>VːC</td>
<td>62</td>
<td>10</td>
<td>0.21</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>VCː</td>
<td>67</td>
<td>20</td>
<td>0.27</td>
<td>24</td>
</tr>
<tr>
<td>YM1</td>
<td>VːC</td>
<td>57</td>
<td>20</td>
<td>0.19</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>VCː</td>
<td>73</td>
<td>20</td>
<td>0.28</td>
<td>25</td>
</tr>
<tr>
<td>YM2</td>
<td>VːC</td>
<td>38</td>
<td>17</td>
<td>0.18</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>VCː</td>
<td>36</td>
<td>18</td>
<td>0.24</td>
<td>23</td>
</tr>
<tr>
<td>YM3</td>
<td>VːC</td>
<td>7</td>
<td>8</td>
<td>0.04</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>VCː</td>
<td>8</td>
<td>5</td>
<td>0.08</td>
<td>21</td>
</tr>
</tbody>
</table>

However, when the Pr/VPr ratio is considered (i.e., how much of the vowel + preaspiration sequence is taken up by preaspiration), the preaspirations of YM2 turn out to be similar to those of the older subjects. It is evident from Table 4–15 that the mean preaspiration durations for YM2 were only two-thirds or less of the durations of the older subjects. However, his Pr/VPr ratios (i.e., the amount of preaspiration contained in the vowel + preaspiration sequence) were almost on a par with the older subjects. By contrast, YM3’s Pr/VPr ratios were considerably lower. This is especially relevant considering that precisely this ratio is a determinant of perceptual salience for preaspiration in Icelandic (see Ch. 3, section 3.2.2). The lower absolute durations for YM2 may therefore simply mean that he has a faster speech rate; thus, his stops should be considered to be preaspirated. This leaves YM3 as the only Gräsö subject who does not preaspirate.
Finally, Figure 4–86 plots preaspiration duration against the combined duration of vowel and preaspiration for all six Gräsö subjects. As with the preaspirating Central Standard Swedish (CSw) subjects (see section 4.2.3.2), preaspirations in VC syllables have a greater Pr/VPr ratio (i.e., comprise more of the vowel + preaspiration interval) than do preaspirations in V:C syllables. Also, in terms of absolute durations, Gräsö preaspirations are generally longer than CSw preaspirations. Note, however, that although these Gräsö data are not from read speech, all measurements are taken from words spoken in isolation, and can therefore be expected to yield longer durations that those observed in the CSw data.
Figure 4–86. Preaspiration duration plotted against the combined duration of vowel and preaspiration for six Gräsmo subjects. The filled circles indicate data points in VC: syllables and the unfilled triangles indicate data points in V:C syllables. The data points for subject YM3 are indicated separately with crosses (VC: syllables) and stars (V:C syllables).

4.4.5 Summary and discussion

Both the ON singleton and geminate word-medial fortis stops are reflected as preaspirated in the Gräsmo dialect. Thus, along with Area 1 Faroese (cf. section 4.3), the Gräsmo dialect is the only Nordic dialect (so far discovered) that reflects ON singleton fortis stops as preaspirated. In fact, of all the Nordic dialects studied, the Gräsmo dialect has the widest phonological distribution of preaspiration. The only context in which preaspiration does not occur is before a sequence of stop + /s/, and, incidentally, no contrast between fortis and lenis stops is made in such sequences. The ON lenis stops are generally reflected as voiceless unaspirated in all positions. It can be noted in this connection that the ON word-medial approximants (*β̃, *ð̃, *ɣ̃) are also reflected as voiceless unaspirated stops in the Gräsmo dialect.

The durational analysis indicates that preaspiration in V:C syllables is shorter than in VC: syllables. This is also the case for the non-normative preaspirations in Central Standard Swedish (cf. section 4.2.3.2). The Pr/VPr ratios found in Gräsmo V:C syllables are quite low, and actually often near the minimal ratios for auditory salience established by Pind (1993) for Icelandic (cf. Ch 3., section 3.2.2). However, the limits for the categorical perception of preaspiration in Icelandic cannot be directly transferred to other languages. Pind’s findings pertain specifically to
Icelandic listeners, even though they suggest that the $Pr/VPr$ ratio may play a central role in the perception of preaspiration in other languages.

The fact that one of the younger subjects in the SWEDIA 2000 data set did not preaspirate his stops raises questions regarding the normative status of preaspiration in the Gräsö dialect. The subjects in the SOFI data set were recorded in the late 1960’s, and, as noted above, were all more than 60 years of age at the time of the recording. The older SWEDIA 2000 subjects were 55 years of age or older, and were recorded in 1999. All these subjects preaspirated their fortis stops. Of the three younger SWEDIA 2000 subjects, two consistently preaspirated (although one had considerably shorter absolute durations than did the older speakers) and one subject had hardly any preaspiration tendency to speak of. Possibly, then, preaspiration is threatened as a normative feature of the Gräsö dialect.

Finally, ON sequences of sonorant + $p$, $t$, $k$ are reflected in the half-voiced, half-voiceless sonorants of the Gräsö dialect. In the descriptions of the Jæren dialect (see Ch. 3, section 3.4.1) and the Kókar dialect (Ch. 3, section 3.5.4), sonorants had also been portrayed as partially voiced. The Gräsö data clearly confirm that this pattern is phonetically realistic. One should also note in this connection that sonorants in equivalent positions in Halh Mongolian are reported to be half-voiced (Svantesson & Karlsson 2002; see Ch. 2, section 2.4).

4.5 The postaspirating dialects

In Chapter 3 we saw that the reflexes of ON word-medial fortis stops in Southern Icelandic, Faroese and several Scandinavian dialects have normative preaspiration. In these dialects, postaspiration seems to be normatively absent in word-medial forties, i.e. producing such stops with postaspiration would likely be considered “deviant” by native speakers, and would probably be branded as a foreign accent.

It has also been argued, that across much of the Scandinavian peninsula, the dialects without normative preaspiration such as CSw and Trønder Norwegian instead have non-normative preaspiration. This means that some speakers have a tendency to preaspirate while others do not.
The measurements of CSw also show that all speakers tend to have a mVOT of approximately 20–30 in word-medial fortis stops, and thus, in a sense, reflect the ON word-medial fortis with a *slight* postaspiration. Nevertheless, it is the case in CSw that word-medial fortis produced with the same degree of postaspiration as word-initial fortis will be considered deviant by native speakers. Thus for *matta* ‘rug,’ both *mːɐ* and *mːʰɐ* would sound native, whereas *mːʰɐ* would be considered non-native, or at least somewhat strange. An awareness of this fact has begun to manifest itself in, for example, textbooks teaching Swedish pronunciation to non-native speakers (see, e.g., Bannert 1990).¹ This avoidance of postaspiration in word-medial stops applies to Norwegian as well, and in at least one textbook on Norwegian phonetics (Endresen 1988), word-initial stops are systematically transcribed as postaspirated and word-medial ones as voiceless unaspirated.

Against this background, one can consider the fact that there are dialects, albeit few, that do reflect the ON word-medial fortis stops as postaspirated. The only such dialect that has been described in any detail in the literature is the Northern Icelandic dialect. Two further areas are considered here. First, it can be inferred from a single comment in an article by Oftedal (1947) that the dialect(s) spoken in Bjerkreim and Dalane in Southern Norway reflect the ON word-medial fortis as postaspirated. Second, the present work has revealed that (at least) some of the dialects of the central and western parts of the Åland archipelago reflect the ON word-medial fortis as postaspirated. (See maps in Figures 1–1, 3–2 and 3–6 for the location of these areas.)

The available information regarding stop production in these three areas will now be discussed. The discussion of the Åland dialect will be more detailed than that of the other two areas, presenting results from an analysis of the stop production of four speakers.

### 4.5.1 Northern Icelandic

Given its size and topography, Iceland has remarkably few dialects, at least in terms of geographical variation (cf. Guðmundsson, 1977, for a

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¹ See also Öhman (1998), whose text is directed towards native rather than non-native speakers.
discussion of possible reasons for this). One of the major dialectal differences is the division between Northern and Southern Icelandic. This difference rests almost entirely on the way in which ON word-medial fortis stops are reflected.

As discussed above (cf. Ch. 3, section 3.1), the ON word-medial \textit{pp}, \textit{tt}, \textit{kk} are reflected as preaspirated in both Southern and Northern Icelandic. It has also been noted that in Southern Icelandic the ON word-medial \textit{p}, \textit{t}, \textit{k} are reflected as unaspirated, and that \textit{l}, \textit{m}, \textit{n} + \textit{p}, \textit{t}, \textit{k} sequences are reflected as a voiceless sonorant followed by a voiceless unaspirated stop. In Northern Icelandic, however, word-medial \textit{p}, \textit{t}, \textit{k} are postaspirated and \textit{l}, \textit{m}, \textit{n} + \textit{p}, \textit{t}, \textit{k} are reflected as a sequence of a voiced sonorant followed by a postaspirated stop.\(^1\) In both Northern and Southern Icelandic, ON \textit{p}, \textit{t}, \textit{k} + \textit{l}, \textit{n} clusters are reflected as preaspirated. However, ON \textit{p}, \textit{t}, \textit{k} + \textit{r}, \textit{j}, \textit{v} clusters are reflected as sequences of a voiceless stop followed by a voiceless fricative. In Southern Icelandic, the fricative tends to be mostly voiced. Most of these differences are indicated in Table 3–1. Further descriptions of the phonological distribution of aspiration in Icelandic stop production are found in, for example, Dahlstedt (1958), Thráinsson (1978) and Þráinsson & Árnason (1992).

Discussions of the production of Northern Icelandic—both here and in the literature—are largely based on impressionistic observations. Some phonetic investigations have been carried out, by, e.g., Einarsson (1927), Pétursson (1974), Rögnvaldsson (1980) and Indriðason et al. (1991). The last is the most extensive of these investigations, and compares the production of word-medial stops for six Northern and six Southern Icelandic speakers. The speech materials used by Indriðason et al. consisted of disyllabic words embedded in frame sentences. The words tested were\(^2\):

\(^1\) Actually, \textit{-lt-} is an exception, since homomorphemic \textit{-lt-} is produced as a voiceless lateral followed by a postaspirated stop in the Northern dialect (cf. Jónsson 1982). Note also that \textit{-ok-} sequences are produced with a voiced fricative (or approximant) followed by a stop in Northern Icelandic, but as a voiceless fricative followed by a stop in Southern Icelandic.

\(^2\) Glossary: \textit{gabba} ‘to fool,’ \textit{gapa} ‘to gape,’ \textit{happa} ‘luck, chance (gen pl.),’ \textit{gadda} ‘tack (acc. pl.),’ \textit{gata} ‘road,’ \textit{hattur} ‘hat,’ \textit{hagga} ‘to budge,’ \textit{haka} ‘chin,’ \textit{hakka} ‘to hack,’ \textit{haggi} ‘budge (1sg. conj.),’ \textit{haki} ‘pick’ and \textit{bakki} ‘bank, hill.’
Each of these words was recorded once for each subject. Thus a total of 144 observations were made, 48 for each of three stop categories: reflexes of ON lenis geminates (e.g., *gabba*), fortis singletons (e.g., *gapa*) and fortis geminates (e.g., *happa*). Indriðason et al. measured vowel duration, preaspiration duration (where applicable), stop occlusion duration, and postaspiration duration (i.e., VOT). Regarding their segmentation criteria, it appears that voice offset and voice onset were used to delimit the onset of preaspiration and the cessation of postaspiration, respectively. Thus, the periods of breathy voice that often precede a preaspiration and follow a postaspiration were apparently not considered.

As expected, the results of Indriðason et al. showed that both the lenis geminates and the fortis geminates are produced similarly by Northern and Southern speakers with regard to aspiration. Thus all the speakers lack both preaspiration and postaspiration in *gabba* type words, and all speakers produce *happa* type words with long preaspiration intervals and without postaspiration. However, the Northern and Southern speakers differed in their production of reflexes of ON fortis singletons (e.g., *gapa*).1 The results of the measurements of Indriðason et al. for these stops is shown in Table 4–16.

Two main differences are apparent. First, the vowels of the Northern speakers are considerably shorter than those of the Southern speakers. Second, the mean postaspiration durations (i.e., VOTs) for the Northern speakers are considerably longer than those for the Southern speakers. As noted, these measurements do not include the breathy voice interval that tends to be present in the vowel following a postaspirated stop. Therefore, the degree to which the Northern Icelandic speakers postaspirate their word-medial fortes may be underestimated.

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1 As described in section 3.2, postaspiration also occurs after nasals and, in some cases, after laterals. However, such contexts are not considered in Indriðason et al. (1991).
Table 4–16. The findings of Indriðason et al. (1991) for mean durations (in ms) of vowel, occlusion and postaspiration in Southern and Northern Icelandic.

<table>
<thead>
<tr>
<th></th>
<th>Southern Icelandic</th>
<th>Northern Icelandic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>V</td>
<td>Occl.</td>
</tr>
<tr>
<td>gapa</td>
<td>162</td>
<td>115</td>
</tr>
<tr>
<td>gata</td>
<td>169</td>
<td>122</td>
</tr>
<tr>
<td>haki</td>
<td>156</td>
<td>133</td>
</tr>
<tr>
<td>haka</td>
<td>151</td>
<td>115</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
<td>160</td>
<td>121</td>
</tr>
</tbody>
</table>

Since the placement of aspiration represents the crucial difference between the two dialects, aspiration has been a major classification feature in Icelandic dialectology and a focus of attention in Icelandic dialectal descriptions. This, however, has not been the case in Scandinavian dialectology. In fact, as far as I can see, there is only one area in Scandinavia in which the ON word-medial fortes have been expressly described as postaspirated. This is what we will address in the following section.

4.5.2 Bjerkreim and Dalane

The claim that the Norwegian dialects of Bjerkreim and Dalane reflect the ON word-medial fortes stops as postaspirated is based on a comment by Oftedal (1947) in his discussion of the stop in the Jæren dialect. Oftedal makes the following remark regarding the neighbouring dialects to the south and east:

The older pronunciation of voiceless mediae [i.e. lenes] is […] not just an isolated residue in Gjestal. It has also been preserved in the neighbouring regions to the east, Bjerkreim (Dalane) […]. It may be worth noting that the tenues [i.e. fortes] in Bjerkreim and in Dalane are, on the whole, postaspirated in the distinctive positions. Thus we get $k^h$att$^h$, $k^h$att$^h$a where Gjestal has $k^h$att$^h$, $k^h$att$^h$ta.

(Oftedal 1947:235; my translation)

This may not seem much to go on. However, there is good reason to suggest that the dialect(s) described by Oftedal reflect the ON word-medial fortes in much the same way as does the Western Åland dialect (to
be discussed in the following section). Oftedal was an experienced linguist, born and bred in Jæren, and thus had good local knowledge. In his text, he focusses particularly on the production of stops and does not just mention them in passing. Also, and most importantly, it is implicit in Oftedal’s remark that, in terms of stop aspiration, the dialect(s) of Bjerkreim and Dalane are distinct not only from the Jæren dialect, but also from other standardised varieties of Norwegian (such as the dialect of the Oslo region). As previously argued, word-medial fortis stops in standard varieties of Norwegian tend to be unaspirated or (non-normatively) pre-aspirated (cf. Ch. 3, sections 3.4.3 and 3.6). It is likely that these stops have little or no postaspiration, like the stops of CSw (cf. section 4.2.4). If this were not the case, there would be no reason for Oftedal to single out the Bjerkreim-Dalane dialect as being special.

Obviously, the surest way of verifying the presence of postaspiration in these dialects is simply to listen to recordings from these areas, but I have not had the opportunity to do this. Thus, this remains an area for future research.

### 4.5.3 Western Åland

The stop production of the Western Åland dialects has not previously been the subject of any detailed phonetic study; nor have impressionistic observations of these dialects led to a description of the word-medial fortes as being postaspirated. It was informally observed that an Åland speaker (subject ES in the following account) tended to postaspirate her word-medial fortis stops quite strongly. To investigate this further, recordings of several Central and Western Åland speakers were obtained. These recordings confirmed that the ON word-medial fortes tended to be reflected as postaspirated in most contexts.

Two of the subjects analysed (NK and AJ) come from the village of Storby on the island of Eckerö, a fairly large island to the west of Åland proper (see map in Figure 3–6). The remaining two subjects (MG and ES) come from the area near Gottby in the southern part of Åland proper (again, see map in Figure 3–6).\(^1\) For the sake of simplicity, the dialect of

\(^1\) An auditory analysis of subjects from the area around Jomala in the very center of Åland proper (to the northwest of Gottby) did not suggest any particularly strong post-
these speakers will henceforth be referred to as the Western Åland dialect.

4.5.3.1 Method and subjects

The Western Åland material consists of two different sets of data. The first set, which comprises subjects MG (male), AJ (female) and NK (female), was obtained from the SOFI archives (cf. section 4.1.1.2). These recordings consist of interviews with Western Åland subjects carried out in the 1960’s. This material, therefore, is unscripted (spontaneous) speech. The sound quality of the unscripted data is generally fairly good, although some echo is present in the recordings. Levels of background noise are generally low, and occur only intermittently.

The unscripted data were transliterated and word-labelled partly by the author and partly by a native Swedish speaker (a student at the Stockholm University Department of Linguistics). Segmentation was carried out by the author in accordance with the criteria specified in section 4.1.2. For subject MG, approximately 12 minutes of uninterrupted speech, containing 2528 words, were analysed; for subject AJ 18 minutes, containing 3952 words; and for NK 21 minutes, containing 4023 words. A rough estimate indicates that MG utters 4.76 syllables per second, AJ 4.99 and NK 4.55 (cf. section 4.2.1 on how this estimate was obtained).

The second set of Western Åland data consists of a recording of a female speaker in her late forties, ES, reading a list of 43 fairly short sentences containing target words with stops in certain contexts. The subject read the list twice. The recordings were made in a sound-treated room, using a Brüel & Kjær 4145 microphone and recorded directly on a PC using a SoundBlaster Live sound card and CoolEdit 2000 software. Segmentation (as specified in section 4.1.2) of stop productions was carried out by the author. The speaking rate was estimated to be 4.97 syllables per second, but since the structure of the read speech material

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1 The SOFI references to these recordings are as follows: MG = Bd 2180; AJ = Bd 2199B–Bd 2200A; NK = Bd 2196–Bd 2197A.

2 Cf. section 4.2.1.
produced by ES is quite different from that of the unscripted speech data, comparisons should be made with caution. Nonetheless, a speaking rate of 4.97 syllables per second is consistent with the author’s impression that ES’s reading was casual and moderately fast. Further methodological information was provided in section 4.1 above.

4.5.3.2 Phonological distribution

On the whole, the data suggest that all ON fortis stops, word-initial and word medial, in consonant clusters and in vocalic contexts, are reflected as postaspirated in the Western Åland dialect. This is in contrast with the Northern Icelandic dialect, in which the distribution of postaspirated variants is much more limited.

In the Western Åland dialect, like in Northern Icelandic, ON word medial \( p, t, k \) are postaspirated, as in \( [bɔːkʰæn] \) ‘the boat’ and \( [bɔːkʰyt] \) ‘to bake.’ Similarly, sequences of ON \( l, m, n + p, t, k \) are reflected as a sequence of a voiced sonorant followed by postaspirated stop, e.g. \( [srɪlʰ] \) ‘salted,’ \( [tʰɪmpʰæn] \) ‘the rope’s end’ and \( [pʰɭɪkʰɔt] \) ‘planks.’ Interestingly, ON \( r + p, t, k \) is reflected with a postaspirated stop, as in \( [bɔːkʰyt] \) ‘away, gone’ and \( [mɛkʰæn] \) ‘marks,’ the latter with palatal frication. Such sequences have a voiceless \( r \)-sound in Northern Icelandic.

The ON geminates are also postaspirated in the Western Åland dialect, e.g. \( [dɔpʰv] \) ‘to dip,’ \( [vɪpʰæn] \) ‘water,’ and \( [spɛkʰɔ] \) ‘the fat.’ Given that Oftedal’s claim regarding such stops in the Bjerkreim-Dalane dialect is correct, the Western Åland and the Bjerkreim-Dalane dialects reflect the ON geminate fortes in a similar fashion. The Northern Icelandic dialect, however, reflects such sequences as preaspirated.

Clusters with a fortis stop as the first element, i.e. \( p(p), t(t), k(k) + l, n, r \) seem to be reflected as sequences of voiceless stop and partially voiceless sonorant (i.e., as postaspirated) with the caveat that not all possible clusters are represented in the data. As examples we have \( [vɪkʰlɪt] \) ‘turn, fold,’ \( [ɔpɔnɔ] \) ‘to open’ and \( [bɛtɪʰɔ] \) ‘better.’ This is unlike the Northern Icelandic dialect, in which \( p(p), t(t), k(k) + l, n \) sequences are preaspirated.

The lenis stops in the Western Åland dialect are predominantly voiced, at least in voiced contexts. This applies to word-initial as well as word-medial lenes, and both singletons and geminates. Utterance-initial
lenes are often produced with a voicing lead. Not unexpectedly, long closure phases tend to induce voicelessness.

4.5.3.3 Spectrographic examples

Along with the Northern Icelandic dialect, and the dialect of Bjerkreim and Dalane in Southwestern Norway, the Western Åland word-medial postaspirations represent an unusual development of the ON stop system. In this section, some spectrographic examples of these unusual stop variants in the Western Åland dialect will be presented.

Figure 4–87 contains an example of both a word-initial and a word-medial velar stop in the word koka ‘boil.’ Both stops have similar post-aspiration durations (approximately 50 ms) and there is no indication of preaspiration.1 This is in contrast to comparable stops in CSw, which were shown to have very little postaspiration and, for some speakers, considerable preaspiration (cf. section 4.2.4).

Similarly, the production of both the dental stop in Figure 4–88 and the bilabial stop in Figure 4–89 has considerable postaspiration, whereas in CSw there is preaspiration or no aspiration. Note that syllables of this type (VC:V) are not postaspirated in Northern Icelandic either, but are preaspirated instead.

1 One should be careful not to confuse the echo present in these recordings with preaspiration in spectrographic analysis.
The example in Figure 4–90 contains a preaspiration that is not particularly long, but in auditory analysis of the stop is still quite distinctly identifiable as fortis. This suggests that voice onset (and offset for that matter) is not the only determinant of the strength of the aspiration percept. As Repp (1979) showed, at least the relative amplitude of the (release and) aspiration noise should also be considered (for a discussion, cf. Diehl & Kluender 1987).

Figure 4–89. Subj. AJ: [...] **doppa**
[vɪ...] ‘...the we dipped...’

Figure 4–90. Subj. NK: [...] **vatten**. ‘...on water.’

Figure 4–91. Subj. NK: [...] **hon filbunkar** [ur...] ‘...she sour-milk out of...’

Figure 4–92. Subj. MG: [...] **ritning** [eller...] ‘...a drawing or...’
Nasal + stop sequences in the Western Åland data are also postaspirated. Figure 4–91 presents an example of a velar nasal + stop sequence with approximately 80 ms of postaspiration. Such sequences sound very similar to comparable sequences in Northern Icelandic. In CSw, however, stops in such contexts tend to have very little aspiration. In the Western Åland data, there is little tendency for voicelessness in the nasal preceding the stop occlusion.

Finally, Figure 4–92 gives an example of a stop + nasal cluster, in which the nasal is mostly voiceless. Sequences of ON \( p(p), t(t), k(k) + l, n, r, j \) are usually reflected in this manner, i.e., with a voiceless occlusion followed by a partially voiceless sonorant. By comparison, in the Northern Icelandic dialect, only \( p, t, k + r, j \) are reflected with voicelessness in the sonorant. Otherwise, such clusters are preaspirated.

4.5.3.4 Duration measurements: overview

Measurements of preaspiration and postaspiration duration were carried out on the Western Åland data. Fortis stops in three different contexts were analysed with respect to duration: word-initial stops, word-medial stops (in both V:C and VC: syllables) and word-medial stops following nasals and laterals. As explained in the method section (4.5.3.1), there are two sets of data: read speech (subject ES) and unscripted speech (subjects NK, MG and AJ). When necessary, these two sets of data will be discussed separately, but when possible they will be treated as a whole.

An overview of the data will now be presented. As regards word-initial stops in the unscripted data, only stops preceded by a vowel were analysed (i.e., the preceding word ended in a vowel). This was done in order to allow for measurements of preaspiration in word-initial position. For ES’s read speech data, such contexts were not available, and therefore no measurements were made of preaspiration in word-initial stops for that subject.

The unscripted data yielded a total of 222 tokens of intervocalic, word-initial stops. A breakdown of the data is provided in Table 4–17. Of the 222 tokens, 55 are excluded in the following analysis. In 31 of these cases the exclusions were due to frication (i.e., a stop closure was not produced). The remaining cases were excluded for other reasons such
as laughter during production and external noise. Subject MG was particularly prone to producing fricated stop variants, and almost half of his (intervocalic) word-initial stops were produced in this manner. The remaining two subjects produced fricated variants relatively rarely. Since a definite point for the onset of oral closure and opening cannot be established for fricated variants, they cannot be included in measurements of aspiration durations. For ES’s read speech data, none of the 56 word-initial stop tokens were excluded from analysis.

Table 4–17. Overview of the word-initial fortis stop data analysed for the four Western Åland subjects.

<table>
<thead>
<tr>
<th></th>
<th>Unscripted</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MG</td>
<td>AJ</td>
<td>NK</td>
<td>Total</td>
<td>ES</td>
<td></td>
</tr>
<tr>
<td>Stop closure</td>
<td>27</td>
<td>64</td>
<td>76</td>
<td>167</td>
<td>56</td>
<td></td>
</tr>
<tr>
<td>Fricative</td>
<td>22</td>
<td>7</td>
<td>2</td>
<td>31</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Laughter etc.</td>
<td>3</td>
<td>11</td>
<td>10</td>
<td>24</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>52</td>
<td>82</td>
<td>88</td>
<td>222</td>
<td>56</td>
<td></td>
</tr>
</tbody>
</table>

A similar overview of the word-medial stop data is given in Table 4–18. In total, 467 tokens of word-medial fortis stops occurred in the unscripted data. Of these, 73 were excluded from analysis. In 23 cases, a complete stop closure was not made and a fricative stop variant was produced. Again, subject MG produced the largest number of fricated stops. A further 32 cases were excluded from analysis because either stop or preceding or following vowel were produced such that measurements were impossible. A total of 18 cases were discarded because of laughter, external noise, etc. None of ES’s 59 stop tokens was discarded.

Finally, Table 4–19 gives an overview of the data analysed for sequences of nasal + stop + vowel. A total of 196 occurrences of such sequences were obtained from the unscripted data. Fricative variants are less common in these data than in the intervocalic data. For example, MG produced a fricated stop variant in only 5 of his 62 tokens. However, it is apparent that in 66 of a total of 196 cases were produced in such a way as to make reliable durational measurements impossible. This is due almost entirely to the tendency of the subjects to produce the negation
inte ‘not’ without the final vowel. This commonly occurs in many Eastern Swedish dialects. Lastly, 18 cases were excluded from analysis because of laughter, external noise, etc.

Table 4–18. Overview of the word-medial intervocalic fortis stop data analysed for the four Western Åland subjects.

<table>
<thead>
<tr>
<th></th>
<th>Unscripted</th>
<th>Read</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MG  AJ  NK</td>
<td>Total ES</td>
</tr>
<tr>
<td>Stop closure</td>
<td>61  153  180</td>
<td>394   59</td>
</tr>
<tr>
<td>Fricative</td>
<td>18   5   0</td>
<td>23    0</td>
</tr>
<tr>
<td>Incomplete stop</td>
<td>2    10  3</td>
<td>15    0</td>
</tr>
<tr>
<td>Incomplete vowel</td>
<td>4    10  3</td>
<td>17    0</td>
</tr>
<tr>
<td>Laughter etc.</td>
<td>2    4   12</td>
<td>18    0</td>
</tr>
<tr>
<td>Total</td>
<td>87   182 198</td>
<td>467   59 1</td>
</tr>
</tbody>
</table>

Table 4–19. Overview of the data on sequences of word-medial nasal + fortis stop + vowel analysed for the four Western Åland subjects.

<table>
<thead>
<tr>
<th></th>
<th>Unscripted</th>
<th>Read</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MG  AJ  NK</td>
<td>Total ES</td>
</tr>
<tr>
<td>Stop closure</td>
<td>46  22  39</td>
<td>107   20</td>
</tr>
<tr>
<td>Fricative</td>
<td>5    0   0</td>
<td>5     0</td>
</tr>
<tr>
<td>Incomplete stop</td>
<td>0    0   0</td>
<td>0     0</td>
</tr>
<tr>
<td>Incomplete vowel</td>
<td>10   29  27</td>
<td>66    0</td>
</tr>
<tr>
<td>Laughter etc.</td>
<td>1    8   9</td>
<td>18    0</td>
</tr>
<tr>
<td>Total</td>
<td>62   59  75</td>
<td>196   20</td>
</tr>
</tbody>
</table>

4.5.3.5 Duration measurements: results

Figure 4–93(a–d) shows the range of postaspiration durations (measured as mVOT; cf. section 4.1.2) for both word-initial and word-medial stops for all four subjects and in four different contexts (the leftmost distribution in each panel shows word-initial data). The graphs indicate

\[1\] In case the reader wonders how 59 tokens were obtained from two readings of the same text in which no tokens were discarded, it should be explained that some extra tokens were added when the subject repeated a test sentence.
that word-medial postaspirations are generally slightly shorter than word-initial postaspirations for all subjects, but word-medial aspirations are still fairly long. To facilitate comparisons, medians, means and standard deviations are provided in numerical form in Table 4–20.

Figure 4–93(a–d). Range of durations of postaspiration for word-initial and word-medial fortis stops in the Western Åland data. (For an explanation of these box-and-whisker graphs, see footnote to Figure 4–4.)

The mean duration for word-initial postaspiration ranges from 42 to 57 ms. The lowest mean, 42 ms, is from ES’s read speech data. Word-medial postaspiration in V:CV sequences ranges from a mean of 35 to 50 ms, and, again, ES has the lowest mean duration, 35 ms. In VC:V sequences, again, ES has by far the lowest mean duration, 28 ms, while the
range for the remaining subjects is 46–54 ms. In postnasal contexts, however, ES’s postaspiration durations are more similar to the durations of the other subjects.

Table 4–20. Mean, standard deviation (SD), median and number of tokens (n) for postaspirations measured in the Western Åland data. In the leftmost column, #CV indicates word-initial contexts, VːCV and VCːV indicate the respective syllable types in word-medial position, and VNCV indicates postnasal contexts.

<table>
<thead>
<tr>
<th>Syll. type</th>
<th>Subject</th>
<th>Preaspiration dur.</th>
<th>Postaspiration dur.</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean (SD) – Med.</td>
<td>Mean (SD) – Med.</td>
<td></td>
</tr>
<tr>
<td>#CV</td>
<td>MG</td>
<td>4 (9.7) – 0</td>
<td>57 (14.9) – 61</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>AJ</td>
<td>5 (9.2) – 0</td>
<td>55 (16.6) – 57</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>NK</td>
<td>5 (9.9) – 0</td>
<td>50 (14.6) – 47</td>
<td>76</td>
</tr>
<tr>
<td></td>
<td>ES</td>
<td>—</td>
<td>42 (15.0) – 40</td>
<td>56</td>
</tr>
<tr>
<td>VːCV</td>
<td>MG</td>
<td>11 (13.4) – 9</td>
<td>50 (16.9) – 48</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>AJ</td>
<td>8 (10.3) – 6</td>
<td>42 (14.6) – 40</td>
<td>83</td>
</tr>
<tr>
<td></td>
<td>NK</td>
<td>7 (10.5) – 0</td>
<td>51 (19.0) – 46</td>
<td>107</td>
</tr>
<tr>
<td></td>
<td>ES</td>
<td>19 (11.8) – 17</td>
<td>35 (7.4) – 35</td>
<td>34</td>
</tr>
<tr>
<td>VCːV</td>
<td>MG</td>
<td>17 (19.0) – 11</td>
<td>54 (18.8) – 49</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>AJ</td>
<td>16 (14.1) – 14</td>
<td>50 (16.5) – 48</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>NK</td>
<td>8 (11.0) – 6</td>
<td>46 (14.5) – 44</td>
<td>73</td>
</tr>
<tr>
<td></td>
<td>ES</td>
<td>26 (20.4) – 25</td>
<td>28 (8.0) – 28</td>
<td>25</td>
</tr>
<tr>
<td>VNCV</td>
<td>MG</td>
<td>—</td>
<td>54 (16.6) – 50</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>AJ</td>
<td>—</td>
<td>46 (12.2) – 42</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>NK</td>
<td>—</td>
<td>43 (14.6) – 40</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>ES</td>
<td>—</td>
<td>39 (9.5) – 38</td>
<td>20</td>
</tr>
</tbody>
</table>

Within-subject comparisons indicate that the subject who produced unscripted speech have similar postaspiration durations in word-medial positions, irrespective of syllable type (with the exception of AJ’s stops in VːCV sequences). In ES’s data, however, stops in VCːV sequences have much shorter postaspirations than do those in VNCV sequences. Stops in VːCV sequences have intermediate durations.

Figure 4–94(a–d) shows the range of preaspiration duration for the Western Åland subjects. For each subject, the leftmost box shows the range of durations for word-initial stops, the middle box shows the range
for word-medial stops in V:C syllables, and the rightmost box for word-medial stops in VC: syllables. (Note, however, that word-initial preaspiration duration is not available for subjects ES). Medians, means and standard deviations are provided in Table 4–20.

![Figure 4–94(a–d). Durations of preaspiration for word-initial and word-medial fortis stops in the Western Åland data. The scale of the figures extends to 120 ms so that these graphs be directly comparable to other graphs in this section.](image)

Preaspiration durations are fairly short for all three contexts. In the unscripted data (i.e., subjects MG, AJ and NK), word-initial preaspirations are by far the shortest, with a mean duration of 4–5 ms. Preaspiration duration seldom exceeds 40 ms, and for all three subjects the median is 0, indicating that most instances have no preaspiration whatsoever.
For word-medial contexts data are available from all four subjects. In VːC syllables, the three subjects who produced unscripted speech have mean preaspiration durations ranging from 8 to 11 ms, while subject ES has a mean duration of 19 ms. In VCː syllables the unscripted speech subjects have mean preaspiration durations of 8–17 ms, which are shorter than ES’s mean duration of 26 ms.

As regards voicing conditions preceding the occlusion phase in sequences of nasal + stop, there is little indication of voiceless nasality. Therefore, no analysis of the timing relations in voice offset and stop occlusion is provided here.

4.5.3.6 Summary and discussion

It was shown in section 4.2.4 that the Central Standard Swedish (CSw) speakers have a much greater difference in duration between word-initial and word-medial postaspirations than the Western Åland subjects. In the CSw data (cf. section 4.2), word-initial stops (tennis type words) have mean postaspiration durations ranging from 44 to 58 ms. Word-medial stops (båten and vatten type words) have mean postaspiration durations of 20–32 ms. In a third group of words, the taverna type, which have a word-initial stop in a lexically unstressed syllable, the initial stop has mean postaspiration durations ranging from 40 to 58 ms. In CSw, therefore, word-initial position as such induces postaspiration in stop consonants (cf. discussion in 4.2.4). The fact that a syllable is unstressed does not, in itself, lead to unaspirated stop production.

In the Western Åland data, we observe relatively small differences between postaspiration in word-initial and word-medial stops, at least for the unscripted speech data. Certainly, these differences are much smaller than in CSw. Unlike CSw, these durational differences in the Western Åland dialect can be attributed to stress differences. In fact, the duration of word-medial postaspiration in the Western Åland data seems to be directly comparable to that in CSw taverna type words, i.e. word-initial stops in unstressed syllables.

Words referred to as taverna type words in the CSw data occur very infrequently in the Western Åland data. Therefore, such words are not discussed specifically for the Western Åland dialect.
The results from the Western Åland durational measurements are in accordance with the auditory impression that ON word-medial \( p, t, k \) are reflected as postaspirated stops in the Western Åland dialect. Auditorily, the word-medial postaspirations in the speech of subjects AJ and NK appear to be “stronger” or more “prominent” than those of Northern Icelandic. The postaspirations of subjects MG and ES are more similar to what one normally hears in the Northern Icelandic dialect.

Considering the fact that both AJ and NK generally produce shorter postaspirations than MG, it may seem strange that their postaspirations could be more auditorily salient. However, as noted above, voice offset and onset times are unlikely to be the only determinants of the prominence of the aspiration percept. Thus it is possible that AJ and NK utilise some means besides modal voice onset time to achieve the aspiration percept to a greater degree than does MG.

In general, ES’s postaspiration durations are shorter than for the remaining three Western Åland subjects, despite the fact that ES’s data are from read speech in contrast to the data for MG, AJ and NK that come from unscripted spontaneous speech. The difference is stronger in the duration of word-medial intervocalic stops than in the other syllable types, and, in fact, many of the word-medial stops do not yield a strong aspiration percept.

The impression that ES produces stops in a way similar to Northern Icelandic speakers may have to do with the fact that her postaspiration durations in VC: syllables are shorter than those in other contexts, and that she tends to produce preaspirated variants instead, or to have both preaspiration and postaspiration simultaneously. Since the Northern Icelandic dialect has preaspiration in VC: syllables, whereas postaspiration is the rule in other contexts, ES comes much closer to the Northern Icelandic norm than do the other Western Åland subjects.

The production of simultaneous preaspiration and postaspiration, especially notable in ES’s VC:V sequences, seems to be typologically unusual. In ES’s speech, both preaspiration and postaspiration duration in VC:V sequences are quite variable. Some instances have both preaspiration and postaspiration, as in the example in Figure 4–95. Other
instances may have preaspiration only, or postaspiration only, and in a few cases there is very little aspiration of either kind.

Figure 4–95. Subj. ES: [...är] vatten [en…] ‘…is water a…’

Figure 4–96. Subj. ES: [...den] tappre [riddaren…] ‘…the brave knight…’

A comparison of ES’s preaspiration and postaspiration durations suggests that although the relative contributions of preaspiration and postaspiration differ, the total amount of aspiration duration is similar for both VːC and VCː syllables. This is demonstrated in Figure 4–97(a–b). The graph on the left represents aspiration durations in VːCV sequences, and the graph on the right VCːV sequences. The leftmost box in each graph represents preaspiration duration and the middle box represents postaspiration duration. In VːCV sequences, preaspiration contributes less to the voicelessness surrounding the occlusion than does postaspiration (\(\bar{x} = 19\) ms and 35 ms respectively). In VCːV sequences, preaspiration and postaspiration contribute roughly equally to the voicelessness surrounding the stop occlusion (\(\bar{x} = 26\) ms and 28 ms respectively—this does not mean, though, that each individual case will have equal amounts of preaspiration and postaspiration). In the rightmost box in each graph, preaspiration and postaspiration duration have been combined, and, thus, the total amount of aspiration surrounding the stop occlusion is indicated. As it turns out, despite the fact that the relative contributions of preaspiration and postaspiration differ, both types of sequence, VːCV and VCːV, have the same total amount of aspiration (\(\bar{x} = 54\) ms). This kind of
trade-off effect between preaspiration and postaspiration has not been observed for any other subject in the data analysed in this work.

![Graph showing preaspiration and postaspiration duration for fortis stops in VːCV and VCːV sequences in ES’s read speech data.](image)

Figure 4–97(a–b). Preaspiration and postaspiration duration for fortis stops in VːCV and VCːV sequences in ES’s read speech data (further explanation in text).

A possible explanation is that the peculiarities of ES’s stop production are the result of dialect mixture. As we have seen, many Central Standard Swedish speakers tend to preaspirate stops in VCː syllables, and, to a lesser degree, in VːC syllables. Postnasal stops are not preaspirated, however. If ES is being influenced by Central Standard Swedish preaspirations, they should primarily affect her production of stops in VCː syllables, and perhaps to a lesser degree in VːC syllables, but nasal + stop sequences should be unaffected. This is the pattern we observe in her speech.

What may speak against such an explanation is ES’s production of word-medial fortis stop + sonorant clusters, in which there does not seem to be as strong a tendency for preaspiration and in which the sonorant is typically voiceless (cf. the production of such a sequence in Figure 4–96). This gives the auditory impression of a postaspirated stop, rather than the CSw unaspirated or preaspirated percept.
4.6 Summary and conclusions

The survey of the phonological distribution of preaspiration (Chapter 3) and of their phonetic expressions in four sets of data (Chapter 4) provides a basis for the discussion of how the fortis vs. lenis contrast was expressed in earlier times, i.e., in Old Norse (ON). The main conclusions from these two chapters can now be summarised:

1. The ON contrast between fortis vs. lenis stops is maintained in all the dialects considered here. In fact, these contrasts are maintained in virtually all mainland Scandinavian dialects.

2. The phonological distribution of preaspiration is highly dialect-specific. No two dialects exhibit exactly the same pattern of distribution, especially when one considers the development of clusters. Still, in all dialects that have normative preaspiration, the ON geminate fortis stops are reflected as postaspirated.

3. Phonetically, the stop contrasts are expressed in a variety of different ways in the dialects considered, involving preaspirated, unaspirated, postaspirated and voiced variants. There is no simple one-to-one relationship between phonetic expression and the fortis ~ lenis categories.

The following discussion draws together and summarises the findings from the surveys in Chapters 3 and 4. We shall first consider the fate of the ON lenis stops and then turn our attention to the fortis stops. The reader may find it helpful to consult the various tables presented in Chapter 3, especially Table 3–13, which contain an overview of the reflexes of ON stop contrasts in many of the dialects considered here. The map in Figure 1–1 should also be useful.

It is assumed here that in its early period (700–900 AD) ON had a fortis vs. lenis stop contrast in word-initial position. In word-medial position, it is assumed that there was a phonological contrast in V(ː)C: syllables and not in V(ː)C syllables, i.e., for geminate stops and not for singletons (cf., e.g., Haugen 1982 for an overview of the presumed phonological organisation of ON). This phonological organisation is preserved in Southern Icelandic and some Faroese dialects (specifically Areas 1 & 2, cf. Ch. 3, sect. 3.3). However, in mainland Scandinavian

\[1\] Through the introduction of loan words, a fortis vs. lenis distinction can be made in V:C syllables in both Northern Icelandic and Area 1 Faroese.
the ON word-medial voiced fricatives, -ð- and -g- (i.e., *[ɣ]), are usually reflected as stops.\(^1\) Therefore, in the dialects of Norwegian and Swedish, the stop systems are typically more “regular” in that a contrast is made between fortis and lenis stops both word-initially and medially, and in both VC: and V:C syllables.

In mainland Scandinavia, most dialects have been described as having voiced lenes in both word-initial and word-medial positions. Seemingly, the only exceptions are the dialects of Jæren in South-Western Norway and the dialects of Northern Uppland, including Gräsö, in which the ON lenes are (or, perhaps, used to be) reflected as voiceless, or partially voiceless, both word-initially and word-medially. We should note here that the dialects of Gudbrandsdalen, Härjedalen and Kökar, in which preaspiration is found, do not seem to have voiceless lenes.\(^2\)

According to most accounts, the ON lenis stops are reflected as voiceless and unaspirated in both Southern and Northern Icelandic. Area 1 and Area 2 Faroese generally reflect the ON lenes as voiceless unaspirated as well, while Area 3 Faroese reflects them as voiced (as far as can be judged from extant accounts).

The data reviewed in Chapter 4 can be used to complement the picture of the reflections of ON lenis stops presented so far, although, as we shall see, it does not change it to any appreciable degree. First we consider reflexes of ON word-initial lenes. When these occur in utterance-initial position, the Faroese subjects reflect them as voiceless unaspirated. This is also the case for at least two of the Gräsö subjects. The CSw and Åland subjects tend to have a voicing lead in their utterance-initial lenes when the word is a content word, but tend more towards voicelessness in function words. In voiced contexts (i.e., when preceded by a voiced segment), the word-initial lenes have a stronger voicing tendency in all the languages examined. Voicing is quite categorical in the CSw and Åland data, in which no examples of voiceless word-initial lenes in voiced contexts are found. The CSw and Åland data also show

\(^{1}\) This is a rather gross simplification, since there is actually a great deal of variation in the way these fricatives are reflected in different dialects.

\(^{2}\) Note, though, Hesselman’s statement about “final” lenes in the Gudbrandsdalen dialects (cf. Ch. 3, sect. 3.4.2).
that the ON word-initial lenes have a certain tendency to be reflected as voiced fricatives or approximants, especially in intervocalic context. In Faroese, word-initial lenes in voiced contexts are more varied in terms of voicing. There are numerous examples of fully voiced word-initial lenes, something not reported in previous research, and one also finds a large number of half-voiced and fully voiceless variants. We should be reminded, again, that the unscripted (spontaneous) data used here probably reflect the range of variability found in the production of stops to a greater extent than does the “lab-speech”\(^1\) data used in most previous research on these languages and dialects.

The ON word-medial geminate lenes (i.e., ON lenes in \(V(:)C:\) syllables) are reflected as fully voiced in the CSw and the Åland data, and there is no particular tendency to produce these as voiced fricatives, although this does sometimes occur. In Faroese and again for at least two Gräsö subjects, these stops are usually reflected as voiceless unaspirated. Typically, however, there is some voicing at the onset of the stop, and if the stop is fairly short it may be voiced throughout.

As mentioned earlier, the word-medial lenis stops in Norwegian and Swedish \(V:C\) syllables have their origins in ON \(\delta\) and \(*\gamma\), and are therefore not direct reflexes of ON lenes. These are reflected predominantly as voiced stops, fricatives or approximants in the CSw and Åland data (cf. also Engstrand & Lacerda 1996). The word-initial lenes and the word-medial singleton lenes are therefore similar in this respect. Note that the word-medial stops in Southern Icelandic and Faroese usually identified as “lenis” stops have their origin in the ON word-medial “fortis”\(^2\) stops, \(p, t, k\). Despite their different origins, there is little auditory difference between the Gräsö lenes (\(<\) ON \(\delta\) and \(*\gamma\)) and the Faroese and Icelandic lenes (\(<\) ON \(p, t, k\)).

Let us now consider the ON fortis stops and their reflexes. In the data considered for Chapter 4 it is evident that stops deriving from ON word-initial fortis stops tend to be quite strongly postaspirated. My own

\(^1\) Typically, “lab-speech” involves the reading a list of target words or syllables in isolation or in frame sentences.

\(^2\) This use of quotation marks serves as a reminder that there was, in fact, no fortis vs. lenis contrast in such contexts in ON.
impressionistic observations of the production of such stops in different parts of Scandinavia\textsuperscript{1} suggest that this is the case for practically all dialects descending from ON. As far as can be seen, unaspirated word-initial fortes are found only in Finland-Swedish dialects, a fact that can probably be ascribed to contact with Finnish, in which postaspiration appears to be normatively absent in simple stops all word positions.

We turn now to the reflexes of ON word-medial geminate fortis stop (indicated graphemically through $\textit{pp}$, $\textit{tt}$, $\textit{kk}$) and the singleton “fortes” (indicated through $p$, $t$, $k$). The use of quotation marks in the latter case underlines the fact that the singleton stops did not have a lenis counterpart in ON, and therefore the designation “fortis” is based on graphemic identity rather than the presence of a contrast.

Both the singletons and the geminates are reflected variably as voiceless unaspirated or preaspirated in CSw. These observations are corroborated by recent research on Swedish and Norwegian dialects, in which it has been shown that a tendency to preaspirate is present for many speakers of different dialectal backgrounds (van Dommelen 1998, 1999, 2000; Wretling, Strangert & Schaeffler, 2002; Tronnier 2002; see also discussion in sect. 3.6). In this way the tendency to preaspirate, although it is not normative, permeates Scandinavian stop production.

One should keep in mind, though, that the production of these stops in CSw usually results in a release burst and varying degrees of postaspiration (usually quite modest, especially in auditory analysis). This becomes significant in our analysis of the possible mechanisms of change that led to the current distribution of stop contrasts in the Nordic languages (see Ch. 5).

A number of languages and dialects in which the ON word-medial fortes are reflected as normatively preaspirated were discussed in considerable detail in Chapters 3 and 4. It was found that ON geminate fortes are reflected as normatively preaspirated in Icelandic (both Northern and Southern), Faroese (all dialects), the Jæren and Gudbrandsdalen dialects in Norway, the Härjedalen and Gräsö dialects in Sweden and the Kökar

\textsuperscript{1} For Swedish I have made observations of speakers with very different geographical backgrounds, from North to South and West to East. As for the Norwegian speakers I have observed, I have been exposed to less data and have less accurate information regarding their geographical background.
diacritic in the Åland archipelago. Thus, in all the Nordic languages and
dialects that have normative preaspiration, the ON word-medial
geminates are reflected as preaspirated. And, as it turns out, this is the
only aspect of the phonological distribution of preaspiration that all these
dialects have in common.

By contrast, the ON singleton fortis are reflected as normatively
preaspirated only in Area 1 Faroese and the Swedish Gräsö dialect.
Actually, these stops are in some cases reflected as preaspirated in the
Hede and Funäsdalen dialects in Härjedalen as well as in the Kökar dia-
lect, but only when the stop has undergone lengthening (i.e., in syllables
that have developed into VC: from an older VC. In the Hede and Kökar
dialects, preaspiration turns up only if such a lengthened stop occurs in
word-final position. Unless preaspiration was already normative in ON,
this indicates that preaspiration became normative in fortis geminates in
these dialects already before the quantity change from VC to VC: oc-
curred. Such issues are discussed further in Chapter 5.

Intimately linked with preaspiration is sonorant voicelessness. We
should begin by noting that voiceless sonorants in \( r + p, t, k \) as well as \( lt \)
sequences are far more widespread than in \( m, n + p, t, k \) sequences. All
the dialects that have normative preaspiration have normatively voiceless
sonorants in \( r + p, t, k \) and \( lt \) sequences. However, as we can infer from
the map in Figure 4–98, normative voicelessness in \( lt \) and \( r + p, t, k \) se-
quences (marked as 2 or higher on the map) is\(^1\), in fact, found in all dia-
lects north of a line that crosses Sweden and Norway from east to west,
as well as the dialects in the southwesternmost tip of Norway (Hansson
1999). Thus, a large number of dialects in Scandinavia reflect ON
\( r + p, t, k \) and \( lt \) sequences with a normatively voiceless sonorant but still
do not have normatively preaspirated stops.

By contrast, normative voicelessness in \( m, n + p, t, k \) sequences is ex-
clusive to those dialects that have normative preaspiration. In fact, of all
the dialects that reflect the ON geminate fortis as normatively preaspi-
rated, only two fail to reflect an ON \( m, n + p, t, k \) sequence as a (par-
tially) voiceless nasal and a voiceless unaspirated stop. These are the
Gudbrandsdalen dialect in Norway and the Northern Icelandic dialect.

\(^1\) Or, at least, was at the time that the descriptions used as a basis for this analysis.
The Northern Icelandic dialect is, in fact, quite unusual in that ON $m, n + p, t, k$ sequences are reflected with a voiced nasal and a postaspirated stop. Reflexes of ON singleton fortis are also postaspirated in the Northern Icelandic dialect, but the ON geminate fortis are preaspirated. Thus Northern Icelandic reflects the ON word-medial fortis variably as normatively preaspirated or normatively postaspirated, depending on context.

Two further dialects that reflect word-medial fortis as postaspirated have been brought to light in Chapter 4. First, it was pointed out that Of tedal, in his description of the Jæren dialect in Norway, mentions specifically that the adjacent dialects in Bjerkreim and Dalane have postaspirated stops in exactly those places in which the Jæren dialect has preaspirated stops. Thus, judging by Of tedal’s description, all ON fortis stops, word-initial and word-medial, long and short, are reflected as postaspirated in the dialects of Bjerkreim and Dalane.

Oftedal's remarks are all the more interesting in light of data from the dialect of Western Åland analysed in Chapter 4. In this dialect, it seems
clear that ON \( m, n + p, t, k \) sequences are reflected with a voiced nasal and a postaspirated stop. The data on other word-medial fortes are less conclusive, but it is clear that in the Åland dialect there is a much stronger tendency for the ON word-medial fortes to be reflected as post-aspirated than in CSw.

In Chapter 4, we have looked at stop production in five different Nordic language communities. The focus of attention has been on the production of fortis stops in word-medial position. In Faroese, Icelandic and the Gräsö dialect we find, as we would expect from the literature, that such stops tend to be preaspirated, although the exact phonological conditioning of the preaspiration varies. We also find that the corresponding lenis stops tend to be voiceless or half-voiced.

The findings for Central Standard Swedish (CSw) are more unexpected. To be sure, the fact that Swedish speakers tend to preaspirate has been noted previously (Rositzke 1940, Gobl & Ni Chasaide 1988, Fant et al. 1991). However, the data show that two of the four CSw speakers use preaspiration consistently as a phonetic correlate in sequences of a vowel and a fortis stop. Also, a comparison of the durational data for CSw (see section 4.2.3.2, Figure 4–8) and Faroese (see section 4.3.2.4, Figure 4–45) shows that, in terms of the timing relations between glottal and supralaryngeal gestures, the preaspirating CSw speakers do not differ greatly from the Faroese speakers.

This is not to say that preaspirations in CSw are as auditorily salient as in Faroese. As we have seen, Faroese speakers tend to enhance the preaspiration percept by adding supralaryngeal friction (section 4.3.3). This tendency is not prominent in the CSw data. It should also be added that the durational tendencies reported here pertain to unscripted (spontaneous) speech. It is possible that in other stylistic registers, for example when reading, CSw speakers may not produce preaspirations to the same degree as in more casual speech styles. In Faroese speakers, however, preaspiration is less likely to be affected by speaking style.

From the point of view of temporal organisation, then, the difference in character between preaspiration in CSw and in Faroese is one of degree rather than of nature. Also, the preaspirations are perceptually salient in both languages—although probably more salient in Faroese than
in CSw—and it has been shown that preaspiration can be employed as a cue in stop perception by all speakers, not merely those who tend to produce preaspiration (van Dommelen 1998).

In brief summary, then, Chapter 3 gives a fairly detailed account of the known geographical spread of preaspiration in Northwestern Europe. The stop systems of several dialects in which preaspiration occurs are analysed and the stop contrasts in different contexts are described in terms of voicing conditions. This account is based, to a large extent, on descriptions provided in dialectological literature from the late 19th and early 20th centuries. Chapter 4 considers the phonetic variation and durational characteristics of stop production in four Nordic dialects. Two of these dialects, Tórshavn Faroese and Gräsö Swedish, have normative preaspirated stops in word-medial position that show a high degree of phonetic variation. Western Åland Swedish was also considered, and here stops were found to be postaspirated where Gräsö Swedish has preaspirated variants. This type of development is known to occur in only two other (fairly small) Nordic language communities. One further dialect considered, Central Standard Swedish, has traditionally been described as having voiceless unaspirated or postaspirated stops. The data show, however, that some speakers regularly employ preaspiration as a means of expressing the fortis stop category. This is referred to here as non-normative preaspiration.

The results of the survey in Chapters 3 and 4 suggest an even greater diversity in Nordic stop production than has hitherto been assumed. This diversity provides a basis for a reinterpretation of the phonetic expression of ON stop contrasts. Specifically, this reinterpretation involves the possibility that ON fortis stops had non-normative preaspiration and may have been produced in much the same way as in CSw today. It will thus be argued that the simplest way to account for the observed diversity is to assume that a stop production similar to that which we find for CSw fortis stops today provides the most favourable phonetic preconditions for the patterns of stop production in the Nordic languages. Also, the similarity in nature between the normative preaspirations of Faroese and the non-normative preaspirations of CSw leads to the suggestion that the step from non-normative to normative preaspiration may occur as a
gradual process rather than a leap of phonological reorganisation. This proposal will be explored further in Chapter 5.
5 FROM OLD NORSE TO THE PRESENT

5.1 Introduction

One of the main aims of this last chapter is to attempt a reconstruction—to the extent that this is feasible and possible—of the phonetic expression of stops in Proto-Nordic (henceforth PN). PN is used here to refer to the ON language during the period around 800 AD, at which time the western–eastern split of North Germanic was already in progress.¹ This reconstruction of the PN stop system has to take several facts into account:

1. Across the Scandinavian peninsula there is a non-normative tendency for preaspiration in the realisation of word-medial fortis stops.

2. Concomitant with the production of word-medial fortis stops is a fairly constant postaspiration, which, in CSw, is generally 20–40 ms long² (cf. Ch. 4, section 4.2.4). In this sense, a tendency for postaspiration is also present in the word-medial fortes.

3. In the area in which Nordic languages are spoken one finds both normative preaspiration and normative postaspiration.

4. Where found, the detailed phonological distribution of normative preaspiration varies greatly—none of today’s dialects have exactly the same pattern of distribution.

5. From a typological perspective, preaspiration seems to be extremely rare. By comparison, postaspiration is fairly common.

It is suggested here that the simplest way to account for all these facts is to assume that the type of variation in the productions of fortis

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¹ The terminology regarding different time frames within ON is exceedingly confusing. My use of Proto-Nordic complies with the terminology used in recent literature by Scandinavian linguists (cf., e.g., Bandle, in press). In the present context, PN is largely interchangeable with the more traditional term Old Scandinavian.

² Measured as mVOT (cf. Ch. 4, section 4.1.2).
stops that we find in, for example, Central Standard Swedish (CSw) was already present in PN. Essentially, then, it is proposed that in most of Scandinavia, the realisation of fortis stops has not changed much over the last 1500 years. We should therefore see the present tendency for pre-aspiration as a stable phonetic pattern rather than a transient phenomenon or an anomaly.

Importantly, the presence of non-normative preaspiration and post-aspiration provides the phonetic preconditions necessary for the development of normative preaspiration and postaspiration. The role of such preconditions for sound change has been emphasised by, for example, Ohala (e.g., 1993) and Engstrand et al. (1998). It is further posited that the development of normative preaspiration has taken place relatively independently in the different dialects. The reason is that this seems to be the most straightforward way to account for (i) the cross-dialectal diversity of the phonological distribution of normative preaspiration, (ii) the close agreement between the observed durational characteristics of non-normative preaspiration and the phonological distribution of normative preaspiration, and (iii) the existence of dialects that have developed normative postaspiration instead of preaspiration. As regards preconditions for change, it can be pointed out that the linguistic literature offers several examples of genetically related languages or dialects that undergo similar changes even though they have not been in contact for some time (Sapir 1927:171ff, Dixon 1997:14).

A second question addressed in this last chapter emerges from the scenario described above: exactly how does a transition from non-normative to normative preaspiration occur? Or, for that matter, from non-normative to normative postaspiration? It will be suggested that an explanation can be obtained by seeing phonetic variation as dynamic over time and bound not only by physiology or system internal pressures, but also by convention. As a consequence, phonetic variation can be expected to expand and/or contract over time. A phonetic change can occur as a result of an expansion of phonetic variation (such that the variation covers an increasing volume in “phonetic space”) followed by a contraction of phonetic variation to a different locations in phonetic space. This will be referred to as the E/C (expansion/contraction) model.
Some thoughts will also be offered on the issue of “preservation of contrast”. It will be suggested that maintaining phonological contrast is less demanding in terms of speech production than are maintaining sociolinguistic identity and conveying paralinguistic information. Therefore, rather than seeing the maintenance of phonological contrast as a primary aim of speech production, we should turn our attention to the factors behind phonetic variation.

5.2 Old Norse stop production

As reconstruction and written sources suggest, a distinction was made between two stop series in most contexts in ON. These two stop series are commonly referred to as fortis and lenis stops. There is a wealth of written sources from the Old Icelandic (OI) period (written between approximately 1150–1400) which, with regard to the consonant system, is generally taken to be largely representative of the phonological distinctions of ON in older periods. The following account summarises, in brief, the phonological distinctions that are likely to have existed in ON (for further discussion, see, e.g.: Benediktsson 1972:165ff; and Haugen 1972:34ff, 1982:57ff). The graphemic representations are given in normalised ON orthography. In the manuscripts the orthographic distinctions may be indicated in other ways, but the important point is that such distinctions were indicated.

In OI manuscripts, the fortis series was expressed graphemically with $p, t, k$ in word-initial position. For the word-initial lenes, $b, d, g$ were used. In word-medial and word-final postvocalic positions, a distinction between two series was made only in $V(ː)C$ syllables, i.e., syllables in which the stop was long. This difference was expressed graphemically through $pp, tt, kk$ vs. $bb, dd, gg$. However, the sources indicate that only one stop series occurred in $V(ː)C$ syllables, and thus there was not a contrast between two stop series for phonologically short stops. These stops were written as $p, t, k$, but this graphemic notation should not automatically be taken to indicate that they were phonetically equivalent to $p, t, k$ in other contexts, e.g. the geminates. The graphemes $ð$ and $g$ are

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1 This representation is normalised orthography. In the manuscripts the difference may be indicated in other ways, but the important thing is that a difference was indicated.
both found in V(ː)C syllables, but are thought to have indicated voiced fricatives rather than stops.\footnote{In Old Icelandic manuscripts one also finds \textit{d\textcircled{}} and \textit{ð\textcircled{}} is much more common (especially in early manuscripts) and is used as the basis for a normalised orthography.} An overview of the posited phonological contrasts is given in Table 5–1.

Table 5–1. Overview of the stop contrast of ON in terms of graphemic distinctions. Note that the characterisation of the word-medial singleton series as being \textit{fortis} simply reflects the fact that these stops were written with \textit{p}, \textit{t} and \textit{k}. The parenthesised $-g-$ probably did not represent a stop (further discussion in text).

<table>
<thead>
<tr>
<th></th>
<th>Word-initial</th>
<th>Word-medial &amp; -final postvocalic</th>
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<tbody>
<tr>
<td></td>
<td>Singleton</td>
<td>Geminate</td>
</tr>
<tr>
<td>\textit{Fortis}</td>
<td>\textit{p-}</td>
<td>\textit{-p-} \textit{-t-} \textit{-k-}</td>
</tr>
<tr>
<td>\textit{Lenis}</td>
<td>\textit{b-}</td>
<td>\textit{bb-} \textit{-tt-} \textit{-kk-}</td>
</tr>
</tbody>
</table>

A graphemic distinction was also made between two types of nasal + stop clusters (e.g: \textit{-mp-} vs. \textit{-mb-}; \textit{-nt-} vs. \textit{-nd-}; \textit{-nk-} vs. \textit{-ng-}), which is thought to have reflected a stop contrast (i.e. \textit{b}, \textit{d}, \textit{g} were not produced as voiced fricatives). However, comparative evidence suggests that similar distinctions in graphemic clusters of liquid + stop (e.g: \textit{-rk-} vs. \textit{-rg-}; \textit{-lk-} vs. \textit{-lg-}) are less likely to have represented stop contrast, and \textit{-d-} and \textit{-g-} were probably produced as voiced fricatives. Still, \textit{lt} vs. \textit{ld} probably constituted an exception involving a genuine stop contrast, at least in PN.

As yet, we have not assigned much phonetic content to these stop distinctions. In the following sections we will first examine earlier suggestions as to the pronunciation of stops in ON. Then, the essential information on the modern reflexes of lenis and fortis stops will be recapitulated. Finally, based mainly on synchronic data, some suggestions will be made as to how these stop contrasts were expressed phonetically in different contexts in PN period.

5.2.1 The ON fortes in earlier descriptions

There is an apparent tacit assumption among many scholars in the field of ON that the ON stops were produced largely in accordance with
their orthographic presentation. Thus, it seems to be generally assumed that the ON lenes were voiced in all positions, word-initially and word-medially. The fortes are often assumed to have been “aspirated,” although the phonetic nature of this aspiration is rarely stated explicitly.

Scandinavian linguists have generally believed that, in Norwegian and Swedish, the difference between word-initial and word-medial fortis stops (e.g., Sw. \textit{tar} ‘takes’ vs. \textit{hatar} ‘hates’) is a question of degree of postaspiration, and ultimately a function of stress (cf. discussion in Ch. 1, section 1.1). Although this is seldom discussed explicitly, it seems that a similar interpretation has been applied to ON as well. Thus, it appears to be commonly assumed that the fortis stops of ON were postaspirated, and that the degree of aspiration depended on stress in the same way as has been assumed to be the case in Swedish and Norwegian.

The data from CSw reviewed in Chapter 4 suggest that such a view of the production of fortis stops in Swedish and Norwegian is inaccurate. In fact, the essential difference between word-initial and word-medial stops in Scandinavian is neither a question of degree of postaspiration nor of stress. This claim is supported by the following two empirical observations: (i) when present, the aspiration of word-medial fortes takes the form of preaspiration rather than postaspiration, and importantly, many speakers tend neither to preaspirate nor postaspirate their word-medial fortes to any significant degree; and (ii), to be sure, a fortis stop that occurs before a stressed vowel in Swedish or Norwegian is always postaspirated and, in this sense, postaspiration is conditioned by stress. However, a word-initial fortis stop is also always postaspirated, even if the vowel that follows is unstressed (cf. Ch. 4, section 4.2.4).

1 The word-medial, postvocalic grapheme \textit{g̃} is thought to have indicated a fricative and not a stop.
2 However, cf., e.g., Lindroth (1927), Marstrander (1932) and Steblin-Kamenskij (1957; cited in Hansson 1997:85) regarding doubts that the ON word-medial fortis stops were postaspirated.
3 This situation has most likely come about in the following way. In ON, stress was invariably initial, as it still is in Icelandic. Given that in ON, word-initial fortis stops were postaspirated and word-medial stops were unaspirated or preaspirated, postaspiration in ON was associated with both stress in the following vowel and word-initial position. With the arrival in Swedish of loan words with medial or final stress, postaspiration continued to be associated with both stress in the following vowel and word-initial position, even though these no longer cooccurred. Thus, in a word like
Some Icelandic linguists seem to have modelled their ON stop “ideal” on the Northern Icelandic dialect, rather than on Norwegian or Swedish—or Southern Icelandic, for that matter. This can be deduced from the tendency to view the Northern Icelandic dialect as more “original” than the Southern dialect (Böðvarsson 1951, Árnason 1986). Unlike Norwegian and Swedish, the Northern Icelandic dialect has “true” post-aspiration in its word-medial singleton fortis stops, although the geminates are preaspirated. Thus, the ON orthographic representation appears to be better matched by the phonetic “surface forms” of Northern Icelandic than, for example, Southern Icelandic.

We now have evidence of dialects with even “purer” postaspiration than Northern Icelandic. In the Western Åland dialect all ON fortis stops, even the word-medial geminates, are reflected as postaspirated (cf. Ch. 4, section 4.5.3). This is apparently also the case in the areas of Bjerkreim and Dalane in South-western Norway (cf. Ch. 4, section 4.5.2). One could argue that these dialects preserve the original ON pronunciation, postaspirated fortis stops that are free of any preaspiration.

The problem with this idea is: If ON had normative postaspiration on all stops, initial and medial, then why are such stops so rare in Scandinavia today? In the Nordic languages, normative word-medial post-aspiration is known only in three relatively small areas. In fact, areas with normative preaspiration outnumber the areas with normative post-aspiration. In the remainder of Scandinavia, the tendency for non-normative preaspiration seems much stronger than the tendency for post-aspiration. From a typological perspective, it seems counter-intuitive that the relatively unmarked feature of postaspiration has almost entirely given way to the very marked feature of preaspiration, even if this preaspiration is non-normative.

While this issue, as such, has not been considered previously, objections have still been raised, on completely different grounds, against the portrayal of the ON stop system as contrasting postaspirated vs. voiced stops. Chapman (1962) observed that the geographical distribution of

Sw. terräng ‘terrain,’ even though the stress is on the second syllable, the word-initial stop is still aspirated. Likewise, in a word like metall ‘metal,’ also with the stress on the second syllable, the stop is postaspirated even though it is not word-initial.
dialects with (normative) preaspiration indicated a pattern of retention rather than innovation (see also Salmons 1992:129–131 for a more systematic review of the issue). Thus, a straightforward way to account for the wide spread of dialects with (normative) preaspiration would be to assume that it was (i) present in earlier times, (ii) that it has disappeared in most of the Nordic language speaking area, and (iii) that it has been retained in a few geographically isolated or peripheral parts.

However, the idea that preaspiration was already present in ON is not a new one. Marstrander (1932) suggested that the early PN clusters *mp, *nt, *ht1, and *nk became preaspirated geminate stops (i.e. *[hp], *[ht] and *[hk]) in some dialects. In other dialects (specifically most Eastern Scandinavian dialects) the nasal + stop sequences were retained, and in still other dialects the preaspirated geminates lost the preaspiration and became simple geminates. Marstrander proposed that ON geminate stops with sources other than the clusters enumerated above became preaspirated through the influence of these new preaspirated stops, perhaps because this provided a better distinction between the geminate and the singleton fortes.

However, in light of the evidence now available, Marstrander’s account, although phonetically sound (cf., e.g., Matisoff 1975), appears untenable. First, there are dialects in which nasal + fortis stop sequences have been retained but which still have preaspirated stops, for example Gräsö & Kökar (cf. Ch. 3, sections 3.5.3–4; cf. also Hansson 1997:101–2).2 Also, Marstrander’s explanation cannot account for the fact that in some dialects, i.e. Faroese (Area 1) and Gräsö, the ON singletons are reflected as preaspirated. As noted, Marstrander’s ideas were later taken up by Chapman (1962). More recently, Page (1997) has, considering a wider range of Nordic data, revived the proposal and drawn comparisons with similar developments elsewhere, especially in Algonquian and Bantu languages. The fundamental problems of Marstrander’s original proposal, however, are not addressed.

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1 Which was probably produced as [xt].
2 Why Marstrander did not consider the Kökar dialect, which had been described in considerable detail by Karsten (1892), is not clear.
On a quite different note, Liberman (e.g., 1982) has proposed that preaspiration is essentially an accentual phenomenon, the origins of which may go as far back as to Proto-Germanic. He describes preaspiration as a “phonologically relevant breathed reinforcement” (1982:98). A breathed reinforcement, in turn, is a prosodic unit that can occur in most (or all?) postvocalic contexts, and Liberman suggests that the ON lenis and fortis geminates alike were produced with such breathed reinforcements. In Liberman’s account, breathed reinforcements came to be interpreted as preaspirations (i.e., segmental rather than prosodic units) after the voiced lenes became voiceless. This is at least the way I interpret the following passage:

The Icelandic weakening of plosives resulted in the phonematic coalescence of such words as labba and lappa. After the merger of postvocalic /pp/ and /bb/ preaspiration became fixed before one type of consonant only. In Icelandic it was retained before original /pp tt kk/ and began to signal the position at which formerly phonologically voiceless stops had occurred. The absence of preaspiration came to signal the position of former voiced plosive phonemes.

(Liberman 1982:268)

A thorough critique of Liberman’s approach is provided in Hansson (1997:104ff). Here, suffice it to say that Liberman offers little in terms of detailed phonetic analysis or explanation of “breathed reinforcements.” Also, to explain why there are Nordic dialects that have voiced lenes and still have preaspirated stops, a different scenario than that proposed by Liberman would be required.

A number of other authors have made contributions to the issue of ON stop production.\^[1] A common thread in most of their writings is the emphasis on explaining why the ON geminate fortes, *pp, tt, kk*, are preaspirated. As we have seen, there are dialects in which the singleton fortes are also preaspirated. Explanations that only account for preaspiration in geminates can only provide a partial account of the problem.

Kortland’s (1988) radically different approach to the issue of ON stop production has the potential of accounting for preaspiration in

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\^[1] A thorough review is found in Hansson (1997), who discusses, for example, the writings of Kacnel’son (e.g., 1966), Steblin-Kamenskij (e.g. 1957), Salmons (1992), Wagner (1964) and Kylstra (e.g., 1972).
singleton stops. Drawing on the idea that one of the stop series (the *mediae*) of Indo-European should be reconstructed as “glottalised” (cf. Kortland 1978; cf. also Gamkrelidze 1987), he suggests that preaspiration in ON has developed as a “weakening” of originally preglottalised stops (Kortland 1988, p. 355). Especially intriguing in Kortland’s account is his proposal that West-Jutland stød\(^1\) is actually a remnant of the Indo-European glottalised stops.

Apparently, Kortland was not aware that there are Nordic dialects that reflect ON singleton *p, t, k* as preaspirated, and therefore proposed that syllable-final glottal stops were lost already in Germanic. In his account, then, Germanic sequences with a preglottalised singleton stop were syllabified as *aʔ.ta*, while geminate ones were syllabified as *aʔ.t.ta*. Kortland’s suggestion that syllable-final glottal stops were lost entails that only the geminates—not the singletons—would later yield preaspiration.

An amendment to Kortland’s scenario is to propose that there was no loss of glottal stops in syllable-final position in Germanic. In this case, the “glottalic” stops of Indo-European all became voiceless preglottalised stops in Germanic, and somewhere on the way to ON, the preglottalisations became preaspirations (except in the area in which we find West-Jutland stød). In this modified version of Kortland’s theory, all ON word medial *p, t, k* were preaspirated, both singletons and geminates, as well as those in clusters (with the exception of *sp, st, sk*).

The merits of the somewhat controversial “glottalic theory” will not be evaluated here, since it lies well outside the scope of this study. However, as Hansson (1997:111) points out, Kortland’s proposal that ON had preaspiration on all non-initial fortis stop is not directly contradicted by data on the phonological distribution of preaspiration in any single

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\(^1\) West-Jutland stød was investigated extensively by Ringgaard (1960). Its phonological distribution is strikingly similar to that of preaspiration and, importantly, quite unlike that of Common Danish stød. Hansson (1999) provides an succinct synopsis and concludes that West-Jutland stød “is cognate with preaspiration” (Hansson 1999: 167; cf. also Page 1997 regarding thoughts on the connection between aspiration and glottal stops). As a definitive example, Hansson singles out the Danish dialect spoken in some villages on the island of Als (off the southeast coast of Jutland) in which Common Danish stød is reflected as a true pitch accent difference and ON word-medial *p, t, k* are reflected as preglottalised in all contexts, including after sonorants. Thus West-Jutland stød is an explanandum in any account of preaspiration.
dialect. With this in mind, Hansson advocates that, notwithstanding the question of the origin of these preaspirations (i.e., whether they were “weakened preglottalisations” or “breathed reinforcements”), all ON non-initial fortis stops should be reconstructed as preaspirated. This is what the evidence—the geographical spread of preaspiration as well as its phonological distribution in different dialects—suggests.

Still, some objections can be raised against the idea that preaspiration was normative in ON. No two Nordic dialects with normative preaspiration exhibit exactly the same pattern of phonological distribution of preaspiration, and none of the dialects preserves the alleged ON pattern intact. The only aspect that is shared among all these dialects is the fact that the geminate fortes are preaspirated. When it comes to the development of the singleton fortes, and especially the development of clusters with fortis stops, the dialects have taken different paths. It has to be assumed that preaspiration was lost in “dialect specific” ways, i.e., that in each dialect, preaspiration was lost in certain contexts and not in others, and that these contexts were different for each dialect. However, these complex patterns of retention do not, per se, rule out the possibility that preaspiration was already normative in PN.

A second objection can be raised. The fact that three dialects have postaspirated stops where neighbouring dialects have preaspirated stops cannot easily be accommodated in a scenario in which all stops are normatively preaspirated to begin with. If this were the case, one would have to assume that preaspirations became postaspirations through some kind of metathesis. As an explanation, this seems rather unsatisfactory. Also, if one accepts such a development, one could also propose that the stops were originally postaspirated and became preaspirations through metathesis. An alternative account that takes into account the phonetic factors that give rise to sound change as well as the mechanisms of change would be preferable (cf., e.g., discussion in Ohala 1993).

How can we reconcile the archaic character of the geographical distribution of preaspiration with the observed diversity in the phonological distribution of preaspiration across dialects, as well as the existence of postaspirating dialects? A potential solution to these issues is hinted at by Helgason (1998, 1999), who suggested that non-normative preaspiration
of the type we find in Central Standard Swedish provides the phonetic preconditions necessary for the development of normative preaspiration. What is proposed here is more specific. Preaspiration in PN was non-normative, very much like what we see in CSw today, and indeed across all of Scandinavia (cf. discussion in Ch.3, section 3.6). A non-normative tendency to produce voiceless nasality before fortis stops must also have been present, although such a tendency has not been observed for CSw. Finally, sonorant voicelessness in \(lt\) and \(r + p, t, k\) clusters may already have been normative over large parts of Scandinavia in PN. In the following section, which is devoted to an attempt to reconstruct the production of stops in PN, it is shown that the synchronic data presented in Chapters 3 and 4 support this view.

5.2.2 The Proto-Nordic fortis ~ lenis contrast: reconstruction

In this section, some suggestions will be made as to the phonetic expression of ON stops, based on the way in which they are reflected in the various Nordic languages and dialects. This reconstruction aims at describing the production of stops in the PN period (as defined at the beginning of this chapter), whereas the phonological contrasts discussed relate to the ON period in general. It should be kept in mind that the following account rests on the data and dialectal descriptions that have hitherto been gathered in the Nordic countries. Clearly, the extant literature does not cover all the dialectal variations that occur in stop production in the Nordic languages. Future dialect studies may throw more light on the problems discussed here.

The lenis stops will be treated first. The data suggest that there is no essential difference in the expression of word-initial and word-medial lenis stops. For this reason, word-initial and word-medial lenes will be discussed together. The ON lenes tend to be reflected as voiceless only in some of the areas with normative preaspiration (i.e. Iceland, the Faroes, Jæren and Gräsö). Apparently, there are no other areas in which ON lenes turn up as voiceless (with the caveat that there may be dialects here or that are inadequately described in the literature). Voicing, then, seems to be the dominant pattern. Following Salmons (1992:130f) and Hansson
(1997:114f), Iceland, the Faroes, Jæren and Grässö can be argued to be “peripheral” language communities in the sense that they are more likely to reflect archaic linguistic features than are, e.g., South-eastern Norway or Southern Sweden. This favours a phonetic reconstruction of the ON lenes as tending towards voicelessness. However, Salmons and Hansson also include Gudbrandsdalen, Härjedalen and Kökar in their list of peripheral language communities, and in these areas the word-initial lenes seem to be voiced.

The facts are thus problematic, and a definite answer as to the voicing status of lenis stops in PN can not be provided. Different scenarios can be suggested, however. Possibly, the distribution of the modern lenis reflexes is indicative of an earlier isogloss in PN, dividing Southwestern Norway and the remainder of Scandinavia.¹ According to this view, in Southwestern Norway (and hence, later, in Iceland and in the Faroes) the word-initial lenes tended to be produced as voiceless (much as in Icelandic and Faroese today), whereas in the remainder of Scandinavia, they were generally produced with voicing, much as they are today. The fact that the word-initial lenes in Northern Uppland (incl. Grässö) tend to be voiceless has to be explained as a more recent development, specific to that area. An alternative scenario is that the lenes tended to be voiceless across virtually the whole PN speaking area. In this case, one has to assume that the strong tendency towards voicing in lenis stops that we see in Swedish and Norwegian today is an innovation that has spread throughout most of mainland Scandinavia. A third scenario is that the lenes in PN tended to be voiced across all of Scandinavia, and that a tendency for voicelessness developed separately in Iceland, the Faroes, Jæren and Northern Uppland. Even more complex distributions can be envisaged, involving, for example, differences in voicing depending on phonetic context, but these would be even more speculative than the suggestions already offered. The first of these alternatives, that there developed an east–west voicing isogloss in the production of lenis stops, seems to be the one that best fits the current distribution. However,

¹ One might be tempted to see this as a part of the complex of features that separates Old West Nordic from Old East Nordic (see, e.g., Haugen 1982:63ff).
regarding phonetic expression of the lenis geminates there are some complicating factors, which are discussed below.

Let us now consider fortis stop production in PN. Unlike the lenes, almost all languages and dialects that derive from ON reflect a difference in the production of word-initial and word-medial fortis stops. Therefore, these will be treated separately here.

The reconstruction of the production of word-initial fortis stops in PN is a relatively straightforward matter. The uniform way in which ON word-initial fortis stops are reflected in the various Nordic languages and dialects strongly suggests that such stops were postaspirated in PN. Thus there is little reason to doubt that the initial stops in words like *tala* ‘to speak’ and *koma* ‘to come’ tended to be produced with considerable postaspiration in the PN period.

As regards the ON word-medial fortis, we can distinguish three distinct ways in which they are reflected in the modern Nordic languages. By far the most common is the production of a stop with non-normative preaspiration, i.e. the stop is produced as voiceless, but may or may not be preaspirated, depending on speaker and context. Given that an occlusion is produced, a concomitant release burst and some degree of postaspiration is produced as well. This type of stop production seems to be the predominant way in which ON word-medial fortis are reflected in most of mainland Scandinavia. The second type involves normative preaspiration, which we find in various geographically noncontiguous locations within the Nordic language area. The third and most unusual type is normative postaspiration. This type of production is known to occur only in three areas within the Nordic language community, all of which are geographically close to an area that has normative preaspiration—in fact, Northern Icelandic has both normative preaspiration (< ON geminates) and normative postaspiration (< ON non-geminates).

The simplest way to account for the present variability in the reflexes of ON fortis stops in the Nordic languages is to assume that their production in PN was similar to the way in which they are now reflected across most of mainland Scandinavia. One of the more compelling arguments in favour of this account is that there are detailed parallels between the durational characteristics of non-normative preaspiration in Swedish and the
observed phonological distribution of normative preaspiration. Preaspiration durations in CSw are considerably longer in VC; and VCC syllables than in V:C syllables (see Ch. 4, section 4.2.3.2). If PN had non-normative preaspirations with similar durational characteristics, preaspiration would have been more likely to become normative in syllables with geminate stops than with singletons. This is what we observe. In fact, preaspiration in geminate stops is the only feature common to all the dialects with normative preaspiration described in Chapter 3.

Also, the fact that we find both normative preaspiration and normative postaspiration in the Nordic languages is most readily accounted for as a consequence of having phonetic preconditions that can give rise to both types of development. If both preaspiration and postaspiration were part of the phonetic variation inherent in the production of word-medial fortis stops, it is not unexpected that both preaspiration and postaspiration could become established speech norms in some areas. Assuming, instead, that PN speakers neither tended to preaspirate nor postaspirate such stops makes it difficult to explain how they later came to be reflected as preaspirated in at least seven geographically distinct locations. If there was no tendency to preaspirate, it is highly unlikely that such a typologically unusual stop development would have occurred independently in seven different places over a period of a few hundred years. And, as pointed out earlier, assuming that the stops were originally postaspirated is just as unlikely from a typological point of view.

Thus, as regards the ON word-medial fortis stops, both the singletons and the geminates, it seems most likely that their phonetic expression in PN involved an element of preaspiration. It has been argued that this preaspiration was non-normative, very much like it still appears to be in most parts of the Scandinavian peninsula. This has a bearing on the phonetic interpretation of the PN lenis stops. If the word-medial fortis had non-normative preaspiration, it is less likely that speakers generally tended to produce the word-medial lenes (which only occurred as geminates) as fully voiceless, since this would have entailed a poor perceptual distinction between the two series (i.e., some speakers would have produced the word medial fortis as voiceless unaspirated, and the word-medial lenes as voiceless unaspirated as well). Thus it is proposed that
the geminate lenes tended to be produced with voicing (or, at least, as half-voiced) in the PN period.

Table 5–2 gives an overview of the phonetic expressions of PN stops proposed above. There are some points of uncertainty in this representation. Particularly, the question of whether the PN lenes were voiced or voiceless is partly left open. This uncertainty may actually reflect the variation present in the production of these stops in PN. Thus, there may have been individual and contextual variation in their production that renders a categorical dichotomy like voiced or voiceless inappropriate. For example, it could be the case that the word-initial lenes tended to be voiced in voiced contexts and voiceless in utterance-initial position. Or, that the word-medial lenes, which were always geminates, tended to be half-voiced. Such exact statements remain highly speculative.

Table 5–2. Overview of the proposed reconstruction of the phonetic realisation of stops in PN. Parenthesised aspirations represent non-normative preaspiration

<table>
<thead>
<tr>
<th></th>
<th>Word-initial</th>
<th>Word-medial (&amp; -final) postvocalic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Singleton</td>
<td>Geminate</td>
</tr>
<tr>
<td>Fortis</td>
<td>pʰ tʰ kʰ</td>
<td>(ʰ)p (ʰ)t (ʰ)k</td>
</tr>
<tr>
<td>Lenis</td>
<td>b/p d/t g/k</td>
<td>(β/v) (ʊ) (ɣ)</td>
</tr>
</tbody>
</table>

Fortis stops in clusters remain to be considered. It seems likely that $lt$ as well as $r + p, t, k$ sequences were normatively voiceless in much of Scandinavia already in the PN period. This can be inferred from the geographical distribution of voiceless variants in such sequences in the Nordic dialects, which has been mapped by Hansson (1997, 1999). The map in Figure 4–98 shows that voicelessness in $lt$ and $r + p, t, k$ sequences (marked as 2 or higher on the map) extends throughout a contiguous area across Central and Northern Scandinavia, as well as the Faroes and Iceland. Only in Southern Norway and Central and Southern Sweden does it seem that such sequences do not contain a normatively voiceless sonorant.

Normatively voiceless nasals are far less common. In fact, they only occur in dialects that also have normatively preaspirated stops. In this
sense, preaspiration is linked more intimately with nasal voicelessness than with voicelessness in laterals and r-sounds. However, note that some dialects have preaspirated stops but no voiceless nasals. Also, unlike preaspiration, there does not seem to be a strong non-normative tendency for early voice offset in nasals preceding fortis stops in Scandinavia today.

A basic premise in this discussion is the belief that phonetic changes have their roots in the pool of synchronic phonetic variation present in a language (Ohala 1989, 1993; Lindblom et al. 1995). Thus, it can be assumed that voiceless nasality was present, in some form, as a precondition for the development of the normatively voiceless nasals we now find in various Nordic dialects. It is suggested here that, in PN, the relative freedom of timing of voice offset and stop closure in the production of vowel + fortis stop sequences extended to stops following a nasal.

5.3 Where does preaspiration come from?

In Chapter 2, section 2.3, it was stated that a normative trait is present for all members of the group of speakers under examination. Thus, when native speakers of Icelandic produce the word nótt ‘night,’ in a moderate tempo and in isolation, we expect to find, invariably and for all speakers, that the stop is preaspirated. Non-normative traits, however, count as constituent parts of phonetic variation. We do not expect that all speakers of Central Standard Swedish produce the word natt ‘night’ with a preaspirated stop, but, based on our experience of Swedish speakers, we expect that some will. For speakers of Swedish, the production of a vowel + stop sequence varies in a way that it does not for speakers of Icelandic.

What is the source of this phonetic variation? For a given group of speakers, what decides the limits of the variation present in the production of a stop, an [s] or a back, close, rounded vowel? One delimiting factor may be the principle of adaptive dispersion (TAD) (Liljencrants & Lindblom 1972, Lindblom 1986). In this model, speech is produced in anthropophonic space. As the size of a phonological system, for example a vowel inventory, increases, TAD predicts that the proximity of the units within the system will also increase, but in such a way that sufficient contrast is preserved. As a consequence, the room for variability
in the production of the units diminishes. In short, the more units that occupy anthropophonic space, the less freedom each unit has to vary. This model provides at least a partial account of the apparent distribution of vowels in the world’s languages. However, it is difficult to apply such a principle to a stop system. For one thing, the parameters of stop systems are more discrete in nature than those of vowel systems—there is no continuum between a bilabial and a dental stop, for example. Therefore, creating a measure of phonetic distance between stops is more difficult than for vowels. Also, as an effect of the size principle (Lindblom & Maddieson 1988), the addition of a manner or a place distinction in a stop system usually results in the addition to the system of a series of new units, rather than just one.

Another factor that delimits phonetic variation is physiology. Speakers are bound to vary with regard to the size and shape of the larynx, pharynx and the oral and nasal cavities, tongue shape, denture, the innervation (and enervation) of muscles, as well as the control of all these structure at higher levels in the nervous system. These speaker-dependent differences have a substantial effect not only on the acoustic properties of the vocal tract, but also on the articulatory strategies employed by speakers. The latter is evident, for example, in the differences between the speech of males and females, which can be attributed to differences in the size of the articulators (Simpson 2001, Traunmüller 2001).

With regard to preaspiration, differences in vocal fold size and physiology may play a role. Observations in the preaspiration literature are indicative of a sex/gender, as well as an age effect with regard to preaspiration production: Iversen (1913) remarked that preaspiration in the Norwegian Senja dialect was most noticeable in the speech of children; Fant et al. (1991) noted that female speakers of CSw tend to preaspirate more than do male speakers; Foulkes et al. (1999) found, for Tyneside English, that women and children tend to preaspirate, but that adult males do not; and Stölten (2002) found that women’s preaspirations are longer than men’s in Arjeplog Swedish.

Hanson (1997) and Hanson & Chuang (1999) investigated the acoustic voice source characteristics of 21 male and 22 female speakers of American English. They found that, in general, females displayed a
higher degree of spectral tilt than did males. Spectral tilt had previously been identified as a significant parameter in the perceived distinction between male and female voices (Klatt & Klatt 1990). As an explanation of these differences in tilt, it has been proposed that females may actually spread their vocal fold processes in order to de-emphasise the fact that they radiate at higher frequencies than men do (Titze 1989).

In this connection, the impressionistic observation can be made that female speakers of CSw tend to preaspirate less when they increase their vocal effort. This may also be connected to the observation made by Helgason (1999) that a female speaker of CSw, when reading a list of short sentences, tended to produce creaked rather than preaspirated stops when producing stops in stressed, utterance-final position in fast speech.

Possibly, then, the non-normative preaspiration tendency that we observe in Scandinavia is a consequence of the way in which modal phonation is regulated in speech. The more speakers tend to spread their vocal fold processes when producing modal\(^1\) voice, the less resistance their phonation offers to processes that cause phonation to cease, for example supralaryngeal constrictions and glottal abduction. Thus it might be expected that speakers with a breathy voice quality have a stronger tendency for anticipatory voice offset than do non-breathy speakers.

There are some counter-arguments, however. If a propensity for early voice offset relative to stop closure is a function of vocal fold physiology, then an explanation is needed for the fact that that preaspiration seems to be normatively absent in some contexts in some languages. In Icelandic, Faroese and the Swedish Gräsö dialect, for example, there are voiceless unaspirated stops that contrast with preaspirated stops.\(^2\) Not surprisingly, there is practically no tendency to produce these voiceless stops with an early voice offset. Also, impressionistic observations of Finnish in which hC clusters contrast with, for example, geminate stops, suggest that voice offset in geminate stops is quite tightly

\(^1\) The term modal is used here in the meaning “neutral” for a given speaker (cf. discussion in Laver, 1980:95).

\(^2\) Here it is useful to keep in mind that ON word-medial \(p, t, k\) and \(bb, dd, gg\) tend to be reflected as voiceless unaspirated stops in Southern Icelandic and Faroese. In the Gräsö dialect, however, ON \(ð\) and \(*[ɣ]\) (graphemically \(g\)), as well as \(bb, dd, gg\), tend to be reflected as voiceless unaspirated stops.
synchronised with oral closure. In other words, Finnish speakers have little or no preaspiration tendency when producing a word like *matto* ‘mat.’

As regards preaspiration tendencies in other languages we can refer to the discussion in Chapter 2, which states that reports on preaspirated stops, normative or not, were rare. There have been observations that speakers of English tend to preaspirate (Gobl & Ni Chasaide 1988; Foulkes et al. 1999); this is something that I have observed myself, on occasion. However, these preaspiration occurrences seem more sporadic than the preaspirations observed for CSw speakers. My experience with German spontaneous speech data (cf. Helgason & Kohler 1995, Helgason 1996) has given me the impression that preaspiration is very uncommon in German. My impressions regarding other languages are less well-founded, but I have a feeling that when producing a word such as *frappé* or *crétin*, French speakers have no definite preaspiration tendencies. In their study of preaspiration tendencies, Gobl and Ni Chasaide (1988) did examine the stop production of speech of four French speakers, and found that these speakers had relatively tight control of the coordination of voice offset and oral closure. Naturally, however, a sample of four does not provide a sufficient basis for further generalisations.

This absence of preaspiration rather undermines any strong hypothesis that vocal fold physiology is solely responsible for inducing preaspiration. It seems unreasonable to claim that the preaspirations observed in Central Standard Swedish, often 40–80 ms in duration, are the result of a universal physiological property, since this property does not seem to apply universally. Still, it is quite possible that preaspiration is facilitated by a certain type of larynx, and that this has a small but perceptually salient effect on the propensity for anticipatory voicelessness. Such small effects might come to acquire a linguistic significance. In this way, preaspirations might ultimately be caused by fortuitous effects in the transition from modal voice to voicelessness that are generally more prominent in the voice source of females (and children) than in males.

Ohala (e.g. 1981, 1983, 1993) has suggested that a change of this type might occur through a process called *hypo-correction*. This implies
a failure to apply a process of perceptual correction that normally acts to correct perturbations in the speech signal. In this way, unintended or fortuitous effects of the process of speech production “become part of the pronunciation norm” (Ohala 1993:246). If the origins of preaspiration have to do with such fortuitous effects, then they could become part of the norm. In the case of preaspiration in CSw, we have to take Ohala’s words literally. The result of the change in norms is the introduction of preaspiration as (an optional) part of the norm in the production of fortis stops, not as the norm. From the point of view of, for example, Icelandic or Gräsö Swedish, this change is the first step in the change that eventually leads to preaspiration becoming established as the norm.

The preaspirations produced by many speakers of CSw today, then, are not actually “perturbations”, or “fortuitous” or “unintended” (although they may have started out as such at some point in the past). Instead, they are a linguistically relevant feature, employed by some speakers as one of the correlates of the production of sequences in which a fortis stop follows a vowel. Note in this connection van Dommelen’s (1998) finding that speakers of Norwegian who do not themselves pre-aspirate can still make use of preaspiration in perception. Thus, the simplest interpretation of the CSw preaspirations is that they are a matter of convention, a part of the style of speech adopted by certain speakers.

5.4 E/C changes

It has been argued in earlier sections that, like in CSw, the variation in the production of fortis stops in PN involved a tendency for preaspiration as well as a tendency for postaspiration. It has also been argued that across most of the area, these tendencies have remained to a large extent unchanged. In a few areas, though, a change in norms has occurred, so that either preaspiration or postaspiration has become normative. This latter suggestion would be strengthened given an understanding of how a non-normative trait becomes normative.

In this section it will be argued that a phonetic change can occur as the result of either expansion or contraction in the variation permitted in the production of a given phonological entity. Such expansion and contraction (E/C) changes do not require the speaker-listener to perform
phonological reorganisation for the change to be achieved. Instead, an E/C change is achieved through the gradual drift of phonetic norms. These ideas are an extension, and to some extent a reinterpretation of Sapir’s (1921) ideas on phonetic drift.

First it should be clarified, that although a particular trait is non-normative in a language community it is, in most cases, still a part of what is considered normal or native for that community. For example, preaspiration may not be obligatory in CSw, but, nonetheless, it is normal to have it—it is not normative, but still contained within the norm. This same range of variation in the production of voiceless stops may be “prohibited” in other languages. In Southern Icelandic, Faroese and the Gräsö dialect, the synchronisation of voice offset with oral closure in the production of voiceless stops is much more tightly controlled than in CSw, apparently “because” they contrast with normatively pre-aspirated stops. However, such an opposition is not a prerequisite for a tight laryngeal–oral coordination. As suggested in the preceding section, it seems probable that German and French speakers coordinate the laryngeal and oral gestures at the onset of a stop much more tightly than do Swedish speakers. There is no apparent reason for them to do so, other than that this is how one initiates a voiceless stop closure in French and German.

So, phonetic variation has a structure and is contained. This structure is determined and constrained by physiology, system-internal factors and convention. Since the variation is determined and constrained, in part, by convention, it is subject to change. Phonetic variation is, in this sense, dynamic. Not only can we observe that languages or dialects differ with respect to the variation “allowed” in the production of a given type of speech sound (say an open front unrounded vowel, or a voiceless stop), but we should also be able to observe that this variation can change over time. By shifting the focus from norms to phonetic variation it can be argued that changes in norms can also be seen as changes in the structure of phonetic variation. Phonetic variation is dynamic.

The shift from non-normative to normative preaspiration (or post-aspiration, for that matter) is an example of this. Our initial assumption is that the phonetic variation in the production of PN fortis stops was
similar to that in CSw today. Some speakers produced preaspirated stops, others did not. In some areas—for reasons we can only guess at—there occurred a change in the structure of phonetic variation. Within these areas, an increasing number of speakers adopted the non-normative trait of producing fortis stops with preaspiration. This ultimately resulted in several communities of speakers in which synchronised voice offset and oral closure ceased to be contained within the norm.

In terms of the typology of change, the emergence of preaspiration seems to fall in the category of “strengthening processes” (Kiparsky 1988:378, 383). At least, it does not seem feasible to classify it as a “weakening process” (ibid. 377, 381). In phonetic terms, this strengthening might occur in the form of an “active” increase in air flow across the glottis in the production of preaspiration. This is not uncontroversial, however. It is possible, for example, that those CSw speakers who regularly produce preaspiration only adjust the relative timing of the glottal and supralaryngeal gestures and thus perform no “extra work”. These issues might be resolved through experimentation.

Before we turn to the question of what may have triggered this change in the structure of phonetic variation, it is useful to draw a parallel with similar changes in vowel systems. As opposed to changes in consonant systems, changes in vowel systems have been extensively documented. Labov (1994) provides an overview of numerous such studies. Among these is an extensive discussion of vowel changes in Philadelphia, studied in the years 1973–1977 (ibid. p. 55).

In the following, hypothetical demonstration, I shall use as a template the raising and fronting of the nucleus of the diphthong /aw/ in words like bow and about, as described by Labov (ibid. 56ff). Labov’s description is based on observations in “apparent time.” Since I do not have access to real raw data for this change (or any other similar changes), the data points are fictitious. Despite this, I hope that the example serves as an illustration of how changes in the structure of phonetic variation can at the same time be changes in pronunciation norms.

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1 Studies in apparent time refer to studies in which age strata in synchronic data (i.e., pronunciation differences between different generations of speakers) are taken as indications that a change has occurred between earlier and later states of the language (cf. Labov 1994:28).
In this illustration, the change is characterised as a change from [ʊ] to [ɛ]. An overview of how the change can be thought to progress in “real” time—as opposed to apparent time—is given in Figure 5–1. Each of the eight graphs represents a sample of a population of speakers at a given time \(t_n\), where \(t_1\) represents the initial state observed and \(t_8\) the final state observed. Modelled according to Labov’s description, the time interval can be set at ten years, and thus 70 years elapse between the observation at \(t_1\) and the observation at \(t_8\). In these invented datasets, each diamond represents the normalised mean \(F_2\) (x-axis) and \(F_1\) (y-axis) values for a single speaker. Each graph contains observations for 72 speakers. The speakers are equally distributed with regard to age and gender, i.e., each graph contains equally many males and females of all ages.

What can be observed in this hypothetical example is an E/C change, a change whereby the phonetic variation in the expression of a vowel is first seen to expand and then to contract again to a different location in phonetic space. At the outset (\(t_1\)), the normalised means for \(F_2\) are contained roughly between 1750–2100 Hz, and for \(F_1\) between 700–800 Hz. As time progresses, the phonetic variation in the expression of this vowel nucleus is seen to expand. (Note that the faint light-grey diamonds in each graph are the observations made at \(t_1\). This makes comparisons with \(t_1\), the initial state, easier). At \(t_4\), the normalised means for \(F_2\) are contained roughly between 1800–2300 Hz, and for \(F_1\) between 575–800 Hz. What we have (hypothetically) observed is a change in the structure of phonetic variation, in this case an expansion. As in Labov’s data, our fictitious younger speakers tend to produce vowel nuclei that are raised and fronted relative to those produced by older speakers. This trend continues through to \(t_4\). From \(t_4\) to \(t_8\) we witness a continued change in the structure of phonetic variation, but this time in the form of a contraction. As the older generations disappear, only the younger speakers, with raised and fronted nuclei, remain.

A key element in this scenario of change is that no phonemic reinterpretation is required on the part of any speaker at any time. At all times,

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1 This account does not consider the problems involved in the normalisation of data and the notion of perceptual equivalence. It is hoped that these issues do not subtract from the more general point being made with regard to the process of sound change.
from \( t_1 \) through \( t_8 \), the productions of all speakers are contained within the norm, and, in a sense, define the norm. Like the CSw preaspirations, the production of raised and fronted variants may be non-normative, but are still not considered deviant in the linguistic community at large. However, an outside observer, observing the language at \( t_1 \) and \( t_8 \), with no information about the intervening stages, is likely to describe the change as one in which /a/ has changed into /æ/ or /ɛ/.

Figure 5–1. A hypothetical example of an E/C vowel change. Each diamond represents normalised mean \( F_2 \) (abscissa) and \( F_1 \) (ordinate) values for a single speaker. The different graphs each represent a sample of a population of speakers at a specific time \( t_n \), \( t_1 \) representing the initial state observed and \( t_8 \) the final state observed. To make comparisons with the initial state (\( t_1 \)) easier, the mean values at \( t_1 \) are depicted as grey diamonds in each graph.
The case of preaspiration can be described in the same E/C manner. In CSw today, the scope of phonetic variation with regard to preaspiration is roughly equivalent with stage t₃ or t₄ in the vowel change example. Note that this does not imply that there is a change in progress. The fact that stage t₄ in our hypothetical vowel change is transitory applies to that change and not necessarily to others. As previously indicated, I believe that the relative freedom in the production of voice offset relative to oral closure has been a stable feature of most dialects in Scandinavia for more than a thousand years. In some areas the structure of phonetic variation for these stops has changed. The relative freedom in the timing of voice offset has been restricted to encompass only preaspirated variants or unaspirated variants. In cases in which preaspiration has become normative, the change has been described as one by which, for example, /tt/ becomes /ht/. Again, however, that does not entail that any single speaker at any time has been required to perform a phonological reinterpretation of the stops. A parallel case can be made for postaspiration.

Let us now consider voicelessness in nasals before fortis stops. The tendency for anticipatory voice offset in nasals in CSw is much weaker than the preaspiration tendency. However, analogous to the hypocorrective process through which it was suggested that preaspiration became part of the pronunciation norm, it is possible that the relative freedom in the coordination of glottal and supraglottal gestures extended to nasal + fortis stop junctures. As discussed in Chapter 3, an ON sequence of nasal + fortis stop is, in most normatively preaspirating dialects, reflected as a sequence of voiceless (or partially voiceless) nasal followed by a voiceless stop. This indicates that such sequences may have had nasals with non-normative voicelessness in PN, which paralleled non-normative preaspiration. The production of half-voiced, half-voiceless nasals in the Gräsö dialect demonstrates that normative voicelessness need not involve a completely voiceless nasal. By analogy, it is possible that non-normative voicelessness in nasals involved only partially voiceless nasals in PN.

The E/C change scenario exemplified in Figure 5–1 may work equally well for voicelessness in nasals and postaspiration. Like preaspi-
ration, voiceless nasality before fortis stops may have been a feature employed by some (but not all) speakers as one of the correlates of the production of sequences in which a fortis stop follows a nasal. Again, in some areas—notably only the areas in which preaspiration becomes the norm—the structure of phonetic variation changes, and voiced nasals cease to be contained within the norm. As a result, voiceless or partially voiceless nasals become the norm. In this account, we also have to assume that, unlike preaspiration, this alleged non-normative PN voicelessness in nasals has ceased to be part of the norm in the production of such sequences in CSw. As before, no speaker is at any time required to make any phonological reinterpretation. Instead, the limits of phonetic variation in the expression of these sequences becomes reduced, as voiced variants become less common. The development of postaspiration instead of voiceless nasality, which we find in Northern Icelandic and the Western Åland dialects, can be accommodated in a similar scenario.

Changes involving nasal + stop sequences in other languages may be treated as E/C changes as well. In Bantu languages, reconstruction suggests that Proto-Bantu had word-initial sequences of nasal and voiceless, unaspirated stops. These are reflected in various ways in the modern descendants of Proto-Bantu. For example, *nt can yield, for instance, [nt], [t], [nṭʰ] or [tʰ], depending on language and context. (cf. e.g. Hinnebusch 1989, Huffman & Hinnebusch 1998). As in the Nordic languages, these changes can be accommodated in a model that operates with the restructuring of phonetic variation rather than phonological reinterpretation. The basic assumption is that both a tendency for early voice offset (causing voicelessness in the nasal) and a tendency for late voice onset (causing postaspiration) were present as non-normative variants in the production of these sequences. This could explain why the eventual outcome varies so much in different languages and contexts.

5.5 Summary

Let us briefly recapitulate the scenario of the emergence of preaspiration suggested here. First, it was suggested that the ultimate origins of preaspirations have to do with vocal fold physiology, i.e. that a certain type of larynx is more prone to causing anticipatory voice offset than are
others. In this way, some speakers may produce “fortuitous” preaspirations that are short but salient. Further, it was suggested that a process of change similar to that proposed by Ohala (1981, 1993) could account for the introduction of preaspirated variants into speech production. Based on the data on phonetic variation in CSw, it was suggested that such preaspirated variants may not have been employed by all speakers, but were still a part of the pronunciation norms. Thus, preaspiration was non-normative, i.e. the timing of voice offset relative to stop closure in the production of fortis stops was—and still is in most of Scandinavia—relatively free. The time at which this relative freedom in voice offset became established is unknown, but in the scenario proposed here one must assume that it was already the dominant pattern in PN.

At this stage, then, PN had the phonetic preconditions necessary for preaspiration to become normative. This did occur in several areas. In each area, the exact conditions under which the transition from non-normative to normative status differed, and consequently the phonological distribution of preaspiration differs considerably between dialects. Also, in some areas a typologically more usual development occurred and postaspirations became normative. The change from non-normative to normative preaspiration, it was proposed, involves nothing more than the restructuring of phonetic variation such that variants without preaspiration disappear from the pool of variation. Consequently, the relative freedom in the timing of the laryngeal and oral gestures that had previously been dominant becomes more limited.

5.6 Final remarks

In Ohala’s (1993:244) view, changes in norms do not, as such, constitute sound change, precisely because “they do not necessarily involve a change in pronunciation norm.” This point cannot be disputed, since “sound change” is generally used to refer to phonological change rather than phonetic change. However, in the E/C model, phonetic variation is dynamic and partly governed by convention, and thus only partly a predictable and fortuitous by-product of speech production. The data reviewed in Chapter 4 clearly demonstrate this. Changes in phonetic variation, for example an expansion or contraction in a given phonetic
parameter such as VOT or F₀, may thus constitute a change in the “shape” of the norm, i.e., in the scope of variation permitted in the expression of a given piece of phonology.

Central to Ohala’s (e.g., 1981, 1993) scenario of change are listener misperceptions. The failure of a listener to apply reconstructive rules (hypo-correction), or the application of reconstructive rules when they are not needed (hyper-correction), may result in a “mini sound change” (Ohala 1993:243). Such a view of sound change has the advantage that change is “accidental” and not goal-oriented. Changes that occur as a result of listener misperception are, therefore, non-teleological. Lindblom et al. (1995) argued that misperceptions were unlikely to be a significant source of change, since having access to the lexical identity of a word, “listeners-turned-speakers” must already have access to its correct pronunciation. Adopting most aspects of Ohala’s scenario, but deemphasising the importance of listener misperceptions, Lindblom et al. (1995) suggested that sound change is an adaptive process, whereby the speaker-listener evaluates speech output in terms of a range of evaluation criteria, selecting forms that meet the criteria and rejecting those that do not. Thus, speakers may adapt their communicative intent on the basis of templates provided by other speakers. However, it might be argued that this adaptation of Ohala’s scenario reopens the issue of teleology in change.

In light of this debate, it is of interest to consider some aspects of the development of stop systems in the Nordic languages which appear to call for a mechanism that provides direction in sound change. For example, preaspiration in Icelandic, Faroese and the Gräsö dialect seems to have become normative only in contexts in which it is “needed”. Discussing preaspiration in various Nordic dialects, including Icelandic, Faroese and the Jæren dialect, Hansson (1999) comments:

Preaspiration has often come to support a phonological contrast, but only as an indirect consequence of various independent sound changes which would otherwise have resulted in merger were it not for the presence of preaspiration. Such changes […] can thus be said to have increased the ‘functional load’ of preaspiration, changing it from redundant to contrastive.

(Hansson, 1999:163)
Although phonemic merger may be the most commonly observed type of change, the literature is riddled with examples of changes that leave contrast preserved. Numerous vowel chain-shifts have been described and reconstruction of many language families suggests a great many cases of retention of phonological contrast despite phonetic changes. Rischel’s (1998) discussion of tone split in Thai provides a clear example of this type of contrast preservation. Rischel (1998:1f) remarks that “the tone splits which we can observe in the modern [Thai] dialects, are individual and functionally optimal solutions to the preservation of contrast between syllable types.”

The listener misperception scenario promoted by Ohala appears not to predict the type of contrast preservation that one finds in the literature. To be sure, the listener’s primary task in his framework is to preserve pronunciation norms (through corrective processes) and not to change them. However, the observation that a host of changes that appear to be chain reactions take place in a language within a short period of time (as we observe in the Nordic languages and Thai, for example) is not fully compatible with the view that sound change is accidental. The adaptations of Ohala’s model offered by Lindblom et al. may offer a better way of dealing with the observed changes. However, they also entail criticisms of teleology. Therefore, it can be claimed that we do not really have a satisfactory account of diachronic phonetic change at present.

This dilemma is not new. Sapir (1921) discussed the problem of sound change (or, in his terminology, phonetic drift) at length and concluded:

The easy explanations will not do. “Ease of articulation” may enter in as a factor but it is a rather subjective concept at best. […] “Faulty perception” does not explain that impressive drift in speech sounds that I have insisted upon. It is much better to admit that we do not yet understand the primary cause or causes of the slow drift in phonetics, though we can frequently point to contributing factors.

(Sapir, 1921:183)

It is possible that the discussion of sound change has centred too heavily on phonological contrast. Of course, contrast is a key element in speech, but it is not necessarily the ultimate target of utterance plans, as often seems to be implied in the literature. Conveying sociolinguistic
identity and paralinguistic information seems to be just as central to speech production as maintaining phonological contrast. In other words, the phonetic manner in which a contrast is expressed may be just as tightly controlled as the contrast itself. In this sense, contrasts are embedded in speech norms. This is the essence of dialectal differences.

In this view, then, contrasts are preserved not because speakers try to preserve them. Instead, speakers adapt to the exacting production norms of their own dialect. The fact that contrasts are preserved is a consequence of the transmission of pronunciation norms from generation to generation. Thus, we should attempt to specify the limits of phonetic variation as precisely as possible. The present study of stop production in the Nordic languages has attempted to provide one example of the structure of synchronic phonetic variation and its diachronic consequences.
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