

SEGMENTS, TONES AND DISTRIBUTION IN KHOEKHOE PROSODY

A Dissertation

Presented to the Faculty of the Graduate School

of Cornell University

In Partial Fulfillment of the Requirements for the Degree of

Doctor of Philosophy

by

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August 2009

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Cornell University 2009

This dissertation provides a prosodic analysis of Khoekhoe (Nama), a Khoesan language spoken by about 250,000 people in Namibia, South Africa and Botswana. Drawing on both published sources and original fieldwork, I show that almost all Khoekhoe morphemes pattern prosodically as either (lexical) roots or (functional) clitics. These categories differ phonotactically in segment distribution, tone distribution and morpheme quantity, and differ syntactically in their ability to occupy phrase-initial positions. I argue that the primary difference between them is that roots obligatorily initiate a prosodic word, while clitics obligatorily follow one. One crucial observation about both segment and tone distribution in Khoekhoe is that all morpho-prosodic positions are subject to some type of neutralization, so that there is no environment in which all contrasts occur. I show that a full account of these patterns requires both positional faithfulness (Beckman 1999) and positional augmentation (Smith 2005). But despite the fact that the patterns are quite robust, some morphemes seem phonotactically intermediate between roots and clitics. These include demonstratives, auxiliaries, adverbs, postpositions, complementizers and pronouns. I show that their behavior requires us to distinguish among those constraints that target roots, those that target grammatical words and those that target prosodic words.

In addition to these morpheme-level distribution patterns, Khoekhoe employs a type of phrase-level tone sandhi that is best known from descriptions of languages like Xiamen (Chen 1987), in which a morpheme's citation melody is replaced

paradigmatically in certain prosodically-defined environments. But Khoekhoe differs from Southern Min languages in that citation melodies are retained in initial—not final—positions, and that function words fail to take sandhi forms. I show that the domain of tone sandhi can be captured in terms of phonological phrases (Selkirk 1986, Nespor and Vogel 1986), as has been proposed for Xiamen and Taiwanese (Chen 1987, Lin 1994, Truckenbrodt 1999), but that a complete account of Khoekhoe melody substitution patterns requires both positional faithfulness and positional markedness, just like morpheme-level phonotactics. Overall, positional constraints in Khoekhoe conspire to restrict marked elements to the perceptually prominent left edges of syllables, morphemes, prosodic words and phonological phrases.

BIOGRAPHICAL SKETCH

Johanna Christina Brugman was born in Seattle, Washington, in 1974. She graduated from Juanita High School in Kirkland, Washington, in 1992, and enrolled at the University of Washington, where she earned a B.S. in Chemistry and a B.A. in German Language and Literature, graduating *magna cum laude* with Department and University honors in 1998. Her third year was spent as an exchange student at the Eberhard-Karls Universität Tübingen. After working for several years in a corporate library, she entered Cornell's graduate program in linguistics in 2001. In 2005, she received Fulbright Award that supported her fieldwork in Namibia. She is celebrating the completion of this dissertation by taking a trip around the world.

ACKNOWLEDGMENTS

I am deeply grateful to the members of my special committee for their support and guidance as I navigated my way through a dissertation that evolved from a phonetic investigation of Khoekhoe segments into the framework necessary to make my original plan possible. In the end, it took me longer than I had hoped or anticipated, but I did make it through. Amanda Miller, my chair, provided relentless encouragement and support, going so far as to set up Skype calls when I was struggling with my direction in the field. Her contagious enthusiasm for all things Khoesan set me on my path and tugged me along when I was lagging behind. Draga Zec proved an invaluable resource when I was working out the kinks in my analysis, and Abby Cohn invariably helped me look at my data from a fresh perspective, even when I didn't really want to. I am also grateful to Chris Collins and Michael Wagner for their helpful discussions of my syntax/prosody problems, and to Bonny Sands for her encouragement and assistance with the Khoesan literature. On the practical side, I could not have managed Cornell's bureaucracies without Angie Tinti and Sheila Haddad, who always knew just what needed to be done and when it needed to happen, and I would never have made a single recording without Eric Evans, who always found me whatever equipment was necessary to get the job done.

My fieldwork in Namibia would not have been possible without the experience I gained as a research assistant on the National Science Foundation grant from the Documenting Endangered Languages Program *Collaborative Research: Descriptive and Theoretical Studies of Nluu* to Cornell University (BCS-0236735, Miller & Collins, co-PIs) and Northern Arizona University (BCS-0236795, Sands, PI). Opinions, findings, and conclusions or recommendations expressed here are, of course, my own and do not reflect the views of the National Science Foundation. My

own fieldwork was supported by a 2005 Fulbright Award and grants from the Cornell Graduate School, but I probably would not have even made it into the country without Willi Haacke, who generously helped me get my paperwork in order and who provided enthusiastic encouragement once I had arrived.

I am especially indebted to Levi Namaseb, not only for his contribution as a consultant *par excellence*, but for his assistance in everything from teaching me to drive a manual transmission on the wrong side of an unpaved, goat-lined road, to finding consultants in Windhoek, to offering me a place to stay when I needed it. Indeed, the entire family, especially Elisa Namases, welcomed me into their home and treated me like one of the family. I will always remember their warmth and generosity. I am also grateful to my other consultants, Jochobeth Naris, Anna Josephina Nanus, Valerie ||Garoës, Mathias !Hoaëb and Herman Ganaseb, and most especially Willendia Ganases, for their patience as I struggled to figure out what exactly I thought I was doing.

Graduate school is not supposed to be easy, but my experience was at least made easier by the commiserating support of my contemporaries at Cornell. Those hours sitting in circles in the basement of Morrill and people's living rooms made the stresses of graduate school much more manageable. In the early years, Rob Young, Rebecca Daly, Ken Matos, Evelyn Browne, Andrew Joseph, Anastasia Riehl, Tanya Matthews, Diego de Acosta and Rina Kreitman helped immeasurably, and as did Effi Georgala, Adam Cooper, Nikola Predolac, Jonathan Howell, Marc Brunelle, Tejaswini Deoskar, Joe Pittayaporn, John Phan, Jo Johnson, Peggy Renwick, Kolfinna Jónatansdóttir and Becky Butler Thompson towards the end. I am particularly grateful to Tejaswini Deoskar, Effi Georgala, Peggy Renwick and Ben Currens for cat-sitting above and beyond the call of duty. I would also like to thank my ex-pat support network in Namibia, especially Kate Schroeder, Bonnie Sylwester, Dominic Von

Stösser, Tina Schönheit, Sarala Krishnamurthy and Chandini Atmakur. Namibia is a beautiful country, but living abroad can be difficult, and it made it easier to share the experience with others who were in the same boat.

Finally, I would like to thank my family for their support, first through my long years in Ithaca and then during the interminable months when I was hanging around the house “finishing up” my revisions. It took me longer than I said it would, but I made it in the end, and this dissertation would not be what it is without their help and encouragement, even when they weren’t entirely clear on what I was doing or why anyone would bother doing it.

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CHAPTER 1: INTRODUCTION

1.0 Overview

In his landmark survey of Khoekhoe phonetics, Beach (1938) observed that vowels in his corpus that had been classified as “short” in previous descriptions could have durations that ranged from 83 ms to 338 ms, while those classified as “long” had durations between 102 ms and 266 ms. This meant that many of the “short” vowels were in fact as long as or longer than the “long” vowels. In discussing his results, Beach concludes that, “perhaps...the boundary between strong roots and weak roots is wrong, and perhaps there are other considerations which must be reckoned with. Or perhaps vocalic length in Hottentot is so capricious as to defy scientific investigation” (p.112). It turns out that Beach was right on the first two counts (and overly-pessimistic on the third), and that one “other consideration” he had not reckoned with was the influence of prosodic structure on segment realization. Though Beach does not provide details about his corpus, his measurements were likely confounded by the interaction of a structurally-conditioned vowel length distinction, subtle differences between roots and root-like function words, and phrase-final lengthening. This dissertation provides a framework for understanding precisely these types of confounds in both Khoekhoe and other Khoesan languages by demonstrating the relationship between distributional constraints and suprasegmental prosodic structures.

The astonishing complexity of Khoesan segment inventories is widely acknowledged, but less attention has been paid to other facets of these languages. This is due in part to descriptive coverage that is spotty and often inaccessible to non-specialists (Güldemann and Vossen 2000). Khoesan languages are spoken by relatively few people spread over a wide area in a somewhat inaccessible corner of the

world, and the complexity of Khoesan phoneme inventories can present a barrier to other types of analysis. Though there has been much progress in recent years on issues in Khoesan phonetics and phonology (e.g., Traill 1985, Miller-Ockhuizen 2003, Nakagawa 2006, Miller et al. 2009), a complete prosodic analysis requires solid descriptions of the phonology, morphology and syntax of a language, and the level detail in published materials is often not sufficient for more than superficial generalizations.

To date, most non-Khoesanists have relied on Traill's (1985) pioneering discussion of !Xóõ. But despite Traill's excellent work, this is just one language, and Traill does not look beyond the question of morpheme-level segment distribution. The present dissertation addresses the empirical gap by offering a prosodic analysis of Khoekhoe, by far the best described of the Khoesan languages, that integrates material from both published sources and original fieldwork. My hope is that the discussion will prove useful for both the specialist and non-specialist audience. The analysis motivated here provides a foundation for pan-Khoesan comparisons by highlighting the types of questions that are likely to be fruitful for future fieldwork on other languages, but the discussion assumes no prior knowledge of Khoesan languages and relates the observed patterns to those attested in languages spoken in other parts of the world.

A second reason that Khoesan languages have received relatively little attention from non-specialist phonologists is that they do not, at first glance, look very interesting. Though the distribution and feature specification of clicks is clearly an issue (e.g., Chomsky and Halle 1968, Sagey 1986, Clements and Hume 1995, Zoll 1996, Beckman 1999), Khoesan languages typically lack segmental alternations, and root phonotactic patterns, though strict, are quite straightforward. Once the clicks have been accounted for, there does not seem to be much else to say. I will, however, show

that the clear-cut distributional patterns found in roots are actually an asset when we turn our attention to the ways that other types of morphemes diverge from the root template. It is well established cross-linguistically that content and function words can differ both prosodically and phonotactically (see e.g., Willerman 1994, Selkirk 1995, Beckman 1999, Alderete 2003, Zec 2005, Urbanczyk 2006). In Khoekhoe, we find that lexical and functional heads are subject to very different constraints on segment and tone distribution, and that some categories of “function word” behave as if they were intermediate between these two extremes. I show that these differences can be accounted for if we recognize the distinction among constraints that target roots, constraints that target grammatical words and constraints that target prosodic words.

In addition to these morpheme-level distributional asymmetries, Khoekhoe exhibits a type of phrase-level tone sandhi that is otherwise unattested outside of east Asia. Building on Haacke’s (1999a) description of the phenomenon, I show that post-lexical melody substitution in Khoekhoe is strikingly similar to that found in Southern Min languages (Chen 1987, 2000, Du 1988, Lin 1994, Lee 2005), and that it can be analyzed in comparable terms. That is, the distribution of citation and sandhi forms can be captured with reference to syntactically-derived prosodic domains. Khoekhoe does, however, differ from Southern Min languages in three important respects. First, the relationship between citation and sandhi melodies cannot be schematized with a “tone circle”. This underscores the fact that the circular chain shifts for which Southern Min languages are famous are formally independent of constraints on melody replacement, and suggests that there could be multiple diachronic paths to substitution patterns of this type. Second, citation melodies are confined to the left, not right, edge of a phonological phrase, a pattern not found in other languages with this type of substitution. Finally, Khoekhoe differs from Southern Min languages in that most (but not all) function words fail to take sandhi forms, even when they bear “root-

like” tone melodies. Taken together, these patterns have important implications for theories of tone sandhi (e.g., Chen 2000, Zhang 2007), which have focused almost exclusively on the areally and genealogically related languages of China, and for theories of phonological phrasing (e.g., Selkirk 1986, 2000, Nespor and Vogel 1986, Truckenbrodt 1995, 1999).

Overall, I show that Khoekhoe segment and tone distribution patterns tend to emphasize the left—rather than right—edges of prosodic constituents. Syllables are open, word-initial onsets are perceptually salient, functional heads are prosodic enclitics, and tones are left-aligned at both the word- and phrase-levels. This across-the-board leftward alignment stands in contrast to the alternating left-right pattern of metrical prominence Wiese (2000) demonstrates for German. Moreover, the Khoekhoe data serve as a case study of the interactions between constraints on positional markedness (Zoll 1998, de Lacy 2001, Smith 2005) and positional faithfulness (Beckman 1999). Segments in root-initial position, for instance, are both more and less marked than the segments in other positions, but they are consistently more salient perceptually. The same is true of tone melody distribution, both lexically and post-lexically. Together constraints on positional markedness and positional faithfulness conspire to accentuate the left edges of prosodic, morphological and syntactic domains.

The remainder of this dissertation is structured as follows. Background about the language, its speakers and its relation to other southern African languages is provided in Chapter 2. I then turn to the shapes of morphemes and the ways that segments are distributed within them. The patterns found in roots are laid out in Chapter 3, while the patterns in clitics are demonstrated in Chapter 4. The distinct tone inventories associated with roots and clitics are discussed in Chapter 5. Then, having established the basic patterns, I turn in Chapter 6 to behavior of those function words

that do not fit neatly into either category. Finally, we look at the relationship between tone sandhi and higher-level prosodic structure (Chapter 7). Conclusions are summarized in Chapter 8. While a single dissertation cannot hope to offer an exhaustive treatment of these issues, this is the most complete prosodic account of any Khoesan language to date, and it forms a necessary foundation for future research on both Khoekhoe and other Khoesan languages.

CHAPTER 2: KHOEKHOE AND ITS SPEAKERS

2.0 Introduction

Though the focus of this dissertation is on issues in Khoekhoe prosody, it is important to remember that every language exists in a particular context. It is used by real people, it has a unique history and it has relationships, genetic and areal, with the languages that surround it. This chapter provides a brief overview of Khoekhoe's context. I begin by addressing the range of names that have been applied to Khoekhoe and its neighbors (section 2.1), and then turn to our current state of knowledge about the genetic relationship between Khoekhoe and the other "Khoesan" languages (section 2.2). This is followed by a short look at contemporary use of Khoekhoe in Namibia (section 2.3), and discussion of the orthographic and transcription conventions used in this dissertation (section 2.4). The chapter concludes with information about the consultants who graciously assisted me, as well as technical information about the recordings that serve as the foundation for my analysis (section 2.5).

2.1 The Khoekhoe language

This dissertation follows recent Khoesanist practice (e.g., Traill 1995, Haacke et al. 1997) in using the term *Khoekhoe* to refer to the language under investigation. Previous work has applied a range of names, including *Hottentot* (e.g., Beach 1938, Greenberg 1950, 1966, Chomsky and Halle 1968, Trubetzkoy 1939a, 1939b, Swadesh 1971), *Nama Hottentot* (e.g., von Essen 1962, Hagman 1977), *Nama* (e.g., Haacke 1976, Ladefoged and Traill 1984, Ladefoged and Maddieson 1996, Witzlack-Makarevich 2006), *Dama* (Cruttenden 1992) and *Damara* (Klein 1976, Haacke 1986). In some cases, these names reflect work on a specific dialect (e.g., Haacke 1986,

Witzlack-Makarevich 2006), but naming confusion is a pervasive problem in Khoesian linguistics (see Treis 1998 for an overview), in part because of Europeans' attempts to categorize the peoples of southern Africa on conflicting economic, racial and linguistic grounds. Because comparisons between Khoekhoe and other southern African languages are relevant for portions of this dissertation, I provide a brief overview of the classificatory morass.

The term *Hottentot* was coined by 17th century Dutch settlers to refer to the pastoralist culture they found upon their arrival at the Cape. The word's origin is disputed, but it may derive from the "jesting carry-over of an incremental-repetitive formula in a typical dancing song" (Nienaber 1963), and it soon became the standard term in European languages for the lighter-skinned, non-Bantu speaking pastoralists of southern Africa. These people called themselves *Khoekhoe*, a reduplicated form of the root for 'person' that means something like 'human human being' or 'proper human being' (Haacke 2002). The name is frequently spelled *Khoikhoi* in English, but following a proposal by Nienaber (1990) and requests from speakers of Khoesian languages, there has been a shift towards a spelling that harmonizes with Khoesian orthographies, in which the vowel sequences *oe* and *oi* can be contrastive. The same applies to the word *Khoesan*, the origins of which will be discussed below.

As Europeans expanded inland, they encountered hunter-gatherers who were culturally distinct from the Cape Khoekhoe, but who resembled them physically and whose languages were also characterized by a high proportion of clicks. These people had no name for or sense of themselves as a group, but the Khoekhoe called them *Sān* 'foragers',¹ and they came to be known in English as *Bushmen* (Wilson 1986,

¹ In the early years of the Cape colony, *Sān*, or *Soaqua*, could actually be applied to anyone who was impoverished and outside of society, including poor Khoekhoe and Europeans, and until the late 18th century, the term *Bushman* had similar socio-economic connotations. Ultimately, however, both terms came to designate ethnic, rather than social groups. See Guenther (1986) for discussion.

Guenther 1986, Barnard 1992:7). Originally, then, the terms *Hottentot* and *Bushman* indicated an economic distinction between pastoralists and hunter-gatherers. But at the same time, the physical similarities of these peoples and the phonotactic similarities of their languages clearly set them apart from their Bantu-speaking neighbors.

It was not until the 19th century that Khoekhoe and the various Bushman languages were described in enough detail for linguists to begin assessing the relationships among them. By the mid-1800s it was being argued that Khoekhoe's use of gender categories indicated kinship with the languages of North Africa, even if its phonology had been "corrupted" by the speech of the Bushmen (e.g. W. H. I. Bleek 1858, 1862, Lepsius 1863).² This classification depended crucially on the assumption that the distinction among "sex-denoting", "prefix-pronominal" and "genderless" languages was of primary importance in establishing historical relationships. Since Khoekhoe was "sex-denoting" and the Bushman languages were thought to be "genderless", they were assumed to belong to different groups. Bleek in particular also believed that this classification was corroborated by parallels between Khoekhoe folk tales and those of other "sex-denoting" languages (Bleek 1864). This position was subsequently taken up by others, most notably Meinhof (1912) and his followers, though there were also those who felt that the similarities between the Hottentot and Bushman languages were too significant to ignore (e.g., Planert 1905, 1927, Drexel 1921/22).

² The original claim is generally attributed to Lepsius (e.g., Meinhof 1912, Greenberg 1966), and Vossen (1991:416) points to a comment by Lepsius himself that "the formation of genders has appeared to me so characteristic of the three principle branches that I thought it (1844) a sufficient reason, to ascribe all the African nonsemitic languages, which distinguish these genders, to the Hamitic branch...." (Lepsius 1863:90). Lepsius goes on to specifically mention Hottentot and Bushman. W. H. I. Bleek (1862:viii, 1864:xvi-xx), on the other hand, maintains that this claim was first made independently by Adamson (1851, 1854), Logan (1854) and himself (W. H. I. Bleek 1851).

Concurrent with the early linguistic descriptions was work by anthropologists who sought to classify the peoples of southern Africa along phenotypic and cultural lines. One of the most influential of these was Schultze (1928), who surveyed the physical characteristics of Hottentots and Bushmen, and concluded that they were similar enough to each other, and different enough from other groups, to constitute a separate race. He proposed the term *Khoesan* (he spelled it *Khoïsan*) from the names the Khoekhoe used for themselves (based on the root *khoe* ‘person’³) and the Bushmen (i.e., *Sān*⁴) in order to refer to these two groups collectively.

Schapera (1930) took the matter one step further, arguing that the Hottentots and Bushmen should be seen as part of a “larger ethnic unit, which, it is important to note, is clearly differentiated from the Bergdama on the one hand and the Bantu on the other” (p.5). From Schapera’s perspective, the similarities he saw in race, language and religion were more significant than the economic differences between the two groups, though race seems to have been his primary criterion for excluding the Khoekhoe-speaking Bergdama (i.e., Damara) from his classification. Schapera is widely credited with popularizing the term (and spelling) *Khoisan*, and he is the first to have applied it to the “Khoisan languages”. But to a large extent, Schapera’s case for Khoesan linguistic unity looks like an attempt to neatly align cultural, racial and linguistic categories. Subsequent developments in the classification of Khoesan languages will be taken up in section 2.2. For discussion of recent linguistic and

³ Schultze was presumably following W. H. I. Bleek’s use of the word *bantu* ‘person’, which appears in several languages of that family (W. H. I. Bleek 1857/1952, Bleek 1858, 1862, see Cole 1971:9 for discussion). Drexel (1921/22) and D. Bleek (1927:55) had both already proposed names for the language family based on the root *khoe*.

⁴ Schultze’s spelling reduces the long vowel of the Khoekhoe word, marked orthographically with a macron, to a short vowel and incorporates the third-person, common-gender, plural suffix [-n] as part of the word. Nienaber’s (1990), following Haacke, suggests the spelling *Khoesaan*, but the proposal has largely been ignored. In this dissertation, I have adopted a spelling that harmonizes with that of *Khoekhoe*, but have not changed the second part of the word, since as Barnard (1992:7) observes, *Khoesan* is a European construct and not a meaningful word in any of the Khoesan languages.

population-genetic research on the relationships among click languages and their speakers, as well as critique of the idea that clicks are somehow reflexes of “proto-language”, see Güldemann (2007, in prep.), Güldemann and Stoneking (2008) and Sands and Güldemann (2009).

Today, the term *Hottentot* is widely considered pejorative, and speakers of Khoekhoe are usually referred to with the ethnonyms *Nama*, *Damara* and *Hai||om*. Early linguistic descriptions often referred to the language as *Nama*, because the missionaries who had traveled north from the Cape worked among the Nama before encountering the more northerly Damara and Hai||om (Haacke 2002). Since the earliest texts and grammars of the language were produced by these missionaries, the name of this one ethnic group came to apply to the entire language, to the extent that Hagman (1977), who worked exclusively with Damara speakers (Maho 1998), titled his dissertation *Nama Hottentot Grammar*. Even today, sources like *Ethnologue* (Gordon 2005) give *Nama* as the language’s primary name, despite the fact that it is probably spoken by more ethnic Damara than Nama. In Namibia, the official name of the language is now *Khoekhoegowab*, meaning ‘Khoekhoe language’, though Namibians themselves still frequently call it *Nama/Damara* or *Damara>Nama*.

The status of *Bushman* as a linguistic descriptor is even more problematic. The word itself is now considered by many to be both sexist and racist, and *San* has been introduced as a more politically-correct substitute (Wilson 1969, see Guenther 1986 for a summary of the subsequent debate). This term is not, however, without its own problems, and many of the people it refers to actually find *San* more offensive (Barnard 1992:7-10, Gordon and Douglas 2000:4-8). Given the adoption of *San* by NGOs working in these communities (e.g., South African San Institute, WIMSA), it seems likely that *Bushman* will eventually be displaced, but from a linguistic perspective *San* and *Bushman* are equally bad. There is no evidence that the languages

spoken by *San/Bushman* groups constitute a linguistic unit, despite the economic, phenotypical and cultural similarities among the people who speak them. While the languages Dorthea Bleek called “Central Bushman” (D. Bleek 1927) are clearly related to Khoekhoe, there is little or no positive evidence of connections among Bleek’s “Northern”, “Central” and “Southern” groups. For this reason, I refer only to specific languages, or to established language families (see section 2.2) and dispense with the terms *San* and *Bushman* altogether.

The earliest linguistic descriptions of Khoekhoe date from the Dutch arrival at the Cape in the 17th century. At that time there seems to have been a dialect chain that stretched from the Cape to what is now southern Angola (Haacke 2002), but aside from a few wordlists made by explorers, the language was not reliably documented until the 19th century. The most important early descriptions of Khoekhoe, particularly the Nama and Korana varieties, are summarized in Doke (1933). The first significant contribution from the perspective of contemporary phonetics and phonology is Beach’s (1938) excellent survey, which presents the segment and tone inventories in a phonetically accurate way. More recently, Ladefoged and Traill (1984), Spencer (2004) and Miller, et al. (2007b) have discussed the articulation of Khoekhoe clicks, while other researchers have examined its syntactic (Lewy 1966, Günther 1969, Haacke 1976, 1977, 1978, 1983, 1992, 2006, Klein 1976, Hagman 1977), tonal (Dempwolff 1913, von Essen 1962, 1966, Haacke 1983, 1999a) and information (Witzlack-Makarevich 2006) structures. But despite the fact that several works have touched on issues related to prosodic structure, most notably Cruttenden (1992), this aspect of Khoekhoe phonology has yet to be investigated in a systematic way. One of the goals of this dissertation is to fill this descriptive and analytic gap.

2.2 Khoekhoe and the “Khoesan” languages

As we have seen, linguistic debate in the first half of the twentieth century focused primarily on the question of whether Khoekhoe should be classified as an Afroasiatic language that had been “corrupted” by Bushman influence (e.g., Meinhof 1912), or whether it and the Bushman languages together constituted a family that could be grouped under the heading “Khoesan” (e.g., Planert 1905, 1927, Drexel 1921/22, Schapera 1930). Due in part to Meinhof’s influence in the field, claims about Khoekhoe’s North African origins were not laid to rest until Greenberg (1950, 1966) presented his influential classification scheme for African languages. Greenberg essentially adopted Dorthea Bleek’s (1927) division of the Hottentot and Bushman languages into Northern, Central and Southern groups, as shown in Figure 2.1, and treated the geographically distant languages Hadza and Sandawe (spoken in Tanzania) as separate branches of the same family.

As Güldemann (forth.) observes, Greenberg’s classification had two distinct but intertwined goals. The first was to refute the claim that Khoekhoe was of “Hamitic” (i.e., Afroasiatic) origin. This was accomplished by showing that Khoekhoe had far more in common with the “Central Bushman” languages than any of the languages of North Africa,⁵ and the widespread acceptance of Greenberg’s proposal effectively meant the end of the “Hamitic hypothesis”. Greenberg’s second goal was to demonstrate the genetic unity of the various groups of Khoesan languages, but here he was misled by “the usual view...that the languages of the Bushmen, which are quite diverse, form a single family” (Greenberg 1966:66). While Khoekhoe and the “Central Bushman” languages are indeed related, the evidence for connections among “Northern”, “Central” and “Southern” Southern African Khoesan languages has

⁵ Güldemann (forth.:2) notes that “this was an extension of the arguments of several earlier scholars who had already identified the relevant empirical data.”

always been scant. For the most part, arguments for the macro-Khoesan hypothesis seem to rest on phonotactic similarities, obvious lexical parallels (the possibility of borrowing is not considered) and the spurious notion that the cultural similarity among different Bushman groups implies a shared linguistic history. Critique of Greenberg's data and methods can be found in Westphal (1971), Sands (1998) and Güldemann (2002, forth.). An overview of current issues in the classification of African languages is presented in Sands (2009).

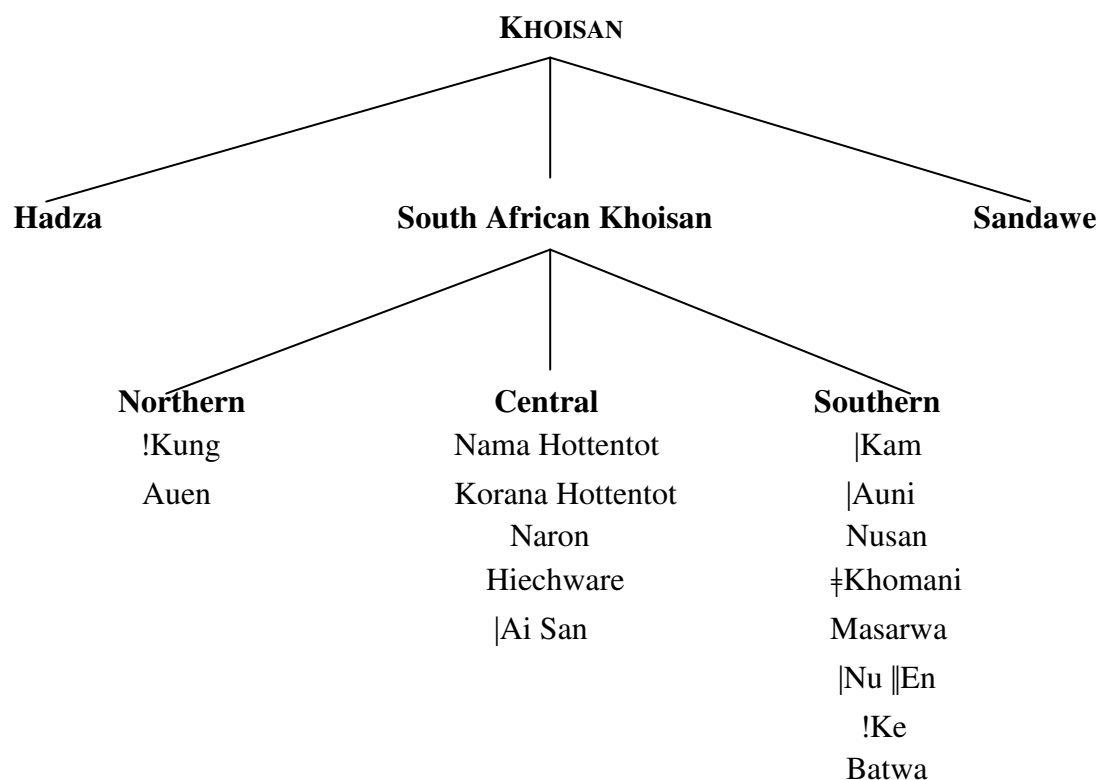


Figure 2.1 Greenberg's (1966) classification of non-Bantu African click languages.⁶

⁶ The languages listed here are those Greenberg mentions in his discussion. Differences in both terminology and orthography make it difficult to compare Greenberg's classification of particular languages with those in Figure 2.2. Note that ‡*Khomani* is also known as *N/uu*.

One problem with Greenberg's work on Khoesan languages was that he knew relatively little about them, or the generally poor quality of available descriptions (Güldemann forth.). He also took little note of criticisms, particularly from Westphal, of the reigning assumptions about the unity of Bushman languages (Westphal 1962a, 1962b, 1971). Westphal took exception to the idea that economic distinctions could indicate linguistic distinctions, as well as the idea that phenotypical similarities might suggest linguistic similarity (1962b:1). Based on his own extensive field work, Westphal proposed five distinct groups of non-Bantu click languages.

Despite objections from Khoesanists like Westphal, Greenberg's classification has remained influential with researchers outside the field (e.g., Gordon 2005). Subsequent work has either accepted the basic premise of Greenberg's approach and assumed the existence of a genetic entity "Khoesan", or else has taken a more conservative, splitting approach like that advocated by Westphal. Güldemann and Vossen (2000), for instance, find none of the evidence for genetic connections among the various "Khoesan" languages convincing, and note that the lack of existing documentation, combined with the fact that many of these languages are severely endangered or extinct, may mean that the such evidence will never be available. They do, however, point out that genetic relationships can generally be demonstrated *within* Greenberg's Southern African branches, and they adopt the common-sense approach that has emerged among many recent researchers (they note Köhler 1975, 1981, Traill 1980, 1986, Sands 1998) who explicitly adopt "Khoesan" as a cover term for languages that have clicks but no obvious affiliation with other language families. Güldemann (forth., in prep.) offers a "pragmatically oriented" alternative to Greenberg's groupings, which is adapted slightly in Figure 2.2. In this dissertation, I follow this practice of using *Khoesan* only as a cover term, and refer to *Khoesan languages* or the *Khoesan group*, but never the *Khoesan family*.

Hadza	Hadza (isolate)
Sandawe	Sandawe (isolate)
Khoe-Kwadi	
	<i>Khoe</i> (“Central S. A. Khoesan”)
	<i>Khoekhoe</i> (“Hottentot”)
	<i>North:</i> Nama/Damara, Hai ’om, Eini [‡]
	<i>South:</i> !Ora [‡] (<i>Korana</i>), Cape Khoekhoe [‡] (DC)
	<i>Kalahari</i> (“Central Bushman”)
	<i>East</i>
	<i>Shua:</i> Cara, Deti [‡] , Xaise, Danisi, Ts’ixa, etc.
	<i>Tshwa:</i> Kua, Cua (<i>Hiechware</i>), Tsua, etc.
	<i>West</i>
	<i>Kxoe:</i> Kxoe, Ani, Buga, G anda, etc.
	<i>G//ana:</i> G//ana, G ui, †Haba, etc.
	<i>Naro:</i> Naro (<i>Naron</i>), etc.
<i>Kwadi:</i>	Kwadi
Ju-†Hõã	
	<i>Ju</i> (“Northern S. A. Khoesan”, DC)
	<i>Northwest:</i> !’O!Xũu, !Xũu (<i>/Kung</i>)
	<i>Southeast:</i> Ju ’hoan, †Kx’au ’e (<i>Auen</i>)
<i>†Hõã</i>	†Hõã (isolate)
Tuu (“Southern S. A. Khoesan”)	
	<i>Taa-Lower Nossob</i>
	<i>Taa:</i> West !Xóõ, East !Xóõ, N amani [‡] , ‘N ohan, Kakia (DC)
	<i>Lower Nossob:</i> ’Auni [‡] , Haasi [‡] (DC)
<i>!Ui:</i>	N ng (DC includes N uu), †Ungkue [‡] , Xam [‡] (DC), Xegwi [‡]

(DC = ‘dialect cluster’, ‡ = presumed extinct, () = alternative names)

Figure 2.2 Khoesan lineages (bold), branches (italics) and languages (based on Güldemann forth., in prep.)

In contrast to the tenuous status of genealogical relationships among the various lineages, phonotactic similarities across southern African Khoesian languages are very real. I show in Chapters 3 and 4 that word shapes and segment distribution are highly constrained in Khoekhoe. These same patterns are pervasive in Khoe-Kwadi, Ju-ǀHōã and Tuu languages, though such similarities should not be taken as evidence of shared inheritance, because prosodic characteristics can spread in contact situations. Chamic languages, for instance, have shifted from a bisyllabic word template to one that is sesquisyllabic, presumably under the influence of Mon-Khmer languages, and word shapes in colloquial Eastern Cham and Utsat have subsequently become monosyllabic, likely due to influence from Vietnamese and Chinese, respectively (Thurgood 1999, Brunelle 2008). Given the time depth of interactions among speakers of southern African Khoesian languages (at least 2000 years, Güldemann in prep.), I assume that phonotactic similarities can be attributed to contact-induced convergence.

Now that we have established Khoekhoe's historical context, we turn to the people who speak it today.

2.3 Khoekhoe speakers today

Today, Khoekhoe is spoken primarily in Namibia. The map in Figure 2.3 shows the approximate distribution of Khoesian languages in southern Africa, but note that Khoesian languages are not the only, or even the dominant, languages spoken in these areas. There are no recent statistics on the number of Khoekhoe speakers, or indeed the number of speakers of most Khoesian languages, but the last Namibian census did record the languages spoken in each household, as shown in Table 2.1. This, together with more recent population estimates, provides a rough approximation of the number of Khoekhoe speakers in Namibia. Assuming Khoekhoe speakers still constitute 11.5% of the population and a current population of 2,108,665 (Central

Intelligence Agency 2009), the number of Khoekhoe speakers in Namibia should be on the order of 240,000.

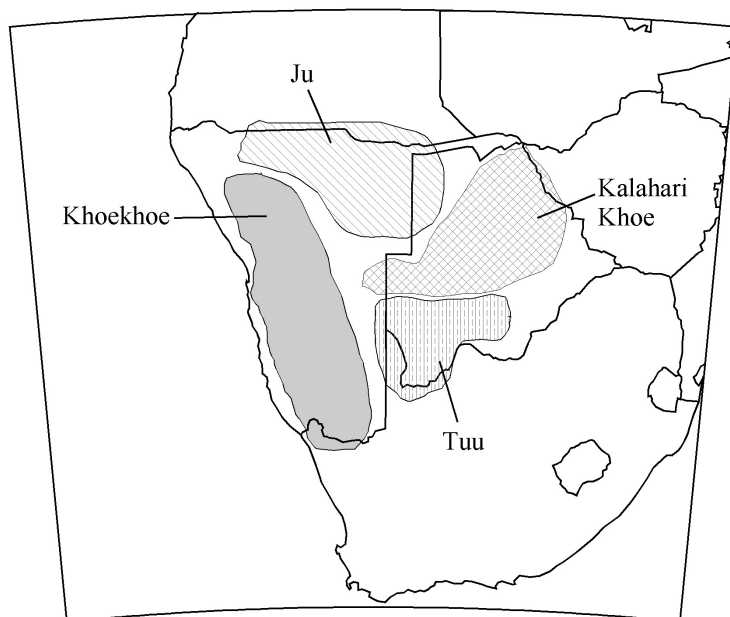


Figure 2.3 Approximate distribution of southern African Khoesian language families.

Table 2.1 Home languages recorded in the 2000 census (Namibian Central Bureau of Statistics 2003)

Language	Households	Percent
Oshiwambo	167,943	48.5
Khoekhoegowab	39,717	11.5
Afrikaans	39,481	11.4
Kavango languages	33,741	9.7
Otjiherero	27,374	7.9
Caprivian languages	17,493	5.0
English	6,522	1.9
San languages	4,229	1.2
German	3,654	1.1
Setswana	1,051	0.3
Other European	1,790	0.5
Other African	1,447	0.4
Not stated	2,013	0.6
Total	346,455	100.0

English has been Namibia's official language since it gained independence in 1990, and English is now the language of government, as well as the language of instruction in most Namibian schools after grade 3. The Namibian constitution guarantees the right to mother-tongue education in grades 1-3 (Haacke 1994), but the most recent available figures, summarized in Table 2.2, show that the number of Khoekhoe-speaking students in Khoekhoe-medium education is only 34%. This number is significantly lower than those for students who speak a Bantu or European language at home. Before Namibian independence, mother-tongue education was associated with the apartheid policies of the South African government, and even then, many parents opted for English-language education (de V. Cluver 1992:123, Haacke 1994:244). It is not clear why Khoekhoe-speaking parents today should differ so dramatically from other groups, but these data are consistent with the results of a survey conducted with Khoekhoe-speaking parents in Windhoek (Namaseb 2000), which found that 33% of parents opted for Khoekhoe-medium education, while 43% opted for English. The top three reasons Khoekhoe-speaking parents gave for having their children educated in English were that: 1) English is the official language of Namibia (43%); 2) English is the language for economic success (24%); and 3) English is the language of international communication (14%). Parents who opted for Khoekhoe, on the other hand, were more concerned with preserving their culture (53%) and preventing the extinction of the language (32%). Only 5% of the parents who chose Khoekhoe as a medium of instruction did so because they felt it important for the children to understand the material.

Table 2.2 Number of Namibian students in grades 1-3 by home language (rows) and language of instruction (columns) (Namibian Ministry of Education 2006). 'Rumanyo' is a common medium for the closely related languages Rucgiriku and Shishambyu.

Language of Instruction Home language	Oshikwanyama	Oshindonga	Khoekhoegowab	San	Otjiherero	Rukwangali	Rumanyo	Thimbukushu	Afrikaans	English	German	Silozi	Setswana	Total speakers	Percent of population	Percent in mother tongue medium	Percent in English medium
Oshikwanyama	32126	5294	47	0	110	71	6	0	134	3805	0	1	1	41,595	22.8	77	9
Oshindonga	520	21814	22	0	63	37	0	0	110	2736	3	2	1	25,308	13.9	86	11
Other Oshiwambo	1648	24414	73	0	183	67	2	1	368	2991	1	8	2	29,758	16.3	0	10
Khoekhoe	0	63	6636	0	64	12	2	0	2654	9861	17	2	70	19,381	10.6	34	51
San (Bushman)	33	4	106	93	63	126	18	39	256	1503	0	6	81	2,328	1.3	4	65
Otjiherero	5	28	184	0	6711	7	1	0	488	5418	4	0	42	12,888	7.1	52	42
Rukwangali	4	6	10	0	24	10446	832	7	148	511	0	11	1	12,000	6.6	87	4
Rucgiriku	0	0	2	0	4	253	4061	38	17	171	0	2	1	4,549	2.5	89	4
Shishambyu	0	0	0	0	0	83	966	16	7	39	0	0	0	1,111	0.6	87	4
Thimbukushu	0	0	1	27	2	95	203	2782	16	80	0	18	0	3,224	1.8	86	2
Afrikaans	0	3	123	0	1	6	0	0	7138	3572	33	0	1	10,877	6.0	66	33
English	0	1	3	0	0	1	0	0	67	741	29	2	0	844	0.5	88	88
German	0	0	0	0	0	0	0	0	14	49	515	0	0	578	0.3	89	8
Other European	0	0	0	0	0	0	1	0	7	98	3	0	0	109	0.1	0	90
Silozi	4	20	1	0	1	25	1	6	32	295	0	1708	0	2,093	1.1	82	14
Other Caprivian	11	10	0	0	3	47	3	0	22	223	0	5220	0	5,539	3.0	0	4
Setswana	0	0	14	0	36	0	0	0	57	223	0	0	183	513	0.3	36	43
Other	50	559	9	31	443	4036	1175	9	88	3485	1	6	46	9,938	5.4	0	35
Total per LoI	34,401	52,216	7,231	151	7,708	15,312	7,271	2,898	11,623	35,801	606	6,986	429	182,633			

2.4 Khoekhoe in orthography and transcription

The representation of segments is a consistent challenge in descriptions of Khoesan languages, especially when it comes to the rich sets of contrasts found on clicks and vowels. The earliest descriptions of clicks used a range of *ad hoc* conventions, most of which failed to gain traction with a wider audience (see W. H. I. Bleek 1858:6, Breckwoldt 1972, 1978, 1979 for summaries). One approach that did catch on was the re-purposing of unnecessary letters from the Roman alphabet, specifically *c*, *q* and *x*, to represent the dental, alveolar and lateral clicks of Zulu. This convention was established as early as 1824 (Bleek 1858:6), and continues to be the norm in Bantu orthographies. Contrasts in phonation and nasality are typically represented with digraphs (e.g., Xhosa *gc* for [ᵑ] and *ch* for [ᵑʰ]). Roman letters are also used to represent clicks in writing systems for some Khoesan languages spoken in Botswana (e.g., Naro), where Bantu orthographies predominate, but the practice has been a matter of debate among Khoesanists. See Snyman (1998), Miller-Ockhuizen (2000b) and Visser (2000) for discussion of the pros and cons of such a system in a Khoesan context.

Roman letters were used to represent clicks in some early work on Khoekhoe (e.g., Tindall 1857), but the rapid adoption of Lepsius's (1855, 1863) standard alphabet by missionary societies meant that his symbols were integrated into the Khoekhoe orthography soon after their introduction (e.g., Wallmann 1857). Strictly speaking, however, only the dental (|), lateral (||) and alveolar (!) click symbols actually originated with Lepsius. The current symbol for the palatal click (‡) was proposed by the Rhenish Mission Conference in 1856 as an alternative to Lepsius's slash with an acute accent mark (W. H. I. Bleek 1858:6, Lepsius 1863:79-83, Dammann 1982, Haacke 1989). The hybrid system in use today was applied without comment by W. H.

I. Bleek (1862), so presumably consensus had been reached by that point. The conventions established by the Rhenish Mission remained the *de facto* standard for written Khoekhoe until the Nama/Damara Language Committee of the Department of Bantu Education introduced the first official orthography in 1970 (Haacke 1989, 2005). Today, orthographic conventions are laid out in a revised version of the orthography (Curriculum Committee for Khoekhoegowab 2003) and used in both educational materials and a large Khoekhoe-English dictionary (Haacke and Eiseb 2002). See Dammann (1982), Haacke (1989, 1994, 2005), de V. Cluver (1992) and Maho (1998) for more on the history of language planning in Namibia.

Linguistic descriptions of Khoekhoe clicks since the mid-1800s have relied almost exclusively on the Lepsius symbols. The most notable exception is Beach (1938). Though Beach advocated the continued use of the Lepsius symbols in orthography, his linguistic description relied on what were then the IPA symbols for dental (ʈ), lateral (ɓ) and alveolar (ɕ) clicks, along with a symbol of his own devising (ʘ) for the palatal click. Phonation contrasts were represented with digraphs, and nasalization with minor adjustments to the basic click symbols (see Table 2.3). The IPA symbols had been developed by Daniel Jones during World War I (Breckwoldt 1972) and were used by Doke in his work on Zulu (e.g., Doke 1923), but in the end, they failed to find favor with linguists who specialized in click languages and were replaced by the Lepsius symbols in the 1989 revision of the IPA (Köhler et al. 1988).⁷ See Ladefoged and Traill (1994) and Ladefoged and Maddieson (1996) for discussion of the range of articulatory descriptions that have been applied to the different types of clicks.

⁷ The bilabial click symbol (ʘ) was first used in W. H. I. Bleek (1875:6), though Breckwoldt (1972:285) mistakenly attributes its invention to Lucy Lloyd in 1911. This symbol was added to the IPA chart in the 1979 revision.

The use of Lepsius symbols solves the problem of representing different click types in both orthography and transcription, but the representation of phonation, nasality and airstream contrasts is a separate, more controversial issue. Transcriptions in this dissertation follow the convention motivated by Miller et al. (2009) for the South African language N|uu. The major innovations of this convention with respect to Khoekhoe are the treatment of glottalization on clicks as phonation, and the analysis of clicks with a fricative release as affricates. But because the prosodic issues I discuss touch on a range of phonetic, phonological and syntactic phenomena, the question of how to represent words is a real problem. On the one hand, analysis of phonetic and phonological characteristics requires transcription, but on the other, the superscripts and diacritics necessary for representing clicks, vowels and tone distract from bigger issues in the discussion of word order and tone sandhi. For this reason, I alternate between broad IPA transcription and orthography as the situation demands. The representations of Khoekhoe clicks in different sources are summarized in Table 2.3. The inventory itself will be discussed in Chapter 3.

Table 2.3 Four conventions for representing Khoekhoe clicks

Miller, et al. (2009)	Orthography	Beach (1938)	Hagman (1977)
[! †]	< g g !g †g >	ʔ ɓ ɕ ɕʔ	! †
[^h ^h ^h ^h ^h ! ^h ^h † ^h]	< ! † >	ʔʰ ɓʰ ɕʰ ɕʰʔ	' ' !' †'
[χ χ !χ †χ]	< kh kh !kh †kh >	ʔx ɓx ɕx ɕxʔ	x x !x †x
[^h ^h ^h ^h ^h ! ^h ^h † ^h]	< h h !h †h >	ʔh ɓh ɕh ɕhʔ	h h !h †h
[^h ^h ^h ^h ^h ! ^h ^h † ^h]	< n n !n †n >	ʔ ɓ ɕ ɕʔ	n n !n †n

My use of orthography does, however, necessitate a brief overview of some potentially confusing features. First, as Table 2.3 shows, orthographic representations seem to imply the existence of a voicing contrast, for instance between <|> and <|g>.

This is not the case; rather, the <g> in click digraphs indicates a voiceless, unaspirated segment, while orthographically “plain” clicks actually have glottal phonation. Similarly, the apparent voicing contrast found in the inventory of pulmonic stops (i.e., <p t k > vs. <b d g>) reflects the tonal register of the root, not voicing on the consonant. So, for instance, orthographic <garo> ‘to bend’ is pronounced [kàrò], while orthographic <karo> ‘to dry out’ is pronounced [káró]. Similarly, <doro> ‘to dry up’ is [tòro], while <torob> ‘war’ is [tórop]. The case of <torob> also demonstrates that the 3.M.S PGN marker [-p] is written <-b>, regardless of the tone on the word it is associated with. Finally, the orthography compensates for the absence of upper-case click letters by capitalizing the second grapheme of click-initial words in proper nouns and sentence-initial position (e.g., <||Ari> ‘yesterday’).

Though the most challenging representational issues in Khoekhoe involve clicks, vowel representation can also be a problem. First of all, I diverge from strict IPA usage by indicating vowel length with double letters rather than a length mark (i.e., [néé], not [ně:]) and nasality with a superscripted *n* rather than a tilde (i.e., [!úⁿúⁿ], not [!ú̃ú̃]). Both modifications facilitate tone marking (see Miller-Ockhuizen 2003, Miller et al. 2009 for discussion), and I argue in Chapter 3 that the “double vowel” representation is also appropriate phonologically. Orthographic representations, on the other hand, show vowel length with a macron (e.g., [néé] is *nē*), and nasality with a circumflex (e.g., [!úⁿúⁿ] is *lî*). It is important that these not be taken as indications of tone, which is not marked in the orthography. Transcription of tone will be addressed in Chapter 5.

2.5 Consultants and data collection

The analysis in this dissertation draws from both descriptions in the literature (Beach 1938, Hagman 1977, Haacke 1999a, Haacke and Eiseb 2002), and original

fieldwork. I worked closely with two consultants (M1 and F2), and made recordings with several additional speakers between 2004 and 2007. All were living in Windhoek at the time of the recordings, though they had grown up in different towns. All were trilingual in Khoekhoe, Afrikaans and English, but all had grown up speaking Khoekhoe at home, all still regularly spoke Khoekhoe with friends and family, and all could read and write all three languages. Several were Khoekhoe-medium primary school teachers. Information about each speaker is summarized in Table 2.4.

Table 2.4 Consultant information

Speaker	Age	Occupation	Hometown
M1	48	University lecturer	Okombahe
M2	29	Primary school teacher	Otjiwarongo, Okahandja
M3	38	Engineering student	Khorixas
F1	50	Primary school teacher	Okombahe
F2	32	Primary school teacher	Walvis Bay, Windhoek
F3	23	Primary school teacher	Windhoek
F4	38	Primary school teacher	Rehoboth

There were minor differences among the speakers with respect to their segmental phonology. Speaker F4 had distinct palatalization of /k/ before front vowels, so that the declarative particle *ge* was typically realized [d͡ʒe]. Similarly, speakers M2 and M3, and to a lesser extent M1, pronounced the affricate /ts/ as [t͡ʃ], while other speakers had [ts]. There were not, however, any significant differences along the prosodic dimensions I discuss.

Recordings were made in quiet rooms with either: 1) a Sony TCD D7 DAT recorder and a Sony ECM-MS907 microphone, or 2) a Marantz PMD-670 digital audio recorder and a Shure SM10A head-mounted microphone. Sound files were down-sampled to 22,050 Hz and hand-labeled in Praat. For the most part, data in this

dissertation is discussed in qualitative, rather than quantitative terms. Where appropriate, however, representative examples of acoustic data are presented in one of three formats: waveform, spectrogram or pitch track. Examples of each are shown in Figure 2.4.

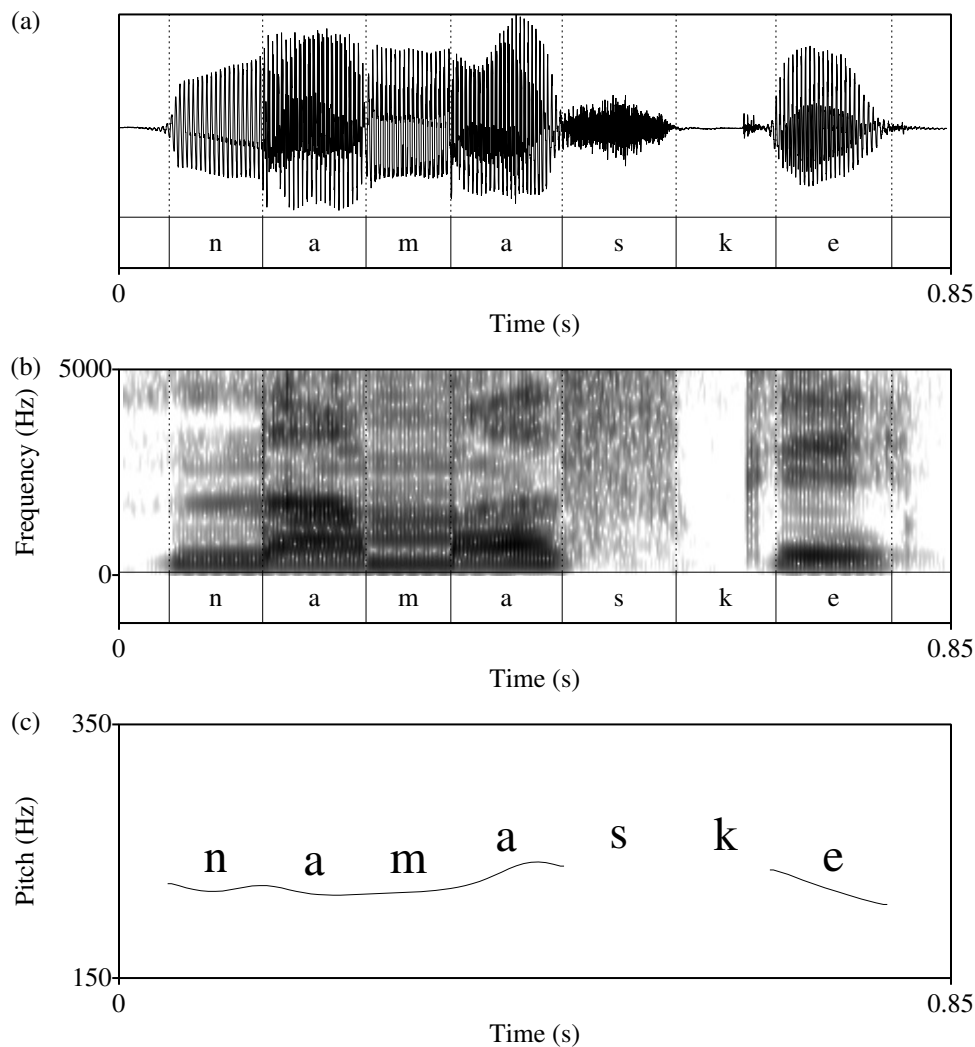


Figure 2.4 Waveform (a), spectrogram (b) and pitch track (c) of the phrase [námás kê] ‘It is the Nama.’ (Speaker F2)

Waveforms like that in Figure 2.4(a) show the change in acoustic intensity over time. They are particularly useful for illustrating the relative prominence or

duration of different parts on an utterance. Spectrograms like that in Figure 2.4(b) show how acoustic energy is distributed in each segment. This type of representation is useful for showing the boundaries between sonorants and the degree of voicing in obstruents. Finally, pitch tracks like the example in Figure 2.4(c) show how the fundamental frequency changes over time. This is relevant primarily in the discussion of tone. In some cases, two or more representations may be combined to illustrate the point under discussion.

We now turn to the analysis proper, starting with the phonotactic patterns found in Khoekhoe roots.

CHAPTER 3: ROOT PHONOTACTICS

3.0 Introduction

One of the most striking characteristics of Khoesan languages is their strong phonotactic constraints on word shapes. These were noted as early as Bleek (1858:31-32) and seem to hold in all southern African Khoesan languages. Indeed, the phonotactic similarities among these languages have often served as implicit evidence in proposals for a “Khoesan” language family, even though the morphosyntactic profiles of the Khoe and non-Khoe groups are very different (see König 2008 for an overview). But despite the apparent simplicity of these patterns, closer examination reveals differences both within and across languages. This chapter and the next will show that Khoekhoe roots pattern differently than other types of morphemes in terms of both segment distribution and syllable quantity, and that these differences reflect distinct prosodic structures. Such differences have been alluded to in previous accounts of other Khoesan languages (e.g., Beach 1938, Traill 1985, Miller-Ockhuizen 2003, Nakagawa 2006), but have never been addressed in comprehensive terms.

This chapter focuses on the phonotactic patterns that hold almost without exception in the open grammatical classes of nouns, verbs and adjectives. For the sake of convenience, I refer to these with the cover term *root*. Beach (1938:26-27) uses *root* in the sense of *morpheme*, and my use of *root* largely corresponds to his *strong root*, while particles and suffixes, which I refer to as *clitics*, would be *weak roots* in his terminology. Words of other categories, like demonstratives, auxiliaries, adverbs, postpositions, complementizers and pronouns, often look like roots, but I show in Chapter 6 that they behave somewhat differently. Beach’s assumption that these words had to pattern with the strong roots seems to be one of the reasons for his difficulty in

accounting for vowel duration patterns. It is not uncommon cross-linguistically for function words to differ from content words (e.g., Selkirk 1995, Hall 1999a, Zec 2005), but before we can discuss the exceptional behavior of these categories, we need to establish a baseline for comparison. This chapter does just that, by laying out the patterns of segment distribution and syllable quantity found in Khoekhoe roots.

The primary goal of this chapter and the next is to show that phonotactic generalizations in Khoekhoe can be captured succinctly by distinguishing between those morphemes that obligatorily initiate prosodic words and those that do not. Cross-linguistically, phonotactic generalizations often refer to syllables and feet, but prosodic words can also be domains for assimilation and dissimilation, stress assignment, segment distribution and minimality, particularly when it comes to content words (see e.g., Booij 1999, Hall 1999b, 1999a). Khoekhoe lacks both stress and segmental alternations, but constraints on segment distribution and minimality crucially apply only to roots and, by extension, to prosodic words. We look first at inventory and distribution of consonants (section 3.1), and then move on to the patterns found with vowels (section 3.2). Findings are summarized in section 3.3.

3.1 Consonants

Our first step in characterizing the prosodic structure of roots is to consider the inventory and distribution of consonants. Khoekhoe's inventory is larger than most, with 32 consonants and 8 vowels. By segment count, Khoekhoe ranks 58th of the 451 languages in UPSID (Maddieson and Precoda 1992), putting it in the 87th percentile.⁸ Khoekhoe's inventory is, however, modest in the context of Khoesan languages: N|uu, a Tuu language spoken in South Africa, has 86 segments (73 consonants and 13 vowels, Miller et al. 2007a, 2009); |Gui, a Khoe language spoken in Botswana, has 99

⁸ The count in UPSID includes schwa, which I take to be a variant of /a/, so the total there is 41.

(89 consonants and 10 vowels, Nakagawa 2006);⁹ Ju|’hoansi, a Ju-#Hõã language spoken in Namibia and Botswana, has 123 (89 consonants and 34 vowels, Miller-Ockhuizen 2003);¹⁰ and !Xóǀ, a Tuu language spoken primarily in Botswana, has 163 (119 consonants and 44 vowels, Traill 1985).¹¹ But despite this wide range in inventory sizes, the structures of these systems are very similar, as are the phonotactic constraints on segment distribution.

My discussion of segment classification will follow the approach motivated by Miller et al. (2009) for N|uu. The intent is to highlight the structural similarities between the click and non-click inventories by describing clicks in same featural terms as pulmonic consonants. Details relevant for Khoekhoe clicks will be discussed in section 3.1.2. Terminologically, this approach replaces *velaric airstream* with the articulatorily more accurate *lingual airstream* (Miller et al. 2007b), and rejects the cover term *accompaniment* (Traill 1985) as a meaningful descriptor. I begin by discussing the pulmonic (section 3.1.1) and lingual (section 3.1.2) inventories, including relevant details about segment realization and distributional parallels with other Khoesan languages. I then turn to the relative frequencies of different consonants (section 3.1.3) and the distribution of consonants within the root (section 3.1.4).

⁹ This includes click releases that Nakagawa analyzes as clusters. See section 3.1.2 for discussion.

¹⁰ Ju|’hoansi is listed in UPSID as !Xu. Its segment count, derived from Snyman (1970, 1975), is given as 141, which includes surface diphthongs. I argue below that this is inappropriate for Khoesan languages.

¹¹ Interestingly, the number of phonemes in Khoesan languages is roughly inversely correlated with the number of speakers. This is the opposite of the cross-linguistic generalization reported by Hay and Bauer (2007). Hay and Bauer specifically excluded Ju|’hoansi (!Xu) from their analysis because its consonant inventory was more than four standard deviations from the mean. Their analysis did, however, include Khoekhoe (Nama), making a Khoesan language with one of the smallest inventories the sole source of the “Khoisan” data points in the charts on p.395.

3.1.1 Inventory of pulmonic consonants

Table 3.1 provides the inventory of Khoekhoe consonants produced with the pulmonic airstream.

Table 3.1 Khoekhoe pulmonic consonants

PULMONIC				
	Labial	Dental	Velar	Glottal
Stops	p	t	k	ʔ
Affricates		\widehat{ts}	\widehat{kx}	
Fricatives		s	x	h
Nasals	m	n		
Approximants		r		

The pulmonic inventory is fairly straightforward, with stops, affricates, fricatives, nasals and one approximant, but no phonation contrast. There is some question as to whether the segment transcribed $[\widehat{kx}]$ should be analyzed as an affricate, an aspirated stop or even an aspirated affricate. Beach (1938:66) describes it as a strongly aspirated affricate, but concedes that some speakers use $[k^h]$ in roots and that all speakers use $[k^h]$ in particles and suffixes, at least some of the time. For my speakers, frication in the affricate can be quite weak and acoustically similar to strong aspiration. This is not the case with the velar fricative, in which production can range from $[x]$ to $[\chi]$, but which is always clearly distinguished from $[h]$. The dental pulmonic affricate $[\widehat{ts}]$ also tends to be aspirated, but is consistently affricated as well. Some speakers (particularly M2 and M3 in my corpus) have the $[\widehat{tʃ}]$ variant described by Beach. Because the variation is widespread and of long standing, and because the question is orthogonal to the discussion of Khoekhoe phonotactics, I have retained Beach's analysis of these segments as affricates. I do, however, transcribe the aspirated rather than affricated version in particles and suffixes, because in such

contexts the affricated version is used only in careful speech. I suspect this is an example of lenition in prosodically weak environments.

A second issue with the pulmonic inventory is the status of the glottal stop. As in other Khoesian languages, orthographically vowel-initial roots are produced with a glottal stop, or at least some degree of glottalization. I have not looked at the question quantitatively, but my impression is that the strength of glottalization varies with the strength of the prosodic boundary, as has been reported for other languages (e.g., Dilley et al. 1996). But though glottal stops are clearly phonemic in some languages, and clearly epenthetic in others, Khoekhoe is one of the many cases where its phonemic status is difficult to assess. Distributionally, glottal stops are restricted to morpheme-initial position, but this is true of other pulmonic obstruents, as well. There is, however, one case in the paradigm of person-gender-number (PGN) markers where the difference between two morphemes is most easily captured with reference to a glottal onset (see Chapter 4), so I treat [ʔ] as a phoneme. Note, however, that a phonemic glottal stop is a prerequisite for analyses that treat the glottalized click release as a cluster rather than a phonation contrast (e.g., Nakagawa 2006), as discussed in section 3.1.2.

The final issue for the pulmonic inventory is the status of morpheme-internal consonants. In many Khoesian languages, [ɾ] and [t] (or [d]) can be treated as positional allophones, with [t] in morpheme-initial positions and [ɾ] morpheme-internally (e.g., Miller-Ockhuizen 2003). Khoekhoe, however, has suffixes that begin with both types of segments. The functional load of this contrast is low, but the distribution of [t] and [ɾ] is not entirely complementary, so they must be regarded as separate phonemes, much like English [θ] and [ð]. Within the root inventory, however, the obstruent [t] is confined to initial position, and the sonorant [ɾ] occurs only medially. Though /r/ is occasionally realized as a trill ([r̄]) or an approximant ([ɹ]), and

though /t/ voices in some intervocalic contexts, realizations of these segments never overlap.¹²

The same cannot be said of the allophonic relationship between [p] and [β]. Khoesan languages vary somewhat in terms of the phonemes they allow in root-medial position, though these generally include at least [m], [n], [ɾ] and [p]/[b]. Across these languages, medial bilabial obstruents tend to be realized as [β] (e.g., !Xóǀ in Traill 1985, Ju|'hoansi in Miller-Ockhuizen 2003, N|uu in Miller et al. 2009), but in Khoekhoe, production of root-medial /p/ can range from [p] or [b], to [β] or [v], as illustrated by the waveforms and spectrograms in Figure 3.1. In these examples, the stop variants in Figure 3.1(a-b) both have bursts, while the approximant variant in Figure 3.1(c) does not. Additionally, the voiceless stop [p] is much longer than the voiced stop or the approximant. This alternation is a matter of free variation that is reflected in the official orthography, which permits either *p/b* or *w* in root-medial positions (Curriculum Committee for Khoekhoegowab 2003:20).¹³ The variation in both orthographic usage and phonetic realization is at least partially idiosyncratic—one consultant (Speaker F1) had a strong preference for writing the stop versions, while another (Speaker F2) had the opposite preference—but both speakers produced both variants, albeit with frequencies that correlate with their orthographic preferences.

¹² The one exception to this generalization I have encountered is in the morphologically complex, high-frequency greeting [matisa] ‘how is it?’, which is often pronounced [marisa]. I take this as the equivalent of American English [si:jərəmɔ:ɪɔs] ‘see you tomorrow’ in which the word-initial /t/ is flapped because the entire phrase is treated as a single unit.

¹³ As discussed in Chapter 2, the orthographic distinction between *p* and *b* reflects the tonal register of the root, not the voicing of the segment.

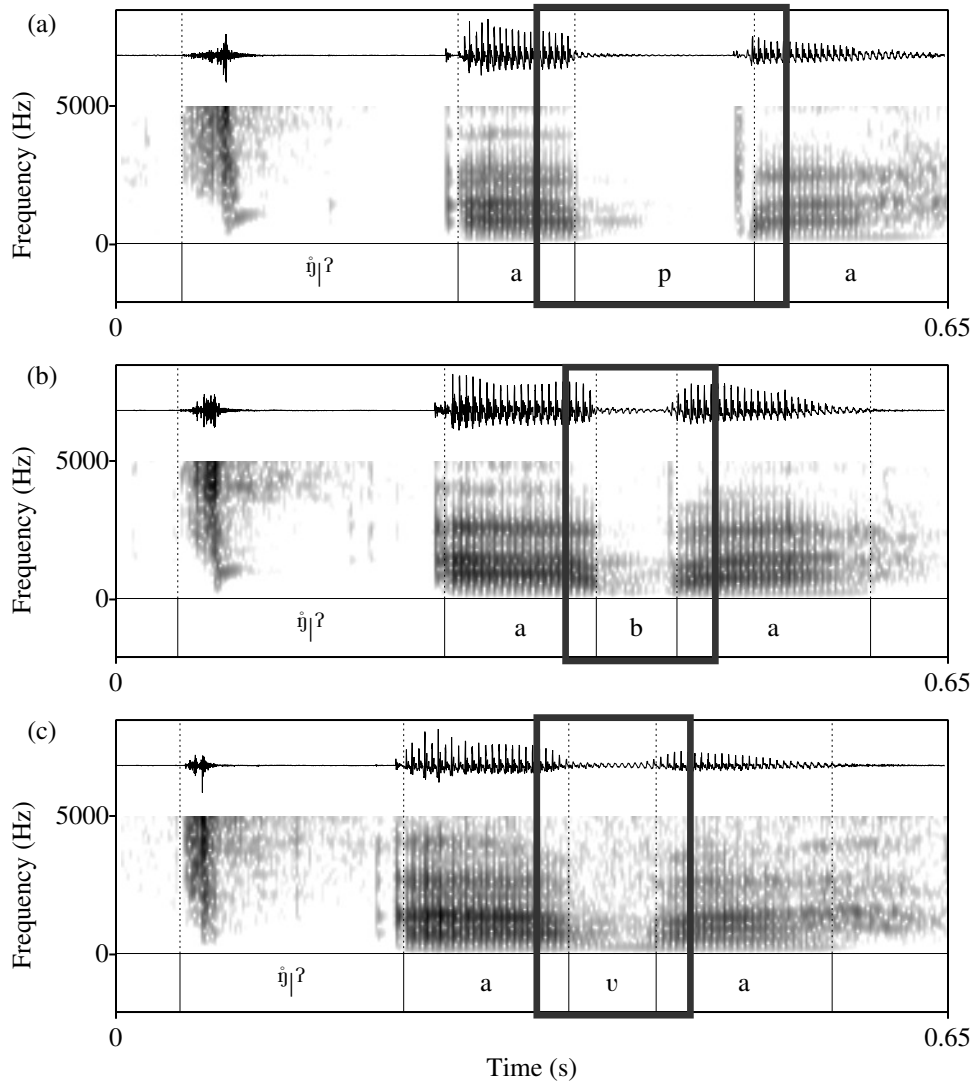


Figure 3.1 Waveforms and spectrograms showing variant productions of root-medial /p/ in three tokens of the word / $\dot{\eta}|ʔ$ apa/ ‘wet dog smell’ produced in the same recording session. (Speaker F1).

Like the aspiration/affrication issue discussed above, this variation seems to be of long standing. Wallman (1857:5) notes differences between Orlam and Namaqua speakers in their pronunciation of “b” and “w”, and Beach (1938:55) reports:

In [root-medial] position the **p** is sometimes voiced slightly, though most Hottentot speakers would pronounce it unvoiced. In one variety of Korana, the **p** in this position is not only voiced, but the lip-articulation is so weak that the

sound is a mere bilabial fricative instead of a plosive. It is possible that this bilabial fricative...was formerly fairly common in South-West Africa. At any rate, intervocalic **p** was written by Krönlein as *w*, and it is so written in the present current orthography. The German missionaries mostly pronounce this *w* as a *labiodental* voiced fricative (phonetically written as **v**), and this pronunciation has spread to some extent through the influence of the mission schools. Some Hottentot-speakers consider it a mark of erudition to use **v** in place of intervocalic **p**. But the commonest pronunciation is the unvoiced or slightly voiced *plosive*.

Among my speakers, the commonest pronunciation is the fricative [β] or the approximant [v], at least in the somewhat formal context of a recording session. Because this is the most frequent production, I will transcribe it as such throughout, but it should be remembered that a range of realizations is possible. The fact that [p] surfaces at all root-medially is most likely due to Khoekhoe's lack of a voicing contrast. That is, a lenited variant is preferred in this environment, but the faithfulness to the phoneme is also an acceptable realization. Significantly, however, the same is never true of /t/, which is a separate phoneme from /t/.

Interestingly, a similar pattern has also been reported in !Xóõ, which does have a voicing contrast. Traill (1985:164-5) gives the inventory of possible root-medial segments as [b, l, ʝ, m, n, ɲ], where medial obstruents are voiced, and the oral alveolar is a sonorant. But Traill also observes that [b] and [ʝ] are frequently produced as [β] and [j], demonstrating the pan-Khoesan preference for sonorants in root-medial position. In emphatic speech, however, medial [b], [l] and [ʝ] can be realized as segments Traill transcribes as [p:], [t:] and [c:], respectively. That is, the voicing is lost, and the duration is increased, just as we saw with the Khoekhoe voiceless variant above. The stylistic alternation seems roughly comparable to an American English speaker saying [wa.tʰə] for [wa.rə].

Even more interesting is the distribution of segments in |Gui (Nakagawa 2006:114), where the set of medial consonants is [b m r n j w]. That is, [b] and [w] contrast in medial position. Nakagawa cites the examples [!ábà] ‘spread out to dry’ and [ʰ]àwà] ‘yes’, but does not give any indication of how robust the contrast is. |Gui also patterns with Khoekhoe in allowing both [r] and [d] in the initial position of particles and suffixes, indicating that the [b]/[w] and [d]/[r] contrasts are both phonemic in |Gui, even though the distributional preference for initial obstruents and medial sonorants is otherwise quite robust.

We now turn to the click inventory.

3.1.2 Inventory of lingual consonants

The analysis of segments in this dissertation follows Miller et al. (2009), who argue that clicks can and should be described with the same basic parameters that are used for pulmonic and glottalic consonants, namely airstream, place, manner and phonation.¹⁴ By definition, clicks are produced with the lingual airstream, though Miller et al. (2009) show that airstream contours, in which the click’s posterior constriction has a pulmonic or glottalic release, are also possible. Clicks are complex stops with two places of articulation, but unlike labial-velars and other complex segments transcribed with digraphs, the two places of articulation in clicks are inherent in the symbols used to represent them. The nature of the lingual airstream requires that clicks always have a stop component, so possible manners include stops, nasals and affricates (i.e., contours in both manner and airstream). Nasal airflow in nasal clicks extends into the beginning of the following vowel, indicating that these are fully nasal segments and not prenasalized stops. Finally, phonation contrasts across Khoesan languages largely parallel those in pulmonic inventories, but there are

¹⁴ For simplicity, nasality is treated as a manner.

complexities that seem to be unique to Khoesan. Some of these will be discussed in section 3.1.2.1.

The Khoekhoe click inventory is presented in Table 3.2. The chart is arranged in the standard IPA fashion, with places of articulation in columns, manners of articulation in rows and phonation in sub-divisions of each cell. Because the Khoekhoe inventory is so small, I do not separate the linguo-pulmonic affricates (e.g., [ʎ]) from the other lingual segments, as Miller et al. (2009) advocate for N|uu. Nasality and phonation contrasts are indicated with superscripts (see Miller et al. 2009 for discussion).

Table 3.2 Khoekhoe lingual consonants.

LINGUAL				
	Dental	Central Alveolar	Lateral Alveolar	Palatal
Stops		!		‡
Affricates	ʎ	ʎ̥	ʎ̥̥	ʎ̥̥̥
Nasals	ɲ ^h ɲ ^h ^h ɲ ^h [?]	ɲ [!] ɲ [!] ^h ɲ [!] [?]	ɲ ɲ ^h ɲ [?]	ɲ [‡] ɲ [‡] ^h ɲ [‡] [?]

Like pulmonic stops, oral lingual stops in Khoekhoe lack both voicing and aspiration contrasts, and each click type has an affricated counterpart. Like pulmonic affricates, it is somewhat unclear whether the affricated clicks should be treated as such, or as aspirated stops. My consultants tend to produce weak affrication that to me sounds intermediate between the phonemically contrastive aspirated and affricated clicks in N|uu. As with the pulmonic affricates, I retain Beach's analysis of these segments as affricated rather than aspirated clicks, but note that Ladefoged and Trill (1984) make the opposite decision.

The click inventory is larger than the pulmonic inventory, and it is also entirely symmetrical, with four click types ([|, ||, !, ‡]) and five ways of producing each. Such

symmetry is the norm in click inventories, except in cases where the click and the release are both low-frequency (e.g., [ᵀχʰ] in N|uu, Miller, et al. 2009). Indeed, Khoesan languages with richer sets of phonation contrasts typically have similarly symmetrical pulmonic inventories. These inventories are large because they make full use of their combinatory options, not because they are qualitatively different from the inventories of other languages. In the terms of Clements (2003), these systems have a high degree of feature economy.

One crucial feature of the inventory presented here is the analysis of clicks with glottal and uvular releases as single segments, rather than as clusters. Clicks have traditionally been treated as unit phonemes, regardless of their complexity, but Traill (1985:208-211) opens the door to a cluster analysis for !Xóǀ on the grounds that it would significantly reduce the atypically large inventory, bringing it in line with cross-linguistic averages. Traill supports this position by observing that the components of complex click releases (e.g., [ʔ] or [q]) are usually also independent phonemes in the language.¹⁵ But it is not the case that a large segment inventory is a problem in and of itself. Some languages have many segments, some languages have few segments. Khoesan languages simply fall at the high end of the range, in part because they exploit a uniquely modifiable airstream. Moreover, any learnability issues that might be presented by a large inventory are likely offset by their symmetry and feature economy. Downsizing the phonemic inventory does not address the fundamental issue of Khoesan onsets, namely their astonishing phonetic complexity, and we will see below that the cluster analysis actually introduces new problems.

¹⁵ Nakagawa (2006:252), in discussing Traill's observations, argues that, "cluster analysis can adequately describe this phonologically independent status of click accompaniments." It is not, however, necessary to account for the phonemic status of simple onsets. Rather, the phonemic status of these elements is a prerequisite for a cluster analysis.

Traill’s line of argumentation was subsequently taken up by Güldemann (2001), who observes that a cluster analysis also captures the structural similarities between click and non-click inventories across Khoesan lineages. While this is an important observation, these same generalizations can be captured at the level of features (Miller et al. 2009). Structural regularities across the different inventories do not, therefore, necessitate a cluster analysis. Moreover, a cluster analysis does nothing to explain the exceptionally large vowel inventories also found in languages like !Xóõ and Ju|’hoansi, in which both oral and nasal vowels can differ in terms of modal, breathy, glottalized and epiglottalized voice qualities. While these contrasts are clear in featural terms, there is no useful way to treat phonatory differences as “clusters”. As long as we allow for both complex (e.g., clicks, labiovelar stops) and contour (e.g., affricates, prenasalized stops) segments (Sagey 1986), a distinction that is motivated by patterns in a wide range of languages, and acknowledge that glottalized releases behave like a phonation contrast (Miller-Ockhuizen 2003), there is no need to assume that troublesome onsets consist of two segments.

The last major work advocating a cluster approach is Nakagawa (2006), who adapts Güldemann’s pan-Khoesan proposal for his description of |Gui. Nakagawa’s most significant contribution to the debate is the claim that a cluster approach is the only way to explain how [ɿ, ɿ̥] on the one hand, and [q, ɿ̥q] on the other, pattern with respect to the Back Vowel Constraint (Traill 1985, Miller-Ockhuizen 2000a), which prohibits front vowels with “back” consonants (see section 3.2.3). It should, however, be noted that the combinations crucially absent in |Gui (e.g., [ɿ̥qee], [q^hee]) do occur in !Xóõ (Traill 1994) and N|uu (Sands et al. 2006), making this argument less compelling in a cross-linguistic context.

More importantly, the cluster analysis is problematic because it replaces one cross-linguistic abnormality with another. Kreitman (2008) demonstrates with a

survey of onset clusters in 62 languages that obstruent-obstruent sequences occur only in languages that also have obstruent-sonorant clusters. Khoesan languages have no onsets that can be viewed as obstruent-sonorant clusters, which makes analyzing large swaths of the !Xóõ, N|uu and |Gui inventories as obstruent-obstruent clusters highly problematic. Kreitman also reports on a study by Morelli (1999) that found stop-fricative clusters only occur in languages that also have stop-stop clusters. While this is not a problem for cluster analyses of !Xóõ, N|uu or |Gui, it is troublesome for Khoekhoe, which has clicks followed by uvular frication (e.g., [!χ]), but not clicks followed by uvular stops (e.g., [!q]). Clearly, Khoesan languages are typologically exceptional in one way or another, and I follow Miller, et al. (2009) in arguing that a large but highly economical inventory made up of features motivated by other languages is preferable to a preponderance of typologically anomalous clusters.

3.1.2.1 Click voicing and nasality

This section is something of a digression from the main topic of this chapter, but prosodically-conditioned voicing patterns in nasal clicks seem to provide important clues about the nature of click phonation contrasts, so I include an overview of the phenomenon and a brief discussion of its implications.

One of the ways that Khoekhoe differs from other southern African Khoesan languages is in its lack of a voicing contrast, which is part of the reason for its smaller inventory. There are, however, interesting patterns of non-phonemic voicing in both lingual and pulmonic stops. The behavior of root-medial /p/ has already been discussed, but in root-initial position, the most significant variability is found in clicks with a voiceless nasal closure (e.g., [ʰ!] and [ʰ!ʰ]). Though closures in voiceless unaspirated (e.g., [!]) and affricated (e.g., [!χ]) clicks are always voiceless, and voiced nasal (e.g., [ʰ!]) clicks always have some period of nasal voicing, closure voicing in

“voiceless” nasal clicks varies with both segmental and prosodic context. I argue that this variability demonstrates these nasals are not phonologically voiceless (i.e., [-voiced]), but rather their voiceless closures are a side-effect of their phonation contrasts.

Ladefoged and Traill (1984) provide a detailed instrumental analysis of click nasalization, with examples from both Khoekhoe and !Xóǀ. For Khoekhoe, they present simultaneous oral and nasal airflow data, together with waveforms and pharyngeal pressure measurements for oral, voiced nasal and voiceless nasal clicks, and they report that intervocalic glottalized and nasal aspirated (“delayed aspirated”) clicks exhibit an “intrusive nasal” during the click closure. Ladefoged and Traill regard this as a categorical phonological process, so that [tii] ‘my’ before [ʔⁿuip] ‘brother-in-law’ becomes [tiiⁿ ʔⁿuip], where “the click becomes fully nasal, and the preceding vowel is nasalized” (p.6). But closer examination reveals that nasalization in this environment is really a matter of intervocalic voicing, and is less categorical than their description implies. It does not, for instance, neutralize the oral/nasal contrast on the preceding long vowel, because only the end of the vowel is nasalized, and the “intrusive nasal” is not fully equivalent to the nasalization found in voiced nasal clicks. This is illustrated in Figure 3.2, which shows the different closure voicing patterns among the oral, “voiceless” nasal and voiced nasal clicks. There is no prosodic difference between the two contexts; both are phonological-phrase medial under the analysis presented in Chapter 7, and there is no auditory impression of different phrasing. Note also that the apparent coda consonants in these examples are separate morphemes and not exceptions to the generalization that roots cannot have non-nasal codas. These suffixes will be discussed in Chapter 4.

The waveforms in Figure 3.2 show that the degree of voicing in “voiceless” nasal clicks is conditioned by segmental context. The voiceless unaspirated and

affricated clicks in Figure 3.2(a-b) have no closure voicing in either environment, while the nasal click in Figure 3.2(e) is voiced in both, though the duration and intensity of voicing is greater intervocalically. The two “voiceless” nasal clicks, on the other hand, are phonetically voiceless after [p], but somewhat voiced intervocalically. Crucially, the closure periods of clicks like Figure 3.2(c-d) can have audible voiceless nasal airflow, showing that they are still nasal clicks, even in the absence of vocal fold vibration. This has been confirmed by a quantitative study of nasal airflow in different prosodic positions (Spencer 2004). Moreover, the degree of intervocalic voicing in Figure 3.2(c-d) is significantly less than that with the phonologically voiced click in Figure 3.2(e), and the “tapering-off” pattern, where the intensity of voicing decreases immediately before the click burst, is the reverse of what is found with voiced nasal clicks in post-consonantal (and utterance-initial) position. This is consistently the case in both Khoekhoe and N|uu (Miller et al. 2007a). The click closures in Figure 3.2(c-d) and Figure 3.2(e) are not, therefore, equivalent in the way that Ladefoged and Traill’s discussion implies.

The degree of voicing in voiceless nasal closures is also prosodically conditioned in both Khoekhoe (Brugman 2003, Spencer 2004) and N|uu (Miller et al. 2007a), as demonstrated by the prosodically distinct intervocalic environments shown in Figure 3.3. Under the analysis in Chapter 7, the environment on the left corresponds to a phonological phrase boundary, while the environment on the right is phrase-medial. The environment on the left also gives the auditory impression of being a stronger boundary.

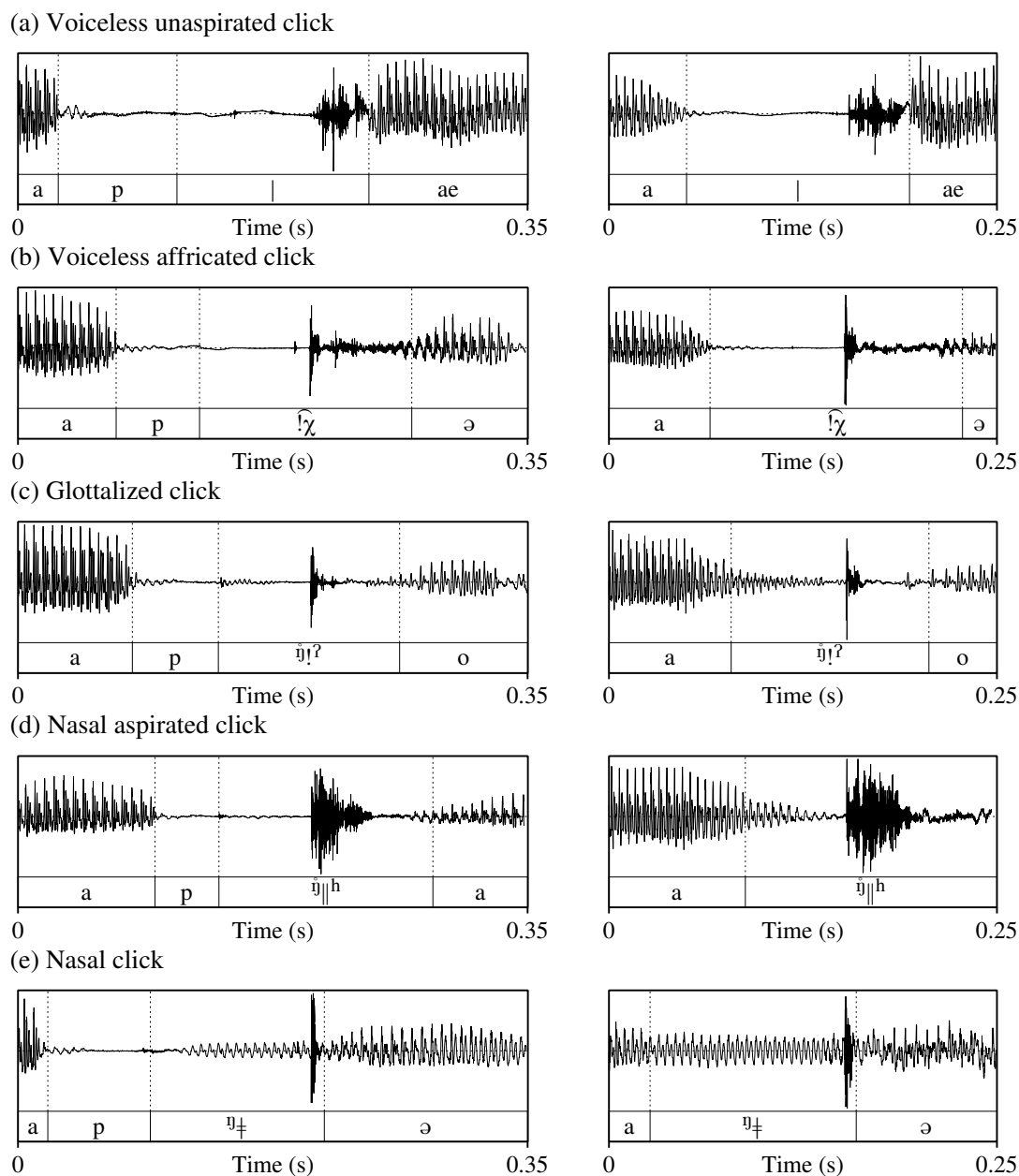


Figure 3.2 Waveforms showing click closures in different segmental contexts for the words: (a) [ǀǎep] ‘gemsbok’, (b) [ǀχǎrip] ‘home-brew’, (c) [ǀǀǎrès] ‘dish’, (d) [ǀǀhǎas] ‘bullet’ and (e) [ǀǀǎís] ‘dove’. Extracted from the sentences *Tita ge Sǎb ___ xa gere ǀǎi* ‘I was thinking about the San’s ___.’ (left) and *Tita ge sa ___ gere ǀǎi* ‘I was thinking about your ___’ (right). Click bursts aligned at 0.2 s in the post-consonantal context and at 0.15 s in the post-vocalic context. (Speaker M3).

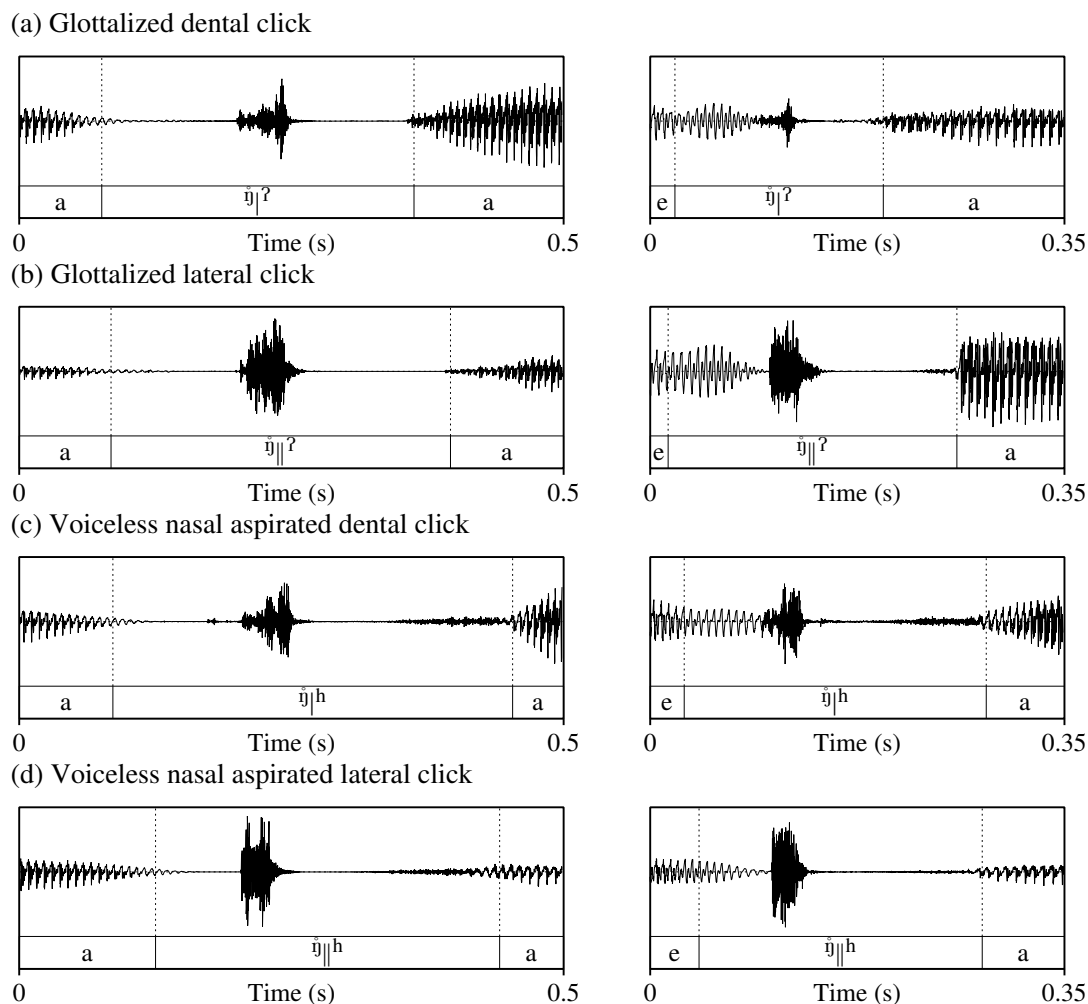


Figure 3.3 Waveforms showing glottalized (a-b) and voiceless nasal aspirated (c-d) closures in different prosodic contexts for the words: (a) [ʔ|ʔáa] ‘sharp’, (b) [ʔ|ʔáa] ‘to wash’ (c) [ʔ|háa] ‘to collect’ and (d) [ʔ|háa] ‘to load a gun’. Extracted from the sentences *Nēs a ___?* ‘Is this ___?’ (left) and *Kaise ___*. ‘very ___’/‘to ___ well’ (right). Click bursts aligned at 0.2 s in the strong context and at 0.15 s in the weak context. (Speaker M1).

In each case in Figure 3.3, we see relatively little voicing during the long closure in the context on the left, but strong voicing during the relatively short closure in the context on the right, where the prosodic boundary is weaker. This is also the case in N|uu (Miller et al. 2007a). It should be noted that nasalization in both contexts begins towards the end of the preceding vowel, but that voicing dies out only during the longer closure. I do not have examples with a voiced nasal click in these same

contexts, but the typical patterns with such segments at a strong prosodic boundary is for voicing to peter out part way through the closure and then start up again shortly before the click release. This never happens with the “voiceless” nasal clicks; if anything, the voicing in such segments is weakest immediately before the click burst. This difference is readily explained by the fact that aspiration and glottalization require vocal fold configurations that are incompatible with voicing, so voicing is weakest immediately before the burst, when the vocal folds are moving towards the configuration necessary for the release.

The “voiceless” nasals associated with clicks seem, therefore, intermediate between voiced (e.g., [ᵑ!]) and voiceless (e.g., [!]) segments. It has been proposed that voiceless pulmonic sonorants should be regarded phonologically as [spread glottis], rather than [-voiced] (e.g., Clements 2003 and references therein). Lingual nasals differ from pulmonic nasals in that they are obstruents, and their releases can be associated with phonation contrasts. If we assume that aspiration reflects the phonological feature [spread glottis], it is unsurprising that the realization of nasality in segments like [ᵑ!ʰ] is “voiceless”, or at least less voiced than in nasal clicks with no phonation contrast. At the same time, the specification of nasality requires airflow during the click’s closure, which leaves the door open for prosodically-conditioned voicing in intervocalic contexts. The extension of this interpretation to glottalized clicks, which presumably carry the feature [constricted glottis], is more problematic, but the realization of segments like [ᵑ!ʔ] is parallel to [ᵑ!ʰ] in ways that suggest any type of laryngeal specification can interfere with nasal voicing. In any case, it is not necessary to treat these segments as phonologically [-voiced], which is a desirable result, particularly in a language with no voicing contrast.

The question remains, however, why phonation contrasts on clicks should co-occur with nasality at all. Voiceless nasal aspiration of the type found in Khoekhoe is

also found in N|uu (Miller et al. 2009), †Hoan (Bell and Collins 2001) and G|ui (Nakagawa 2006), and contrasting voiced and voiceless nasal aspirated clicks are found in Ju|’hoansi (Miller-Ockhuizen 2003) and !Xóǀ (Traill 1985, Ladefoged and Traill 1984, 1994), both of which also have voicing contrasts on all stops, as well as contrast between voiced and voiceless oral aspiration.¹⁶ Similarly, glottalized clicks are nasalized in N|uu, †Hoan and Sandawe (Wright et al. 1995), but do not seem to be in Ju|’hoansi or !Xóǀ. The most interesting case is G|ui, which seems to contrast oral and nasal glottalized clicks.¹⁷ Even more interesting, the nasal glottalized click in the Khute dialect of |Gui is realized as a preglottalized nasal when it occurs in a word with a pharyngealized vowel (Nakagawa 2006:172). This could be due to dissimilatory forces similar to those driving the guttural OCP constraint that has been proposed for Ju|’hoansi (Miller-Ockhuizen 2003). Preglottalized nasals are also found in !Xóǀ and †Hoan.

These examples show that the interaction of phonation and nasality is central to the structure of Khoesan inventories, but at this point we can only speculate about the forces driving the connection. Such “rhinoglottophilia” is not, by any means, unique to Khoesan (Matisoff 1975), but it seems significant that lingual stops are independent of pulmonic airflow in ways that pulmonic and glottalic stops are not. That is, the separation of the oral and pharyngeal cavities in clicks allows for more extensive use of nasality, possibly as an enhancement cue.

¹⁶ !Xóǀ also has segments that have been described as unaspirated clicks with voiceless nasal closures (Ladefoged and Traill 1994). I do not have an explanation at this time for how these fit in with my analysis.

¹⁷ Nakagawa analyzes the three G|ui contrasts with glottal adduction as ejected clicks (e.g., [!ʰ]), clicks followed by ejected uvular stops (e.g., [!qʰ]) and “optionally nasalized” clusters of a click and a glottal stop (e.g., [!ʔ]). Under the framework assumed here, the contrast would be between dual-burst linguo-glottalic airstream contours (e.g., [!qʰ]), and single-burst oral and nasal clicks with glottal phonation (e.g., [!ʔ] and [ʰ!ʔ]). The subtle differences Nakagawa describes in the bursts of oral and nasal glottalized clicks can be attributed to pressure build-up that occurs behind the posterior lingual constriction in the absence of nasal venting, rather than to ejection *per se*.

It should also be noted that the nasalization of glottalized clicks provides important supporting evidence that glottal adduction in these segments reflects a type of phonation, rather than ejection. Nasal venting precludes “piston-like” compression of air behind the oral constriction, so these segments cannot be analyzed as ejectives and should not be transcribed with [ʼ]. It is actually surprising that glottal phonation is not more widely attested cross-linguistically, given the frequency of contrasts between breathiness and creakiness on vowels. It is possible that many cases of glottal phonation have been analyzed as ejectives on the assumption that glottal adduction and ejection are equivalent. Kingston (2005), for instance, observes that ejectives can be sub-divided into two types in terms of their effect on tone, namely those with a tightly closed glottis, compression of air and particularly loud bursts, and those with weaker glottal closures, little compression and a short voice onset time. The question of whether this latter type of “ejective” can be reanalyzed as stops with glottalized phonation parallel to that found in clicks is an important question for future research.

Finally, in addition to the co-occurrence of nasality, [spread glottis] and [constricted glottis], we find that nasality and voicing also interact in interesting ways. In Sandawe, voiced clicks are prenasalized in word-medial positions, but they still contrast with nasal clicks, in which voicing extends into the beginning of the following vowel (Wright et al. 1995). And in !Xóǀ, ꞤHoan and G|ui, voiced linguo-pulmonic clicks (e.g., [ʘ̠q̠]) are often characterized by nasal airflow during the click’s closure, though not its release. The consensus regarding these cases seems to be that nasal venting is exploited as a mechanism that allows vocal fold vibration during the click’s closure (Ladefoged and Traill 1994, Wright et al. 1995). In any case, nasality and laryngeal specification interact in lingual stops in ways not found in pulmonic inventories. A principled explanation for this observation is, however, beyond the scope of this dissertation.

We now turn to the distribution of consonants in Khoekhoe roots.

3.1.3 Consonant frequency

Though clicks are rare cross-linguistically, and of only low- to moderate-frequency in the Bantu languages that have borrowed them, they are central to the lexicons of southern African Khoesan languages. This is made clear by the distribution of onset consonants in a database of 1892 roots (all headwords) taken from the largest Khoekhoe-English dictionary (Haacke and Eiseb 2002). The set contains only native vocabulary and fully assimilated loanwords (e.g., *beeb* < Afr. bus, *pirib* < Tswana/Sotho podi ‘goat’). The number of words starting with pulmonic segments is shown in Table 3.3 and the number of words starting with clicks is shown in Table 3.4.

Table 3.3 Number/percentage of roots beginning with a pulmonic consonant.

[p]	22/1%	---	---	[m]	13/1%	35 / 2%	
[t]	62/3%	[\widehat{ts}] 52/3%	[s]	66/3%	[n]	30/2%	210 / 11%
[k]	74/4%	[\widehat{kx}] 40/2%	[x]	52/3%	---	166 / 9%	
[ʔ]	82/4%	---	[h]	34/2%	---	116 / 6%	
	240 / 13%	92 / 5%		152 / 8%	43 / 2%	527 / 28%	

Table 3.4 Number/percentage of roots beginning with a lingual consonant.

[ʄ]	79/4%	[$\widehat{\chi}$] 68/3%	[$\overset{\circ}{\chi}$] 46/2%	[$\overset{\circ}{\chi}ʔ$] 87/5%	[$\overset{\circ}{\chi}^h$] 77/4%	357 / 19%
[ʎ]	89/5%	[$\widehat{\chi}$] 69/4%	[$\overset{\circ}{\chi}$] 90/5%	[$\overset{\circ}{\chi}ʔ$] 72/4%	[$\overset{\circ}{\chi}^h$] 85/4%	405 / 21%
[ʄ]	74/4%	[$\widehat{\chi}$] 65/3%	[$\overset{\circ}{\chi}$] 55/3%	[$\overset{\circ}{\chi}ʔ$] 65/3%	[$\overset{\circ}{\chi}^h$] 65/3%	324 / 17%
[$\overset{\circ}{\chi}$]	55/3%	[$\widehat{\chi}$] 53/3%	[$\overset{\circ}{\chi}$] 57/3%	[$\overset{\circ}{\chi}ʔ$] 53/3%	[$\overset{\circ}{\chi}^h$] 61/3%	279 / 15%
	297 / 16%	255 / 13%	248 / 13%	277 / 15%	288 / 15%	1365 / 72%

There are small differences across the different click types that roughly correlate with their cross-linguistic distributions (i.e., [ʎ] and [ʄ] are common in Bantu

click languages, while [ǀ] is rare outside of Khoesan), but the frequencies of voiceless unaspirated clicks are comparable to those of non-labial pulmonic stops (~4%). That is, clicks may be “marked” cross-linguistically, but they are ordinary segments in Khoekhoe and other Khoesan languages. Overall, about 72% of roots begin with some type of click, which is essentially equivalent to the 73% reported for !Xóǀ (Traill 1985:161) and 68% reported for Jul’hoansi (Miller-Ockhuizen 2003:125-29). As Traill observes, “[c]onsonants like *m, n, k, s, p* which are the very stuff of the world’s phonological inventories, while attested in !Xóǀ, play an insignificant part in the lexicon.”(1985:162) This is generally true across southern African Khoesan languages, but we will see in Chapter 4 that consonants like *m, n, k, s* and *p* are, in fact, the stuff of one part of the lexicon—namely grammatical particles and suffixes. I argue that this is the result of prosodic differences between these two types of morphemes and phonotactic constraints that emphasize the left edges of prosodic words.

Of the roots mentioned above, 878 have a medial consonant. The distribution of these is shown in Table 3.5.

Table 3.5 Number/percentage of roots with medial sonorants

[m]	86/10%	[n]	129/15%	[β]	265/30%	[r]	398/45%
-----	--------	-----	---------	-----	---------	-----	---------

Though nasals are allowed in medial position, and are not uncommon, they are significantly less frequent than their oral counterparts. This may be the result of the diachronic process that is thought (e.g., Beach 1938:50, Haacke 1999a:11) to have created the nasal vowels and nasal-final roots (i.e., CVN, C $\tilde{V}\tilde{V}$ < *CVNV).

The picture that emerges from these distributional statistics is that there is a strong preference in Khoekhoe for words to begin with low-sonority segments, but for non-initial consonants to be highly sonorous. Perceptually, this pattern means that

root-initial position is more prominent and, presumably, easier to recognize. This idea will be explored in more detail below (see also Traill 1985, Beckman 1999, Miller-Ockhuizen 2003).

3.1.4 Consonant distribution

It is generally the case in southern African Khoesan languages (see Eaton 2006a, Wright et al. 1995 for patterns in Sandawe), that monomorphemic roots are restricted to the shapes CVV, CVN or CVCV, and in some languages CVVCV (e.g., Ju|’hoansi, Miller-Ockhuizen 2003). There are no segments that do not occur in roots, but most segments are restricted to certain positions, and many segments are prohibited in other types of morphemes. Clicks, pulmonic stops, fricatives and nasals all occur root-initially, but only pulmonic consonants are found in particles and suffixes, and only sonorants occur morpheme-internally. The root distribution patterns, demonstrated by the tables in section 3.1.3, are illustrated with the verbs listed in (1). Tone is marked in these examples, but will not be discussed until Chapter 5.

(1)	a.	CV ₁ V ₁ :	[!áa] ‘open’	[^h ǀ’óo] ‘die’	[ǂúu] ‘hit’
	b.	CV ₁ V ₂ :	[ǂáe] ‘pull’	[ǁχúí] ‘ambush’	[^h ǀ’óa] ‘kiss’
	c.	CVn:	[tǎh] ‘win’	[^h ǀán] ‘divide’	[ǁχón] ‘fold’
	d.	CVm:	[kám] ‘sip’	[ǀóm] ‘build’	[^h ǀóm] ‘smile’
	e.	CVnV:	[!ána] ‘buzz’	[tsùni] ‘melt’	[ǂǁànu] ‘skid’
	f.	CVmV:	[^h ǀ’ámǎ] ‘buy’	[^h ǀ’úmí] ‘turn’	[^h ǂǁòmi] ‘lie’
	g.	CVrV:	[xǎra] ‘scratch’	[ǀáré] ‘hesitate’	[^h ǀ’írí] ‘spray’
	h.	CVβV:	[tǎβa] ‘invert’	[tsùβù] ‘grab’	[^h ǀ’òβe] ‘ransack’

The examples in (1)(a-b) show CVV roots with monophthongal and diphthongal nuclei, while those in (1)(c-d) illustrate the two different types of CVN roots, and those in (1)(e-h) show the four possible medial consonants. The vast

majority of native roots conform to these patterns, and many borrowings have assimilated to them, but there are certain types of exceptions. We can imagine three possible ways that roots *might* diverge from the template: 1) by beginning with an approximant; 2) by having a non-nasal coda; or 3) by having a root-medial obstruent. The first two of these never occur, except in transparently unassimilated loanwords. The largest Khoekhoe-English dictionary (Haacke and Eiseb 2002), for instance, gives sections for words beginning with [r], [f], [j] and [l], but all entries are obvious loanwords, mostly from English, German and Afrikaans, and loanwords frequently have exceptional phonological behavior.

The issue of loanword adaptation in Khoekhoe is a difficult one, in part because of near-universal bilingualism (Khoekhoe and Afrikaans), if not trilingualism (Khoekhoe, Afrikaans and English). Beach (1938) mentions two systematic adaptation strategies with German and Afrikaans loanwords in Khoekhoe: 1) Word-initial [v] is devoiced to [f] (p.65), which is unsurprising in a language that lacks a voicing contrast; and 2) word-initial [j] in the German pronunciation of ‘Jonas’ is hardened to [c] to give Khoekhoe [conap],¹⁸ which is consistent with the prohibition of approximants in root-initial position. Crucially, however, Beach mentions that speakers with good knowledge of German tend to use the German pronunciations. The same is true of the educated, urban Khoekhoe speakers I worked with, and the bilingual Ju|’hoansi speakers Miller-Ockhuizen (2003:113) encountered. While Haacke and Eiseb (2002) do list a number of loanwords that have been adapted to Khoekhoe phonotactic patterns, such as [pom] ‘to pump’ (< Afr. *pomp*), [doro] ‘to dry

¹⁸ The replacement of the final [s] with [p] is a morphological rather than phonological adaptation. The feminine singular PGN marker is [-s], while [-p] marks the masculine singular. This same adaptation is found in the other male personal names on Beach’s list, namely [cesup] ‘Jesus’, [cosep] ‘Joseph’, [cosaup] ‘Joshua’, [cohanep] ‘Johannes’ and [cutap] ‘Judas’, while the place-name [cerusalems] ‘Jerusalem’ takes the [-s] typical of city names.

up' (< Afr. *droog*), [darap] 'wire' (< Afr. *draad*), my primary consultant expressed a strong preference for code-switching rather than adaptation. Even the official orthography (Curriculum Committee for Khoekhoegowab 2003) includes unassimilated, or incompletely assimilated examples like *wekheb di /ams* 'end of the week' (lit. 'week's end'), *poskantōrs danab* 'postmaster' (lit. 'post office' + 'leader') and *skol/gôab* 'schoolboy'. It is possible, even likely, that Khoekhoe speakers from more rural areas, where English and Afrikaans are less influential, would be more inclined to use adapted forms, but because my speakers were disinclined to use them, the following discussion focuses exclusively on synchronic patterns in the native stratum. See Haacke (1989) for discussion of the influence contact with European languages has had on the Khoekhoe lexicon.

There is, however, one small class of genuine exceptions to the distributional constraints mentioned above, namely words with medial obstruents. These include: [tata] 'father', [tsuxu] 'night', [[asa] 'new' and [axa] 'boy'. While these could be loanwords, their origins are not transparent. Significantly, however, there are no exceptions where a click occurs in root-medial position; exceptions are tolerated, but only so far. Interestingly, the distribution of exceptional segments is comparable to the distribution of consonants in particles and suffixes, suggesting that the constraints on clicks are different from those on other obstruents. This is consistent with the analysis presented in Chapter 4. Medial clicks are generally prohibited in southern African Khoesan languages, though they do occur in Sandawe (Wright et al. 1995, Eaton 2006a, p.c.) and in Bantu languages like Zulu and Xhosa. Sandawe and Bantu click languages can also have stems with two clicks, though these are almost always of the same type (e.g., []). The restriction of clicks to root-initial position is a matter of language-specific phonology, and not a property of clicks *per se*.

With respect to roots, the two most important generalizations are: 1) Obstruents cannot occur root-medially; and 2) Roots must begin with a stop (including nasals, affricates and clicks) or a fricative. I defer the formal account of these patterns until Chapter 4, where the patterns found in roots are contrasted with those found in clitics. We now turn to the distributional patterns found in Khoekhoe vowels.

3.2 Vowels

Like the consonants, vowels in Khoekhoe are governed by a range of distributional constraints, particularly with respect to the sequences that are possible within a root. First, I provide an overview of the inventory of vowels and the quantity constraints that obtain in roots (section 3.2.1), as well as my assumptions about syllabification (section 3.2.2). I then briefly discuss the Back Vowel Constraint (Traill 1985), which restricts the co-occurrence of front vowels and certain clicks in some languages (section 3.2.3). Though this constraint does not hold categorically in Khoekhoe, it is evident as a statistical tendency (Miller et al. 2007b). I then turn to the sequences of vowels that are found in monosyllabic and bisyllabic roots (section 3.2.4). Interestingly, the sequences that are found in these two types of roots are identical, suggesting that the “long vowels” and “diphthongs” in CVV roots are best viewed compositionally, as two vowels that happen to occur in the same syllable.

3.2.1 Inventory of vowels

Khoekhoe has five basic oral vowels and three nasal vowels, but it lacks the phonation contrasts that give Ju-ǀHõã and Tuu languages their significantly larger vowel inventories. Looking first at the set of monophthongs listed in Table 3.6 and the examples in (2), we see that there are both long and short versions of the oral vowels, but only long versions of the nasal vowels. Note that the apparent coda consonants in

these examples are actually separate morphemes: [-p] marks third-person, masculine singular, while [-s] marks third-person, feminine singular.

Table 3.6 Monophthongs found in Khoekhoe roots.

	Front	Central	Back
High	i, ii, i ⁿ i ⁿ		u, uu, u ⁿ u ⁿ
Mid	e, ee		o, oo
Low		a, aa, a ⁿ a ⁿ	

(2) *Monophthongal roots*

- | | | | |
|----|-------------------------------|-----------------------------|--|
| a. | [^h íí] ‘to spray’ | [síi] ‘to arrive’ | [mí ⁿ i ⁿ] ‘to say’ |
| b. | [úrup] ‘wild animal’ | [kùup] ‘sheep’ | [ú ⁿ u ⁿ s] ‘mother’ |
| c. | [sèrè] ‘to slip’ | [èèp] ‘twin’ | ---- |
| d. | [^h óβó] ‘to chew’ | [xóos] ‘cheek’ | ---- |
| e. | [tànàp] ‘leader’ | [^h àap] ‘dance’ | [^h á ⁿ a ⁿ p] ‘moon’ |

Although these examples contain both short and long vowels, the difference between them is *not* an indication of a phonemic vowel length contrast, but rather a reflection of the word’s prosodic structure: CVCV roots have two short vowels and CV₁V₁ roots surface with one long vowel (see Miller-Ockhuizen 2001a, 2003 for discussion of such patterns in Jul’hoansi). Khoekhoe has a small set of synchronically non-decomposable exceptions with CVVCV and CVCVCV shapes (Haacke 1999a:87-93), but they pattern phonotactically and tonally like combinations of roots and suffixes, so I assume the prosody treats them as such. These are discussed in Chapter 4. Similarly, short nasal vowels are found in grammatical particles, but I show in Chapter 4 that this also reflects the prosodic structure of these morphemes, and not a truly phonemic vowel-length contrast.

The duration differences between long and short oral vowels are illustrated in Figure 3.4. Data are presented with boxplots, in which the center line indicates the

median, the box encloses 50% of the values and the whiskers extend to values within 1.5 times the interquartile range. Outliers are indicated with circles.

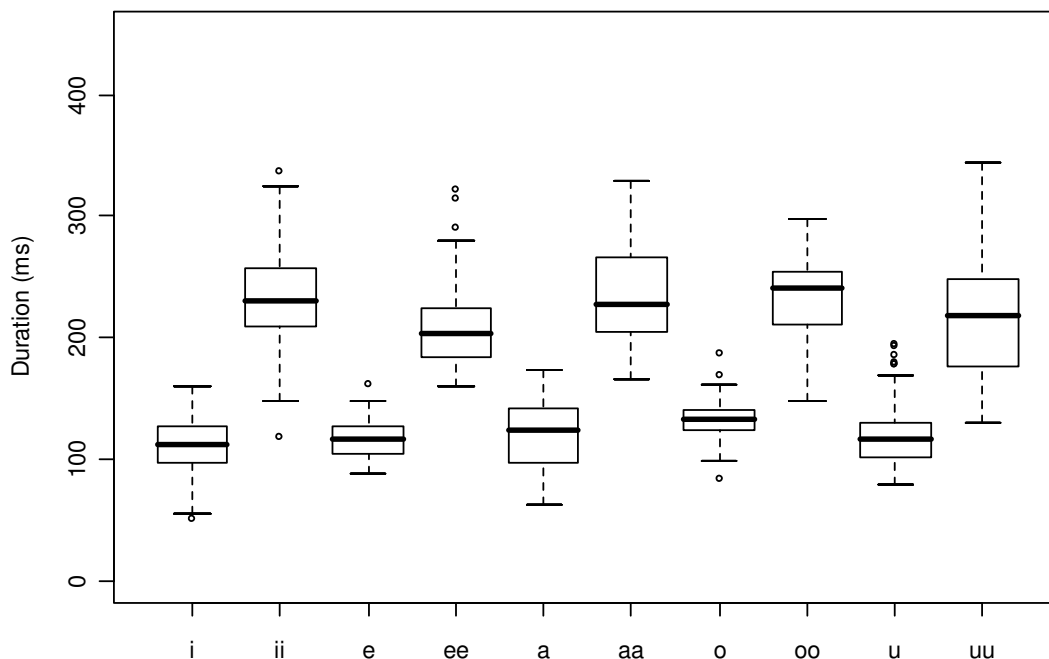


Figure 3.4 Durations of short vowels in CV₁CV₁ roots and long vowels in CV₁V₁ roots. Extracted from the sentence ___ *s ge*. ‘It is ___.’ (n=36 per vowel, Speakers F2, F3 and F4).

The vowels in CV₁V₁ roots are clearly longer than those in CV₁CV₁ roots. In fact, they are nearly twice as long in this context, though in less careful speech the differences can be much smaller. I argue that these data support an analysis where vowels with short durations are monomoraic and vowels with long durations are bimoraic (Hayes 1989, Broselow 1995, Broselow et al. 1997, Cohn 2003). Some roots have two short vowels and some have one long vowel, but no roots have a long and a short vowel, because Khoekhoe roots are strictly bimoraic.

Roots can also contain sequences of vowels. In CV₁V₂ roots, these surface as oral or nasal diphthongs, and in CV₁CV₂ roots each syllable contains a short oral vowel. I show below that vowel sequences in CV₁V₂ and CV₁CV₂ roots are identical. For convenience, I refer to CV₁V₁ and CV₁CV₁ roots as “monophthongal”, and to

CV₁V₂ and CV₁CV₂ roots as “diphthongal”. Permitted vowel sequences are summarized in Table 3.7, and examples are listed in (3).

Table 3.7 Diphthongs found in Khoekhoe roots (arranged by endpoint).¹⁹

	Front	Back	Fronting
High	əi, ə ⁿ i ⁿ	əu, ə ⁿ u ⁿ	ui, u ⁿ i ⁿ
Mid	ae	ao	oe
Low		oa, o ⁿ a ⁿ	

(3) *Diphthongal roots*

- | | | | |
|----|------------------------------------|------------------------------------|---|
| a. | [^h !ämi] ‘to embrace’ | [^h χóí] ‘to be absent’ | [^h !ʔó ⁿ í ⁿ] ‘to test’ |
| b. | [^h !áβú] ‘to sweep’ | [^h χəu] ‘to invite’ | [!ə ⁿ ú ⁿ s] ‘hammer’ |
| c. | [xúnip] ‘snot’ | [^h !úip] ‘rock’ | [^h ü ⁿ í ⁿ s] ‘intestine’ |
| d. | [káres] ‘praise’ | [!äep] ‘gemsbok’ | ---- |
| e. | [tárós] ‘girl’ | [^h !háós] ‘cloud’ | ---- |
| f. | [^h χóre] ‘to wish for’ | [^h !ʔóes] ‘dusk’ | ---- |
| g. | [^h !óra] ‘to pester’ | [!χòap] ‘elephant’ | [ʔó ⁿ a ⁿ] ‘to look for’ |

These seven vowel sequences include all four logical possibilities that begin with /a/, one that ends with /a/, and two that involve fronting and unrounding. Acoustically, the most similar are /ai/ and /ae/ on the one hand, and /ao/ and /au/, on the other. In CV₁V₂ roots, these are distinguished by their starting points as much as their endpoints, with /ai/ and /au/ surfacing as [əi] and [əu], respectively. This is illustrated with the formant plot in Figure 3.5. The letters reflect average F1 and F2-F1 values in monophthongal roots, and the arrows indicate the start- and end-points of the surface diphthongs. The vowel space defined by the monophthongs is unsurprising for a five-vowel system, and is comparable to those reported for Ju|’hoansi (Miller-

¹⁹ Note that the contrast between /oe/ and /ui/, and the absence of /oi/ provides the motivation for the spellings “Khoekhoe” and “Khoesan”. The sequence /oi/ does contrast with /oe/ and /ui/ in other Khoesan languages, including !Xóǎ (Traill 1985:97).

Ockhuizen 2003), !Xóõ (Traill 1985) and |Gui (Nakagawa 2006). The arrows for [əi] and [əu] show that these have significantly smaller changes in F1 than [ae] and [ao].

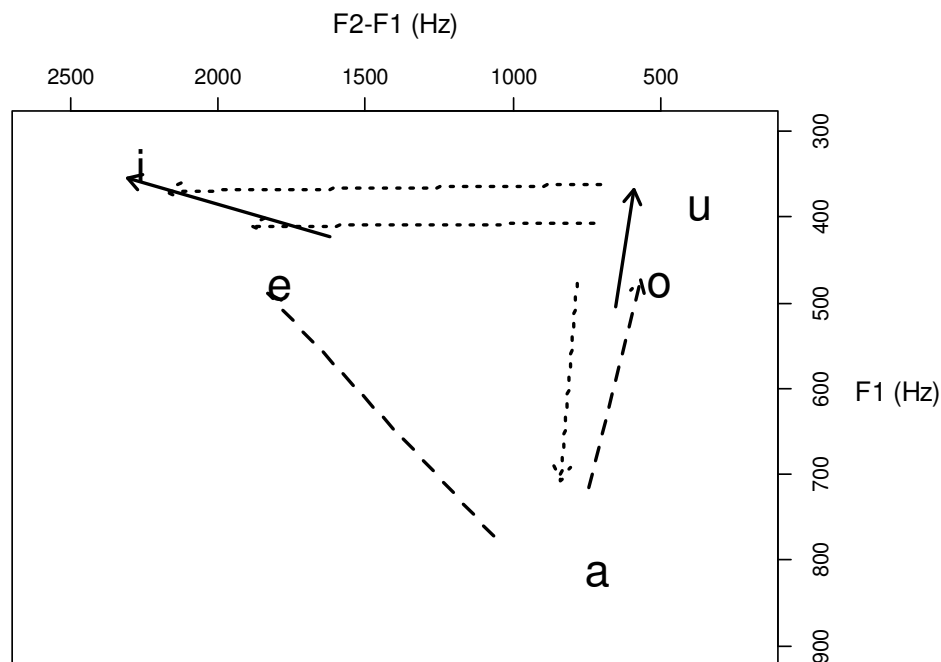


Figure 3.5 Average formant values for long oral vowels and surface diphthongs. Extracted from the sentence ___ s ge. ‘It is ___.’ (n=12, Speaker F2).

For our present purposes, the most important observation about diphthongs is that the nuclei of CV₁V₂ roots always have durations that are comparable to those in CV₁V₁ roots. This is shown in Figure 3.6. As we would expect, the durations of diphthongs pattern with the long vowels. This is true even of [əi] and [əu], in which the first vowel behaves acoustically more like a glide. These patterns provide further support for the argument that Khoekhoe roots are strictly bimoraic.

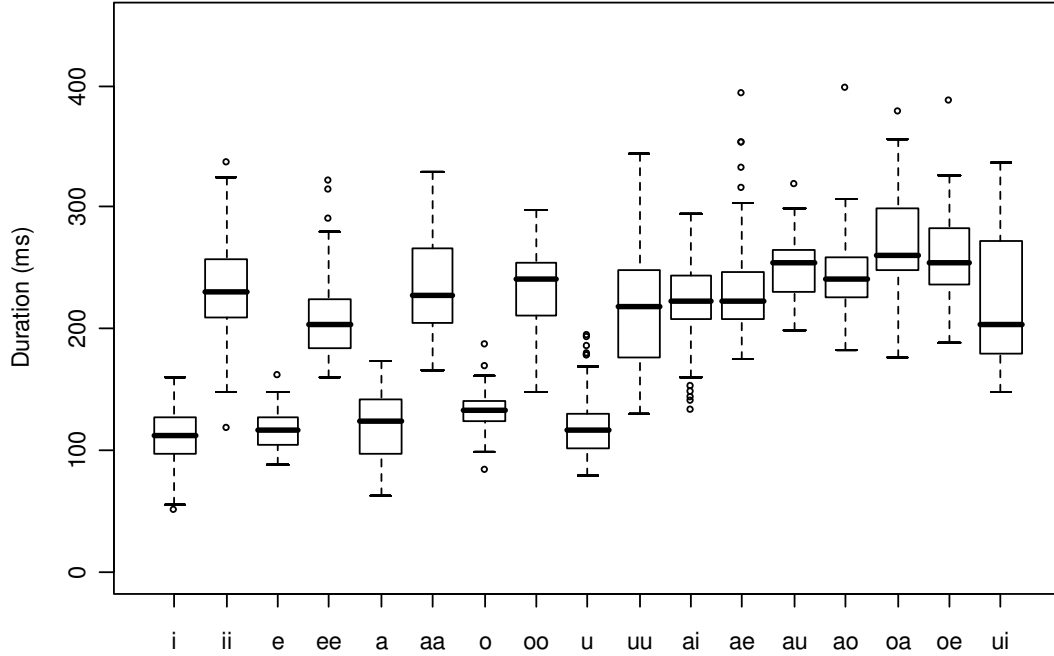


Figure 3.6 Durations of short vowels in CV₁CV₁ roots and long vowels in CV₁V₁ and CV₁V₂ roots. Extracted from the sentence ___ *s ge*. ‘It is ___.’ (n=36 per vowel, Speakers F2, F3 and F4).

In addition to long vowels and diphthongs, monosyllabic roots in Khoekhoe can also have vowel-nasal rhymes. That is, they can have the shape CVN. Possible vowel-nasal combinations are shown in Table 3.8, with examples in (4).

Table 3.8 Vowels-nasal combinations found in Khoekhoe roots.

	CVn	CVm
High	-	-
Mid	(en), on	om
Low	an	am

(4) *Vowel-nasal roots*

- a. [sèn] ‘to fancy’ ----
- b. [ᵀʔòns] ‘name’ [ᵀʔóm] ‘to smile’
- c. [ᵀʔʼán] ‘to know’ [xáʼms] ‘lion’

The sequence [en] is very rare, though it does occur in two roots in my corpus, but the high vowels are entirely absent in this context. It is not immediately clear why this should be, though it could have to do with the diachronic process that created nasal vowels. Like the diphthongs, the durations of CVN rhymes are equivalent to those in CV₁V₁ roots, as shown in Figure 3.7.

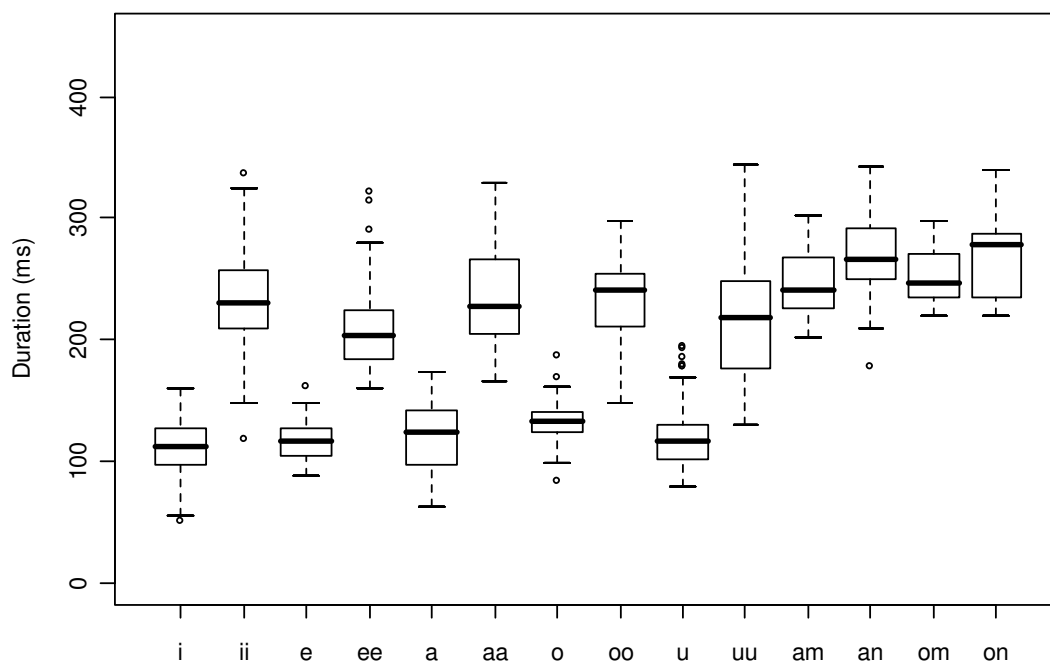


Figure 3.7 Durations of short vowels in CV₁CV₁ roots, long vowels in CV₁V₁ roots and rhymes in CVN roots. Extracted from the sentence ___ *s ge*. ‘It is ___.’ (n=36 per vowel, Speakers F2, F3 and F4).

The relative durations of the vowel and nasal portions of these sequences are variable and nasal coarticulation often makes the segment boundary difficult to detect, but the unit as a whole consistently patterns durationally with the other monosyllables. I take this as evidence that these nasals are also moraic, a proposal that is supported by the observation that they can bear tone. On both distributional and durational grounds, then, we can say that Khoekhoe roots are both minimally and maximally bimoraic. I will show below that this is because they are exactly a foot.

This tendency towards strict bimoraicity is also found in other southern African Khoesian languages. The few “monomorphemic” CVVCV and CVCVCV roots in Khoekhoe behave segmentally and tonally like root-suffix combinations, and Traill (1985) and Nakagawa (2006) make similar observations about !Xóǝ and |Gui, respectively. Ju|’hoansi, on the other hand, has genuine CVVCV roots, 116 of which were found in a 1878-word corpus (Miller-Ockhuizen 2003). The fact that these cannot be treated prosodically like suffixed roots is demonstrated by their reduplication patterns. Reduplication in bisyllabic Ju|’hoansi roots can be either full or partial, and there are important differences between mono- and bitonal roots (Miller-Ockhuizen 1999, 2001a, 2001b, 2003). Examples are provided in (5). The deletion of the medial consonant in (5)(b) will be discussed in section 3.2.4. Reduplicants are underlined and separated from the base by a period.

(5) *Partial reduplication in Ju|’hoansi*

- | | | | |
|----|-----------------------|---|--------------------------------|
| a. | [ʰàma] ‘to take’ | → | [ʰà.ʰàma] ‘to cause to take’ |
| b. | [χə́rí] ‘to fry’ | → | [χə́.χə́rí] ‘to cause to fry’ |
| c. | [ʔə́ucé] ‘to be slow’ | → | [ʔə́.ʔə́ucé] ‘to be very slow’ |

With a monotonal root, like that in (5)(a), the reduplicant is a single, monomoraic syllable, but with the bitonal melody in (5)(b), the reduplicant must be heavy in order to accommodate the two tones, so both base vowels are copied. In bitonal CVVCV roots like the one in (5)(c), the tones in the base associate with different syllables, but both are copied onto the reduplicant, indicating that the melody is a property of the entire root. Interestingly, however, the first syllable in Ju|’hoansi CVVCV roots always contains a diphthong in either vowel quality or voice quality, neither of which can be associated with a monomoraic syllable. Crucially absent are roots with the shape CVCVCV, CVCVV and CV₁V₁CV. Roots in Ju|’hoansi can,

therefore, be trimoraic, but they are still maximally a trochaic foot in which an initial diphthong is tolerated. This observation allows us to maintain the generalization that roots across Khoesan languages are both minimally and maximally a foot.

The absence of CV₁V₁CV roots in Ju|'hoansi is also important because it shows that vowel length differences never indicate vowel length *contrasts* in southern African Khoesan languages. These differences always correlate with different prosodic structures, and I argue that it is structure that determines vowel length in these languages, rather than the reverse. This is not true of Sandawe, which has a true length contrast, as demonstrated by the difference between CV and CVV roots like [tê] 'other' and [té:] 'count' (Eaton 2006a). The absence of minimality (and maximality) constraints in Sandawe is an important example of the prosodic differences between it and other Khoesan languages.

The observation that bare roots in Khoekhoe are bimoraic does, however, raise the question of what, exactly, is the target of the relevant minimality constraints. Is it the root itself, or the morphological word? Because vowel length in Khoekhoe always depends on root shape, Beach (1938) argued vehemently against recognizing a phonemic or orthographic distinction between long and short vowels.²⁰ Though Beach was right about the lack of a phonemic contrast, the duration data presented above show that the vowels in monosyllabic roots are consistently longer than those in bisyllabic roots. Crucially, this is true even in affixed forms, and the lack of alternation shows that constraints on minimality actually target roots, not morphological words.

In order to show that the duration of vowels in monosyllabic roots does not change in suffixed forms, we can look at examples with both inflectional and derivational suffixes, and with non-, mono- and bimoraic suffixes. These include the

²⁰ His argument was, in part, a response to an orthography that recognized *four* different vowel lengths (Beach 1938:109).

person-gender-number (PGN) markers [-s] (3.F.S), [-n̂] (3.C.L) and [-râ] (3.F.D) (see Chapter 4 for details), the diminutive suffix [-rò] and the augmentative suffix [-kàra]. The examples themselves are listed in (6), while duration measurements for the short and long vowels in the different contexts are shown in Figure 3.8.

- (6) *Roots with non-moraic, monomoraic and bimoraic suffixes*
- a. ‘tortoise’: [ʔ!áas] [ʔ!áaŋ] [ʔ!áarâ] [ʔ!áaròs] [ʔ!áakàras]
- b. ‘nara melon’: [ʔ!áaras] [ʔ!áraŋ] [ʔ!árarâ] [ʔ!áraròs] [ʔ!áarakàras]

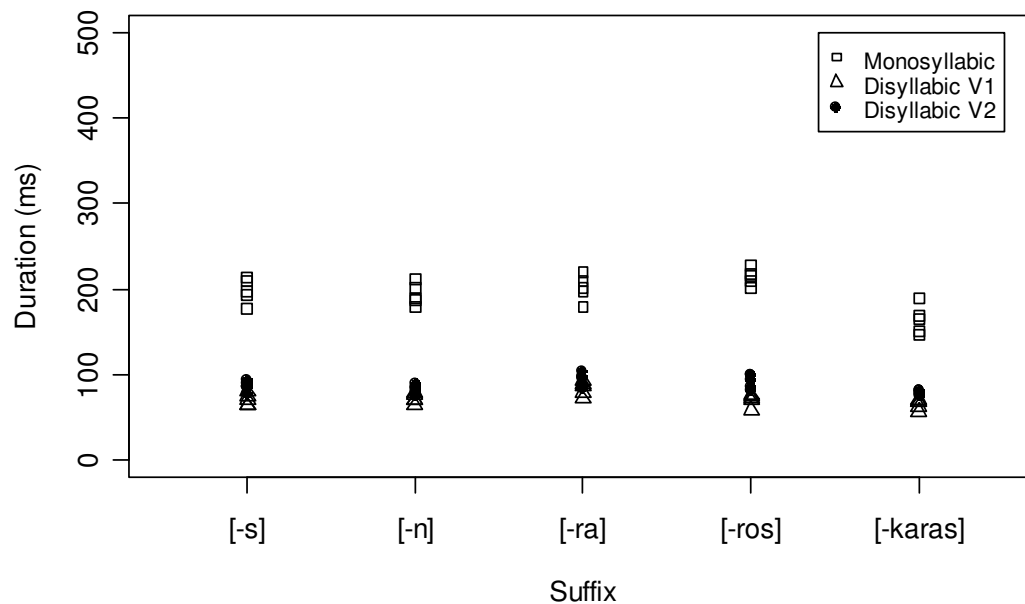


Figure 3.8 Durations of vowels in CVV and CVCV roots with inflectional and derivational suffixes. (n=6, Speaker F2).

These data show that the durations of vowels in mono- and bisyllabic roots remain the same, regardless of the type or size of the affix. The absence of alternation in these contexts demonstrates that it is roots themselves that must be bimoraic, not the entire morphological word. We will see in Chapter 6 that this is not always true of function words.

Descriptively, we can capture the requirement that roots be both minimally and maximally bimoraic by saying that each root parses to a single foot. One way to formalize this is with a templatic constraint like $ROOT=FOOT$ (McCarthy and Prince 1993). Constraints of this type have been used in analyses of a number of languages, including Miller-Ockhuizen's (2003) treatment of Ju|'hoansi, but more recent work has argued that templatic constraints are both unnecessary and inappropriate, and that observed patterns should be shown to fall out from the ranking of other, independently-motivated constraints (McCarthy and Prince 1999). This approach is often referred to as Generalized Template Theory (GTT). It is usually applied to analyses of reduplication (e.g., Urbanczyk 2006), but is also useful when accounting for phonotactic generalizations of the type found in Khoekhoe.

We start with the assumption that each root initiates a prosodic word, an idea that is supported by the segment distribution facts discussed in Chapter 4. Formally, this is captured with $ANCHOR-L(Root;PrWd)$ (McCarthy and Prince 1995, 1999), which requires that the left edge of each root coincide with the left edge of a prosodic word.²¹ Under the Strict Layer Hypothesis (Selkirk 1978/81, 1984, Nespor and Vogel 1986), each prosodic word must contain at least one foot. This is enforced with $HEADEDNESS$ (Selkirk 1995), a constraint that is usually assumed to be undominated cross-linguistically. Because feet in Khoekhoe are always binary, $FOOT-BINARITY$ must also be undominated (Prince 1980, McCarthy and Prince 1986, Hayes 1995). Finally, the general Optimality Theory constraints $MAX-IO$ and $DEP-IO$ (Prince and Smolensky 1993, McCarthy and Prince 1999) are necessary to prohibit gratuitous deletion and epenthesis, respectively. I assume these constraints are formulated as in (7). The ability of these constraints to enforce root minimality for both mono- and

²¹ See McCarthy (2003) on the appropriateness of $ANCHOR$ rather than $ALIGN$ in such contexts.

bisyllabic roots is demonstrated with hypothetical inputs in (8)-(10). Here and throughout, foot boundaries are indicated with “(” and prosodic word boundaries are indicated with “[”.

(7) ANCHOR-L(Root;PrWd): The left edge of each root must coincide with the left edge of a prosodic word.

HEADEDNESS: Any prosodic category C^i must dominate an immediately subordinate prosodic category C^j (except if $C^i = \sigma$).

FOOT-BINARITY- μ : Feet are bimoraic.

MAX-IO: Every segment of the input has a correspondent in the output (i.e., no deletion).

DEP-IO: Every segment of the output has a correspondent in the input (i.e., no epenthesis).

(8) *Minimality in monosyllables*

/#a/	ANCHOR-L (Rt;PW)	HEAD	FT-BIN	DEP
a. [#a]		*!		
b. [(#a)]			*!	
c. (#aa)	*!			*
☞ d. [(#aa)]				*

(9) *Minimality in monosyllables*

/#aa/	ANCHOR-L (Rt;PW)	HEAD	FT-BIN	DEP
a. [#aa]		*!		
b. (#aa)	*!			
☞ c. [(#aa)]				

(10) *Minimality in disyllables*

/ʃana/	ANCHOR-L (Rt;PW)	HEAD	FT-BIN	DEP
a. [ʃana]		*!		
b. (ʃana)	*!			
☞ c. [(ʃana)]				

In (8), the sub-minimal input is obligatorily augmented, at the expense of DEP, in order to meet the bimoraic minimality requirement, while the inputs in (9) and (10) are unaffected. An input like (8) will not actually occur in the native vocabulary, because the principle of Lexicon Optimization (Prince and Smolensky 1993, Inkelas 1994, Itô et al. 1995, Yip 1996, Tesar and Smolensky 1998) assures that input forms will resemble surface forms in languages that lack segmental alternations. Nonetheless, the constraint ranking must generate the observed surface patterns, and these tableaux show that it does.

We now turn to constraints on maximality, which is most often discussed in the context of reduplication (but see Ussishkin 2000, 2005, de Lacy 2004). In Khoekhoe, we find maximality constraints on both roots and clitics. I begin with monomorphemic forms, and then turn to the consequences of morphological complexity. We saw above that bimoraic minimality is enforced by requiring that roots map to prosodic words. Maximality is enforced by limiting the number of feet in a prosodic word and prohibiting unparsed syllables. The first requirement is accomplished with McCarthy's (2003) ENDRULE-L and ENDRULE-R, which are intended as categorical replacements of ALLFT-L and ALLFT-R. These are captured in (11) as a single cover constraint that eliminates candidates with more than one foot. Unfooted syllables are prohibited with PARSE- σ .

(11) ENDRULE-L/R: The head foot is neither preceded nor followed by another foot in the same prosodic word.

PARSE- σ : A syllable must not be unfooted.

The effect of these constraints on a hypothetical trisyllabic input are demonstrated in (12). For the moment, I ignore violations of DEP, the ranking of which will be established below.

(12) *Maximality in monomorphemic roots*

/ʃanara/	ENDRULE	FT-BIN	PARSE- σ	MAX
a. [(ʃanara)]		*!		
b. [(ʃana) ra]			*!	
c. [(ʃana)(raa)]	*!			
☞ d. [(ʃana)]				**

Together, these constraints ensure that roots are no larger than a bimoraic foot, but what about trimoraic forms in which the final syllable is a suffix? Words of this type are common, so the constraint ranking must allow for them. I argue that this is easily accounted for by requiring that morphemes be realized phonologically. For convenience, I formulate this as in (13), but see Kurisu for (2001) extensive discussion.

(13) REALIZEMORPH: Morphemes must be realized phonologically.

Because of this constraint, clitics pattern differently than a third root syllable, as shown by the hypothetical form in (14).

(14) *Maximality in suffixed roots*

/ʃanara + ta/	REALIZE	ENDRULE	FT-BIN	PARSE- σ	MAX
a. [(ʃanarata)]			*!		
b. [(ʃana)(rata)]		*!			
c. [(ʃana) ra ta]				**!	
☞ d. [(ʃana) ta]				*	**
e. [(ʃana)]	!*				*****

Because PARSE- σ is outranked by REALIZE, unparsed syllables are permitted only when they are associated with a non-root morpheme. Quantity constraints on clitics will be taken up in Chapter 4.

There is, however, one candidate not considered in (14) that should be better than the winning candidate, namely one in which the suffix is reduced to [-t]. Single-segment clitics are permitted, but the ranking in (14) implies they are preferred because they do not violate PARSE- σ . This is not the case. Though it is possible to account for this with an appropriate ranking of NOCODA (Prince and Smolensky 1993), I argue that PARSE-SEG, formulated in (15), is preferable.

(15) PARSE-SEG: Segments must be parsed into syllables.

The advantage of PARSE-SEG is that it allows a principled distinction between true coda consonants, which are limited to [m] and [n], and the unparsed clitic segments [-p], [-s] and [-n]. The structure associated with violations of PARSE-SEG also fails to violate ANCHOR-R(Root;Foot), described below, and allows for uniform prosodic placement of all suffixes. The necessary ranking for both -CV and -C inputs is shown in (16).

(16)

/#ana + ta/	DEP	PARSE-SEG	PARSE- σ	MAX
a. [(#ana) t]		*!		*
☞ b. [(#ana) ta]			*	
/#ana + t/	DEP	PARSE-SEG	PARSE- σ	MAX
☞ a. [(#ana) t]		*		
b. [(#ana) ta]	*!		*	

Here, deletion of the clitic nucleus is prevented because it is worse to leave a segment unparsed than to leave a syllable unparsed, but augmentation is prohibited because epenthesis is worse than unparsed segments.

Finally, we come to the question of root minimality in suffixed forms. The constraints motivated so far should allow for a scenario where a hypothetical input /!a/ alternates between [!aa] when bare and [!a-ra] when suffixed. This never happens with roots, though it does occur with certain functional morphemes. Rather than fall back on a templatic constraint like ROOT=FOOT, we can say that the right edge of each root is anchored to a foot boundary, as in (17). The influence of this constraint is illustrated for a hypothetical sub-minimal root in (18).

(17) ANCHOR-R(Root;Foot): The right edge of each root must coincide with the right edge of a foot.

(18) *Minimality in suffixed roots*

/#a + ta/	ANCHOR-R (Rt;Ft)	FT-BIN	DEP	PARSE- σ
a. [(#ata)]	*!			
b. [(#a) ta]		*!		*
☞ c. [(#aa) ta]			*	*

Because the left edge of the root initiates a prosodic word, and because the right edge coincides with the right edge of the only foot in that prosodic word, roots are always bimoraic. This is the only constraint that refers to the right edge of a prosodic constituent in Khoekhoe, but a constraint of this type is the only way to differentiate between the behavior of roots and certain root-like function words. In Chapter 6, I will show that pronouns and demonstrative adverbs often begin with morphemes that also occurs in isolation. Though these morphemes have a short vowel in morphologically complex forms, the vowel is long when the morpheme occurs on its own. This is demonstrated in (19) and (20) for the pair [nee] ‘this’ and [ne-pa] ‘here’. The first tableau assumes that the input has a short vowel, while the second assumes that the input vowel is long. The results are the same, regardless of our assumptions about the input.

(19)

/ne/	ANCHOR-R (Rt;Ft)	FT-BIN	DEP	PARSE-σ
a. [(ne)]		*!		
☞ b. [(nee)]			*	
/ne + pa/	ANCHOR-R (Rt;Ft)	FT-BIN	DEP	PARSE-σ
☞ a. [(nepa)]				
b. [(ne) pa]		*!		*
c. [(nee) pa]			*!	*

(20)

/nee/	ANCHOR-R (Rt;Ft)	FT-BIN	PARSE- σ	MAX
a. [(ne)]		*!		*
☞ b. [(nee)]				
/nee + pa/	ANCHOR-R (Rt;Ft)	FT-BIN	PARSE- σ	MAX
☞ a. [(nepa)]				*
b. [(ne) pa]		*!	*	*
c. [(nee) pa]			*!	

Examples like this show that though demonstratives pattern like roots in many respects, they are not targeted by ANCHOR-R(Rt;Ft). This constraint, together with those above succinctly account for the quantity constraints on Khoekhoe roots.

Having established the patterns with respect to vowel quantity, we now turn to constraints on vowel quality.

3.2.2 Syllabification

Before we can address the distribution of vowels in roots, we must consider the question of syllabification. Though CVCV roots are unquestionably bisyllabic, the status of CV₁V₁, CV₁V₂ and CVN roots has been a matter of some debate in the literature on Khoekhoe and other Khoesan languages. Beach (1938) argues that the only truly monosyllabic roots in Khoekhoe are the monophthongs (i.e., C V₁V₁), and that CV₁V₂ and CVN roots are bisyllabic, at least in “normal careful speech”. He assumed, “whether a vowel combination like **ai** is a diphthong or not depends on whether or not the tongue remains still for a while on the **a** and then again on the **i**. In the latter case two syllables are formed and the combination is not considered a diphthong....” (p.49). Vowel combinations in CV₁V₂ roots frequently have two steady states, and since Beach’s definition precluded this in diphthongs, he concluded that the

only alternative was for CV₁V₂ roots to be bisyllabic. Beach also took the fact that each vowel in CV₁V₂ roots and the vowel and the nasal in CVN roots could have distinct pitches as evidence that these constituted separate syllables.

Haacke (1999a) takes Beach's line of reasoning one step farther, arguing that *all* Khoekhoe roots are bisyllabic. His evidence is partly diachronic—namely his assumption that CVV roots once had a medial consonant and that CVN roots once had a final vowel. Haacke is not explicit on this point, but seems to imply that the CVCV form is still there underlyingly. While it may well be the case that CVV and CVN forms arose in this manner, there is no synchronic evidence in Khoekhoe of medial consonants or final vowels in these forms. Additionally, Haacke argues that the majority of his recordings showed a dip in the intensity curve in the middle of CVV sequences, which he interprets as evidence of separate syllabic pulses. But no such phonetic basis for syllabification has been established in the phonetic literature. Rather, syllabification is typically considered a matter of native speaker intuitions. Haacke argues that the advantage of his analysis is that it "...allows a uniform treatment of all tonal patterns as well as an isomorphic relation between syllable and mora." Indeed, the assumption that syllables and moras are coextensive would necessitate such an analysis, but it is also possible to account for Khoekhoe tone and quantity patterns with the moraic theory motivated by Hyman (1984, 1985), McCarthy and Prince (1986) and Hayes (1989), which does not require syllables and moras to be coextensive.

In order to lay this issue to rest, native speaker intuitions were elicited with a syllable counting experiment. There are many languages for which speaker judgments about syllabification can be problematic, but wherever such intuitions are available, either through direct questioning or indirect methods like language games or poetic conventions, they constitute a reasonable approach for resolving this type of debate.

Three subjects (Speakers F2, F3 and F4) were presented with a questionnaire that asked them to count the number of syllables in CV₁V₁, CV₁V₂, CVN and CVCV nouns with the PGN markers [-s], [-n̂], [-râ] and [-ʔi]. They were instructed to count by saying the word out loud and clapping for each syllable. The subjects had no difficulty with the task and all had strong intuitions about the number of syllables in each word. In fact, judgments were 100% consistent across speakers and tokens. The full list of stimuli, sorted by judgment, is provided in the Appendix. Representative examples are listed in Table 3.9, Table 3.10 and Table 3.11. Syllable boundaries are marked with a period.

Table 3.9 Syllable counts for CVV nouns with [-s], [-n̂], [-râ] and [-ʔi].

Monosyllabic	Bisyllabic	Trisyllabic
[tsèes], [tsèen̂] ‘day’	[tsèe.râ], [tsèe.ʔi]	----
[xóos], [xóon̂] ‘cheek’	[xóo.râ], [xóo.ʔi]	
[òas], [òan̂] ‘ladle’	[òa.râ], [òa.ʔi]	
[hèis], [hèin̂] ‘tree’	[hèi.râ], [hèi.ʔi]	

Table 3.10 Syllable counts for CVN nouns with [-s], [-n̂], [-râ] and [-ʔi].

Monosyllabic	Bisyllabic	Trisyllabic
[àn̂s] ‘meat’	[àn̂.n̂], [àn̂.râ], [àn̂.ʔi]	----
[kóm̂s] ‘termite’	[kóm̂.n̂], [kóm̂.râ], [kóm̂.ʔi]	
[xám̂s] ‘lion’	[xám̂.n̂], [xám̂.râ], [xám̂.ʔi]	

Table 3.11 Syllable counts for CVCV nouns with [-s], [-n̂], [-râ] and [-ʔi].

Monosyllabic	Bisyllabic	Trisyllabic
----	[sá.ras], [sá.rañ] ‘clothing’	[sá.ra.râ], [sá.ra.ʔi]
	[ú.rus], [ú.ruñ] ‘wild animal’	[ú.ru.râ], [ú.ru.ʔi]
	[!ó.res], [!ó.reñ] ‘zebra’	[!ó.re.râ], [!ó.re.ʔi]
	[kò.mas], [kò.mañ] ‘cow’	[kò.ma.râ], [kò.ma.ʔi]

CV₁V₁, CV₁V₂ and CVN roots were always judged monosyllabic with the PGN marker [-s], and CVCV roots with [-s] were always judged bisyllabic. Similarly, CV₁V₁, CV₁V₂ and CVN roots with [-râ] and [-ʔî] were consistently judged bisyllabic, and CVCV roots with those same markers were judged trisyllabic. Finally, [-n̂] patterned as a separate syllable only with nasal-final CVN roots, though two speakers produced it with an epenthetic schwa. Speakers completed the questionnaire independently, and were then asked as a group whether it is ever possible for a word like [l̥as] ‘ladle’ to be pronounced as two syllables, for instance in careful speech or in a song, all three categorically rejected the possibility.²² This small experiment is corroborated by the hyphenation guidelines in the official orthography, which states that, “[p]olysyllabic words are divided according to syllables as slow pronunciation yields them, e.g. //khai-sa-di-si, //kha-wab, hoa-ra-ga-se, /ā-tsē-am-sa, !gû-#na-mi-pe, khoe-ra, khao-#ui, //gam-mi” (Curriculum Committee for Khoekhoegowab 2003:116). Taken together, these data show that Khoekhoe speakers have strong intuitions that CV₁V₁, CV₁V₂ and CVN roots are monosyllabic, and my analysis will treat them as such.

We now turn to a brief discussion of the distribution of vowels with respect to initial consonants, followed by the more general question of how vowels are distributed with respect to each other.

3.2.3 The Back Vowel Constraint

Before we can discuss the distribution of vowels with respect to medial consonants, it is necessary to say a few words about the relationship between vowels and initial consonants. Traill (1985:89-92) describes a phonotactic generalization he

²² In contrast, many non-Khoekhoe speaking phoneticians and phonologists for whom I have played recordings of words like these claim to hear two syllables.

calls the Back Vowel Constraint, which prohibits the front vowels [i] and [e] after “back” consonants. These include [k], [q], [χ], [!] and [||], but not [p], [t], [ʔ] or [ʦ]. Traill observes that this constraint seems to hold across Khoesan languages “with very few exceptions”, but not in the Bantu languages Xhosa and Zulu. Khoekhoe is, however, one of the Khoesan exceptions. Words illustrating front vowels with a range of consonants are shown in (21).

- (21) a. [pèè] ‘to run away’ [pìis] ‘euphorbia’ ---
 b. [tsèep] ‘day’ [tìi] ‘to do’ [tìiᵐ] ‘to ask’
 c. [lèèp] ‘twin’ [li] ‘to instigate’ [lìiᵐs] ‘wart’
 d. [ʦéè] ‘unlucky’ [ʦii] ‘blind’ [ʦχìiᵐ] ‘peace’
 e. [kéè] ‘to foretell’ [kìni] ‘to knead’ ---
 f. [ʔèè] ‘opportunity’ [ʔii] ‘to be deprived’ ---
 g. [||éè] ‘to strangle’ [||χíi] ‘to pinch’ ---

But despite the fact that front vowels and “back” consonants can co-occur in Khoekhoe, Miller et al. (2007b) note that their distribution is still skewed in the direction predicted by the BVC. The co-occurrence of front vowels and consonants with different places of articulation in the 1892-word corpus described above is summarized in Table 3.12.

Table 3.12 Number of roots containing each consonant/vowel combination. Counts reflect all manners and phonation types for each place of articulation.

	“Front” consonants				“Back” consonants		
	[p]	[t]	[ʔ]	[ʦ]	[k]	[!]	[]
[ee]	4	5	9	5	1	4	5
[ii]	2	4	9	9	1	3	6
[iᵐ]	0	6	6	2	0	0	0
Total	6	15	24	16	2	7	11

Here we see that there are roughly twice as many front vowels after “front” consonants as after “back” consonants. Miller et al. (2007b) argue that the distributional differences between the alveolar click [!] on the one hand, and the palatal click [ʈ] on the other can be explained in terms of tongue musculature. In some languages (e.g., !Xóõ, Ju|’hoansi, N|uu), this constraint is phonologized as a categorical co-occurrence restriction, while in Khoekhoe it is reflected as a statistical trend. Note that this trend also seems to hold in the clitics discussed in Chapter 4. Only three of the thirteen morphemes with [k], [k^h] or [x] are followed by a front vowel, in contrast to seven of the seventeen morphemes with [t], [t̪s̪], [n], [r] or [s].²³ For further discussion, see Traill (1985), Nakagawa (2006), Miller-Ockhuizen (2000a, 2003), and Miller et al. (2007b).

Having considered the co-occurrence of onsets and rhymes, we now turn to the distribution patterns of vowels with medial consonants and with each other.

3.2.4 Vowel distribution

Table 3.7 and the examples in (3) above show the vowel sequences that are permitted in Khoekhoe roots. Though there are many such sequences, numerous logical possibilities are not attested, specifically: 1) Vowel sequences that move from front to back (i.e., *iu, *io, *ia, *eu, *eo, *ea); 2) Vowel sequences that move from high to mid or low (i.e., *uo, *ue, *ua, *ie, *io, *ia); and 3) Vowel sequences that move from mid to high (i.e., *ou, *oi, *eu, *ei). Restrictions like these turn up in all southern African Khoesan languages, though there is some variation from one language to the next in terms of which combinations are allowed and which are prohibited. !Xóõ, for example, allows all the sequences found in Khoekhoe, plus [ue],

²³ For the purposes of this count, I treat the basic, object and oblique PGN markers as a single “morpheme”.

[ua], [oi], and [ou] (Traill 1985:97). Across these languages, we find a general dispreference for front vowels, especially in the first position of a sequence. This may be due in part to the Back Vowel Constraint, but that alone cannot account for the low frequencies of front vowels with “front” consonants. Rather, it seems to be an idiosyncratic fact about these languages. Crucially, however, the same patterns always obtain in both CVV and CVCV roots.

The consistent patterning of CVV and CVCV roots in Khoekhoe is demonstrated by the vowel sequences in the 1892-word corpus described above.²⁴ The raw counts for each sequence are shown for monophthongal roots in Table 3.13, for diphthongal roots in Table 3.14 and for VN sequences in Table 3.15. Because the distribution patterns differ somewhat across medial consonants, CVCV roots are sorted accordingly.

Table 3.13 Distribution of monophthongal roots.

	ii	ee	aa	oo	uu	
CVmV			33			33
CVnV	4		33		21	58
CVrV	4	7	52	46	46	155
CVβV			39	24	28	91
CVV	27	26	76	61	61	251
CVⁿVⁿ	17		59		31	107
	52	33	292	131	187	695

²⁴ Nine words from the corpus were treated as exceptions. Two were monosyllables unknown to my consultant, *hius* ‘inland fog’, which is listed in Haacke and Eiseb (2002) with exceptional tone as well, and *in* ‘to bend’. Three more are the disyllables *bupeb* ‘uncertainty’, */gerub* ‘red wasp’ and */khenas* ‘guinea fowl’. The remaining four are discussed below.

Table 3.14 Distribution of diphthongal roots.

	ae	ai	ao	au	oe	ui	oa	
CVmV		27		1		10	15	53
CVnV		24		11		24	12	71
CVrV	28	45	29	41	32	32	36	243
CVβV	34	32	19	31	11	21	26	174
CVV	33	59	59	58	22	46	59	336
CVⁿVⁿ		22		33		25	35	115
	95	209	107	175	65	158	183	992

Table 3.15 Distribution of vowels-nasal sequences.

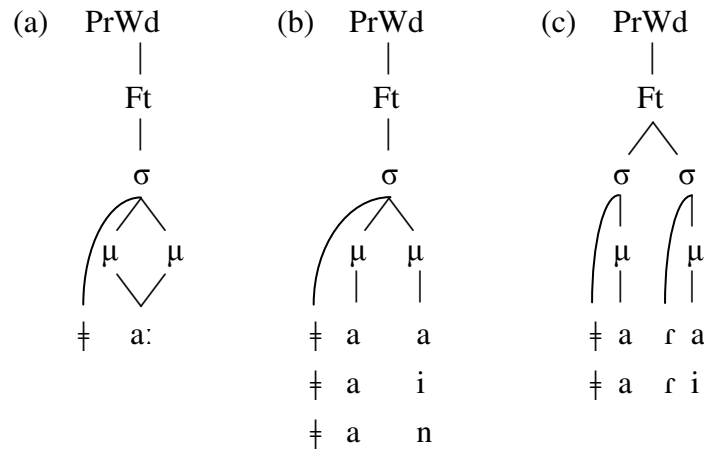
	CVn	CVm	
e	2		2
o	25	61	86
a	45	62	107
	72	123	195

Looking first at the question of vowel-consonant interaction, we see that all vowel sequences occur with medial [r], and that most also occur with medial [β]. The only exceptions with [β] are the front monophthongs, but these are relatively low-frequency, so the gap could be accidental. The distribution of medial [m] is the most restricted, occurring only with the sequences [ama], [ami], [amu], [umi] and [oma]. The distribution of [n] is only slightly less restricted. There are also four exceptions in the database with the sequence [omi], namely [ʰ|hómi] ‘to turn moldy’, [ʰ|hómíɸ] ‘pimple’, [ʰ|hòmi] ‘to tell a lie’ and [ʰ|hómí] ‘to prepare’. Though these all occur with nasal aspirated clicks, so does [ʰ|hùmi] ‘to sob’, so we cannot attribute the exceptional pattern to the lowering of /u/ after a nasal aspirated click. Another possibility is that mid vowels are prohibited after onset /m/, so /e/ is realized as /i/ in this environment, an idea that is supported by the fact that /m/ in root-initial position is never followed by /e/ or /o/ except in loanwords (e.g., *metal-i* ‘metal’ and *moduleb* ‘module’). But

since this is a fairly small set and there are no monosyllables with [oi], I will simply treat them as genuine exceptions to an otherwise robust generalization.

More important than interactions between vowels and medial consonants are the restrictions on the distribution of vowels with respect to each other. There are no cases in which surface “long vowels” and “diphthongs” do not have a corresponding disyllabic form, nor are there cases of disyllables without a monosyllabic counterpart. If we focus for the moment on the diphthongs, these distribution patterns strongly suggest that surface diphthongs of the type found in Khoekhoe are qualitatively different from diphthongs in languages like English (see also Traill 1985:97, Haacke 1999a). That is, there is a sense in which the vowel sequences in Khoekhoe words like [sóě] ‘to gasp’ and [sóré] ‘to share’ are the same, but this is not true of English pairs like “boy” and “body”. Rather, Khoekhoe “diphthongs” are simply two vowels that happen to occur in the same syllable; they are not independently contrastive units and should not be counted as phonemes. A similar argument has been made for diphthongs in Hawaiian (Rehg 2007), and it seems likely that this is the appropriate way to think about surface diphthongs in a number of languages. Extending this analysis to the long vowels is somewhat more controversial, but I argue that the distributional parallels are too compelling to ignore. Specifically, I argue that the parallel distribution patterns in CVV and CVCV roots suggest that surface “long vowels” and “diphthongs” result when two vowels happen to occur in the same syllable. That is, the appropriate structure for CV₁V₁ roots is that in (22)(b), not (22)(a).

(22) *Possible prosodic structures for bare roots*



Though there are good reasons to believe that the representation in (22)(a) is appropriate for a true vowel length contrast (see Hyman 1985, McCarthy and Prince 1986, Hayes 1989), the representation in (22)(b) allows a uniform treatment of CV₁V₁, CV₁V₂ and CVN roots. The crucial difference between Khoekhoe and the majority of cases discussed in the literature is that the length difference in Khoekhoe is not contrastive independent of word shape. Moreover, distributional parallels suggest that vowel sequences in monosyllabic and disyllabic roots should be analyzed in a like manner. Though my analyses of root minimality and tone work equally well with the representations in (22)(a) and (22)(b), the structure in (22)(b) seems more appropriate for surface long vowels and diphthongs in southern African Khoesan languages. Though there are no alternations in Khoekhoe that provide positive evidence for this approach, we do find suggestive evidence in both Ju|’hoansi and |Gui.

As discussed in section 3.2.1, reduplication in disyllabic Ju|’hoansi roots can be either partial or full (Miller-Ockhuizen 1999, 2001a, 2001b, 2003). In partial reduplication of monotonal CVCV roots, the reduplicant is a light syllable, but bitonal roots require a heavy syllable. Crucially, this heavy syllable contains a surface diphthong derived from the vowels of the root vowel sequence, not a lengthened

version of the first vowel.²⁵ This is demonstrated by the examples in (23). Again, the reduplicant is underlined and separated from the base by a period.

(23) *Ju|’hoansi reduplication*

- | | | | | | |
|----|--------------------------------|------------------------------------|---|--|---|
| a. | [<u>ɛ̣</u> hàma] | ‘to take’ | → | [<u>ɛ̣</u> hà. <u>ɛ̣</u> hàma] | ‘to cause to take’ |
| b. | [mà ^ξ ni] | ‘to speak a
non-click language’ | → | [<u>mà^ξ</u> .mà ^ξ ni] | ‘to cause to speak a
non-click language’ |
| c. | [mà ^ξ ní] | ‘to turn over’ | → | [<u>mà^ξ</u> í.mà ^ξ ní] | ‘to cause to turn over’ |
| d. | [<u>ɲ</u> ɛ̣ ^ξ ró] | ‘to find s.t.’ | → | [<u>ɲ</u> ɛ̣ ^ξ ó. <u>ɲ</u> ɛ̣ ^ξ ró] | ‘to find a lost object’ |

In the monotonal examples in (23)(a-b), the reduplicant is a CV syllable identical to the first syllable of the base. But in (23)(c-d), the root’s bitonal melody requires a bimoraic syllable, and so both root vowels are copied, despite the fact that they are associated with different syllables in the base. This relationship between base and reduplicant vowels indicates that, on some level at least, vowel sequences in Ju|’hoansi CV₁V₂ and CV₁CV₂ roots are equivalent.

Interestingly, the opposite process is found in |Gui, a Khoe language spoken in Botswana. Nakagawa (2006:73) describes a sonorant-insertion rule (i.e., VV → VrV, or VⁿVⁿ → Vⁿ_nVⁿ) that applies productively in compounds where the first element: 1) is CVV; 2) has at least one mid-tone; and 3) ends in a [-high] vowel. Examples of the insertion are shown in (24).

²⁵ It is beyond the scope of this dissertation to provide a formal mechanism to account for the deletion of these medial consonants. See Miller-Ockhuizen (1999) for an OT treatment of the Ju|’hoansi data, and Kennedy (2008) for a non-templatic analysis of similar phenomena in several Austronesian languages.

- (24) *Sonorant-insertion in /Gui (Nakagawa 2006:73)*
- a. /!hácē/ + /máⁿàⁿ/ → [!hácē.máⁿàⁿ]
 ‘stab’ ‘give’ ‘stab for someone’
 - b. /^ɓ!àō/ + /máⁿàⁿ/ → [^ɓ!àrō.máⁿàⁿ]
 ‘soak’ ‘give’ ‘soak (leather) for someone’
 - c. /ʔāⁿāⁿ/ + /máⁿàⁿ/ → [ʔāⁿnāⁿ.máⁿàⁿ]
 ‘wear’ ‘give’ ‘wear for someone’
 - d. /^ɓ||àⁿāⁿ/ + /máⁿàⁿ/ → [^ɓ||àⁿnāⁿ.máⁿàⁿ]
 ‘dodge’ ‘give’ ‘dodge for someone’

This rule inserts a medial [ɾ] or [n] between the vowels of the first root, regardless of whether the nucleus is a monophthong or a diphthong.²⁶ As Nakagawa argues, such a rule is easily expressed with the representation in (22)(b), but is problematic for the representation in (22)(a). Though it is not necessary for all southern African Khoesan languages to be analyzed in the same way, distributional parallels between CVV and CVCV roots are similar enough across these languages that it would be preferable if their representations reflected this similarity. For these reasons, I will assume that (22)(b) is the appropriate representation of both diphthongs and long monophthongs in all southern African Khoesan languages.

3.3 Summary

This chapter has provided an overview of the Khoekhoe segment inventory, and of the segmental phonotactic patterns that characterize Khoekhoe roots. Both consonants and vowels were shown to have constrained distributions, and roots were shown to be strictly bimoraic. I argue that this bimoraicity reflects the requirement that roots map to head and only foot of a prosodic word. These same patterns are found across southern African Khoesan languages, but not in other languages with clicks.

²⁶ The nasal insertion version of this rule is particularly interesting, because CVⁿCVⁿ sequences are otherwise unattested.

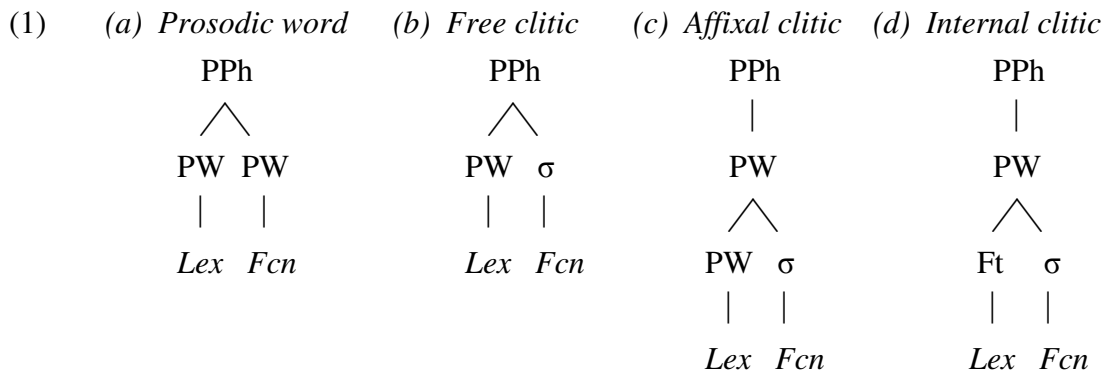
Though we would expect phonotactic patterns in Bantu click languages like Zulu and Xhosa to be different from those in Khoesan languages, the case of Sandawe is more interesting. It is sometimes argued that Sandawe is distantly related to the Khoe languages (Elderkin 1989, Güldemann and Elderkin forth.), so it is significant that Khoekhoe phonotactic patterns more closely resemble those of unrelated, but geographically proximate languages like !Xóǀ, Ju|'hoansi and N|uu. This observation highlights the dangers of using the superficial phonotactic similarities as evidence, implicit or explicit, in arguments about genealogical unity.

CHAPTER 4: CLITIC QUANTITY AND DISTRIBUTION

4.0 Introduction

We saw in Chapter 3 that Khoekhoe content words are subject to strict phonotactic constraints on syllable quantity and segment distribution. This chapter will show that the same is true of elements at the opposite end of the prosodic spectrum. Morphemes of this type are monomoraic and restricted to non-initial positions. On morphosyntactic grounds, they can be categorized as either “particles” or “suffixes”. Particles occur in syntactically-defined positions and often follow words of different types, while suffixes associate with lexical items of a single category (e.g., nouns). But despite clear morphosyntactic differences, particles and suffixes are phonotactically indistinguishable. In terms of their relation to the larger prosodic structure, particles and suffixes give somewhat different auditory impressions of “joinedness” with the roots that precede them, and there are different orthographic conventions for representing them, but I currently have no phonological or quantitative phonetic evidence to show that the categories are prosodically distinct from one another. For the sake of concreteness, I tentatively assume that the auditory impression reflects a real prosodic difference that is represented in the lexicon with the appropriate subcategorization frame (Inkelas 1990), and transcribe particles and suffixes accordingly, but the final word on the issue will have to be a matter for future research.

Under the model of the Prosodic Hierarchy assumed here, lexical and functional heads can have one of the four configurations shown in (1) (Selkirk 1995). Note that these structures differ slightly from Selkirk’s in the prosodic levels represented and the position of the functional element.



The configuration in (1)(a) is appropriate for function words that assume prosodic word status and that co-occur in phonological phrases with a lexical item. Examples of this type will be discussed in Chapter 6. I assume “particles” are functional heads that are morphologically independent of roots but are not themselves prosodic words. These have the structure shown in (1)(b). Suffixes, on the other hand, must have the structure in either (1)(c) or (1)(d). At this time, I can offer no principled reason for preferring one structure over the other, but the morphologically complex pronouns and demonstrative adverbs discussed in Chapter 6 require the structure in (1)(d), so I will assume this is appropriate for suffixed roots, as well. It should be noted, however, that the distinctions in structures (1)(b-d) are actually irrelevant for the phonotactic analysis presented in this chapter. All that matters is that particles and suffixes are never prosodic word-initial. For ease of exposition, I will refer to all such morphemes simply as “clitics”. This usage is non-standard, particularly for derivational suffixes, but it appropriately captures the prosodic patterns found in Khoekhoe and other southern African Khoesan languages.

The phonotactic constraints that hold on clitics are as consistent and striking as those found in roots, and they show that functional elements are simultaneously more restricted and more free than their lexical counterparts. I first demonstrate the relevant patterns for particles (section 4.1), and then turn to the behavior of derivational

suffixes (section 4.2). The PGN markers, which pattern syntactically with both particles and suffixes, will be discussed separately (section 4.3). Finally, I compare the phonotactic patterns found in clitics with those found in roots (section 4.4). The chapter is summarized in section 4.5.

4.1 Particles

This section addresses the patterns of segment distribution found in grammatical markers that appear in syntactically-defined positions. The two most common types of particles are those that indicate whether a sentence is declarative or interrogative, and those that mark tense and the imperfective aspect. I will address each type in turn.

Nearly all matrix clauses (see Chapter 7 for details) obligatorily take either a declarative or interrogative particle in “second” position.²⁷ This initial “topic” position can be occupied by a variety of constituents that consist of at least one prosodic word (e.g., noun, postpositional phrase, adverbial phrase), or it can be empty, in which case the sentence must begin with a conjunction (see Hagman 1977 for details). Sentential particles all begin with [k] or [k^h], and all are monosyllables, as shown in (2) and the spectrograms in Figure 4.1.

- | | | |
|-----|--------------------|------------------------------------|
| (2) | [ke] | declarative ²⁸ |
| | [kəm] | emphatic declarative ²⁹ |
| | [k ^h a] | emphatic interrogative |

²⁷ Matrix clauses can, in certain discourse contexts, begin with a conjunction that occupies a “pre-initial” position, as well as a lexical subject. I will nonetheless refer to the position occupied by sentential particles and subject PGN clitics as “second” position.

²⁸ Unfortunately, I do not have enough data on all of the particles and PGN markers to confidently determine whether their tone is low or falling, so tone is omitted from some examples. None, however, have high tone.

²⁹ The particle [kəm] always co-occurs with the sentence-final particle [ʔo].

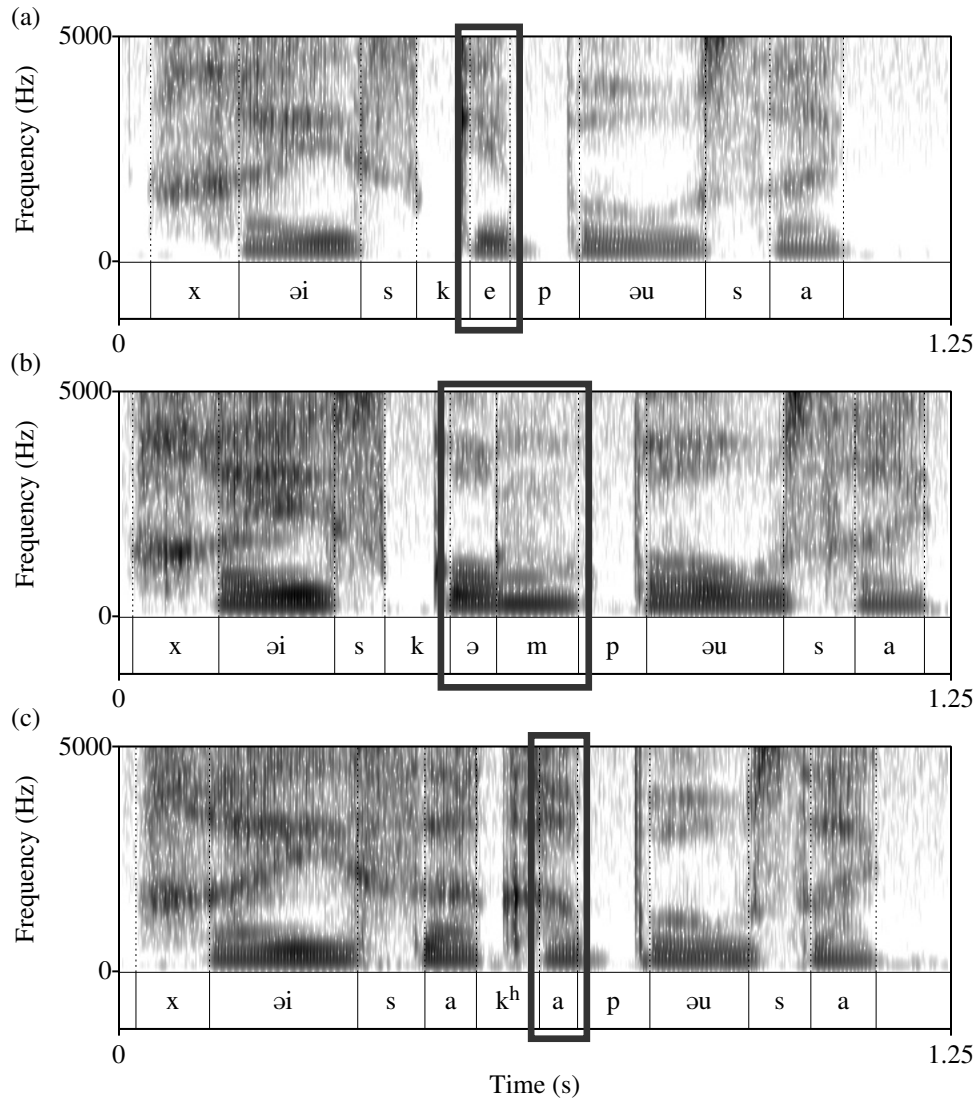


Figure 4.1 Spectrograms showing the durations of: (a) declarative [ke], (b) emphatic declarative [kəm] and (c) emphatic interrogative [k^ha]. Extracted from sentences of the form *Xais __ bausa gere xâu* ‘The kudu was chewing the metal container.’ Note that the interrogative in (c) also requires the oblique PGN [-sa] on the subject. (Speaker F2).

Sentential particles all begin with obstruents, indicating that they differ from root-medial syllables. In terms of quantity, these spectrograms show that the vowels in [ke] and [k^ha] are much shorter than the root diphthongs [əi] and [əu], but approximately the same duration as the final vowel in *bausa* ‘metal container’. That is, they are monomoraic. The emphatic declarative particle [kəm], on the other hand, has a rhyme that is as long as the diphthongs and consists of two distinct segments.

Though this seems to suggest that this particle is bimoraic, there are several reasons to think that vowels in surface CVN clitics are epenthetic, and that the only mora is associated with the [m]. First of all, the schwa is frequently elided or severely reduced in less careful speech. This is much less true of vowels in CVN roots. Second, the quality of these vowels is highly centralized. Though the orthography implies a distinction between morphemes like *kom* and the reflexive suffix *-sen*, the actual vowel qualities are quite similar, with minor differences that can be attributed to labial coarticulation. Finally, morphologically complex forms like /ʎan-n/ ‘(many pieces of) meat’, in which a nasal PGN marker follows a CVN root, are typically produced [ʎan.ən], with an epenthetic schwa. I therefore assume that clitics like *kom* are underlyingly monomoraic (i.e., CN), and that some speakers produce them with an epenthetic vowel. This assumption allows us to make the generalization that all particles are monomoraic.

Turning now to those particles associated with predicates, we find that the present tense copula, the imperfective aspect marker and all tense markers are also monomoraic monosyllables. These are listed in (3).

- | | | | | |
|-----|--------------------|-------------------|------|---------------------|
| (3) | [ke] | remote past tense | [ka] | indefinite tense |
| | [ko] | recent past tense | [ra] | imperfective aspect |
| | [ni ⁿ] | future tense | [ʔa] | present copula |

From a phonotactic perspective, these examples are particularly interesting because the future tense particle has a short nasal vowel, while the imperfective aspect particle begins with [r]. The short duration of *nî* is illustrated with the spectrograms in Figure 4.2.

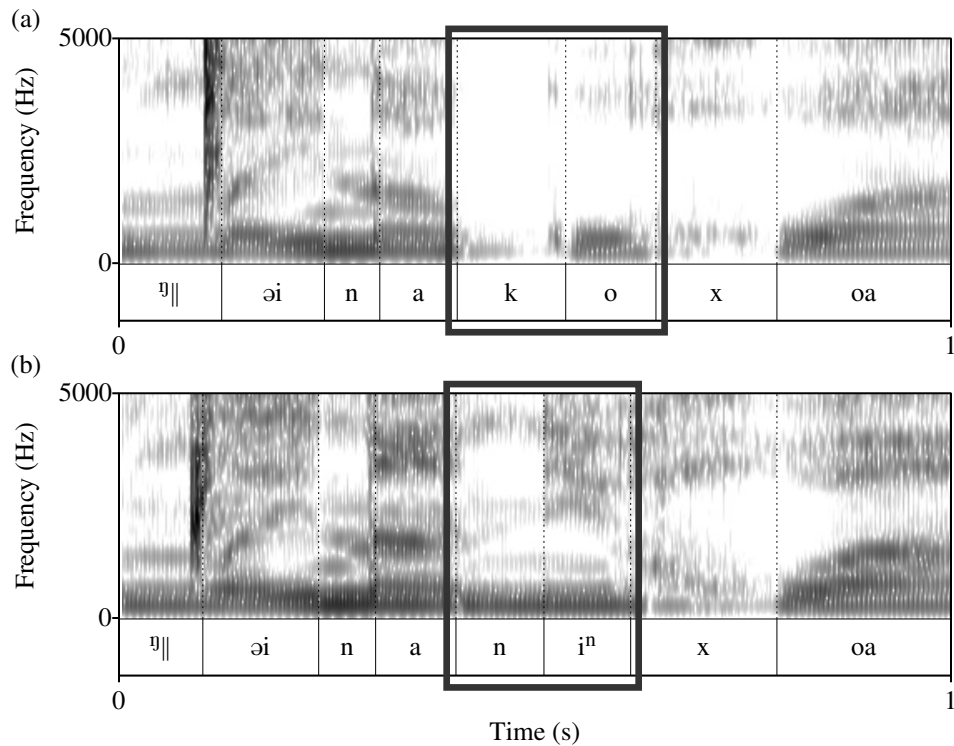


Figure 4.2 Spectrograms illustrating the durations of: (a) the past tense particle [ko] and (b) the future tense particle [niⁿ]. Examples from the frame sentence *Namas ge //naina __ xoa* ‘The Nama picked/will pick berries.’ (Speaker F2)

These spectrograms show that the vowels in [ko] and [niⁿ] are both short. Short nasal vowels never occur in roots, but they are found in a handful of function words. To my knowledge, short nasal vowels of this type have not been demonstrated in any other Khoesan language, though they are present in the output of the |Gui nasal-insertion rule described in Chapter 3 (Nakagawa 2006). In any case, this example, together with others that will be discussed in Chapter 6, shows that the restriction of nasal vowels to roots of CVV shape is a fact about roots in Khoekhoe, not a fact about nasal vowels. Particles are not prosodic words, and therefore not bimoraic, so it is not surprising that a nasal vowel in this context would be short. It is, in fact, exactly what we would expect.

The second anomaly in the inventory of tense and aspect particles is the observation that they begin with both pulmonic obstruents and sonorants, but not with

clicks. This is, in fact, a consistent feature of clitics. Interestingly, however, the only approximant-initial verbal particle, [ra], frequently occurs in environments where it follows a tense marker, and in these contexts the two morphemes give the auditory impression of forming a prosodic unit. This is not typically the case with successive particles. Moreover, the vowel of the aspect marker can harmonize with that of the tense marker, as shown in (4).

- | | | | | |
|-----|------------------------------------|--------------------------|----------------------|--------------------------|
| (4) | [kere] _{Ft} | remote past imperfective | [koro] _{Ft} | recent past imperfective |
| | [ni ^h ra] _{Ft} | future imperfective | [kara] _{Ft} | indefinite imperfective |

I assume these are allomorphs, rather than the result of a productive harmony process. Given the frequency with which an imperfective particle follows a tense particle, it is probably not a coincidence that the second element begins with an acceptable root-medial, and therefore foot-medial, onset. Rather, it reflects the general preference for sonorant onsets in foot-medial position.³⁰

More importantly, the allomorphs in (4) raise the question of whether these complex forms are prosodic words. Zec (2005) shows that free function words in Serbian acquire prosodic word status only when they meet a disyllabic minimality requirement. That is, disyllabic free function words have the structure in (1)(a), while their monosyllabic counterparts have the structure in (1)(b). Might this also be the case in Khoekhoe? Unfortunately, Khoekhoe has no stress, segment or tone alternations to shed light on the question. There are, however, syntactic constraints on both simple and complex verbal particles that suggest it would be inappropriate to treat them as prosodic words.

³⁰ Interestingly, in the rare context when the imperfective particle follows a consonant, the morpheme can surface as [ta]. This is the only clitic that behaves this way—the imperative [re], for instance, never alternates—so I assume that [ta] is an idiosyncratic allomorph, rather than the result of a productive process.

Specifically, we find that tense and aspect markers, alone or in combination, are strictly prohibited in clause-initial positions. Khoekhoe sentence structure is fairly flexible, and constituents can occur in a range of positions, but word order is not completely free. This is illustrated by the word-order variants in (5). These sentences all have the same basic meaning, but they differ in emphasis. Note that these examples use the past imperfective *goro*, but that the same pattern obtains with any tense/imperfective combination. The PGN marking differences in these sentences will be addressed in section 4.3. Examples of this type will always be given in orthography rather than transcription unless otherwise noted.

- (5) a. Namas ge ||naina goro xoa.
 Nama DEC berries PST-IMP pick
 ‘The Nama was picking berries.’
- b. Namas ge ||naina xoa goro.
- c. Xoa goros ge Namasa ||naina.
 pick PST-IMP-PGN DEC Nama berries
- d. *Goro xoas ge Namasa ||naina.
- e. Xoas ge Namasa ||naina goro.
- f. *Goros ge Namasa ||naina xoa.

The sentences in (5)(a-b) show that the verb and verbal particles can occur in either order at the end of a sentence, though (5)(a) is the default. If, however, the verb and tense marker are raised to “topic” position, the verb must come first. This is demonstrated in (5)(c-d). Similarly, the verb can be raised to topic position on its own, leaving the verbal particles *in situ*, but the reverse is not permitted. This is shown in (5)(e-f). A similar pattern is found in embedded structures, as illustrated with the adverbial clauses in (6). For clarity, the embedded clause is set off with “[”.

- (6) a. Namas ge [daoba ra |napu-se] ra ||nae.
 Nama DEC road IMP sweep-while IMP sing
 ‘The Nama is singing while sweeping the road.’
- b. Namas ge [|napu ra-se] ra ||nae.
 Nama DEC sweep IMP-while IMP sing
 ‘The Nama is singing while sweeping.’
- c. *Namas ge [ra |napu-se] ra ||nae.

When the embedded clause includes a pre-verbal element with prosodic word status, for instance the object *daoba* ‘road’ in (6)(a), the tense marker precedes the verb. But in the absence of a prosodic host, the verb and tense marker are obligatorily inverted, as in (6)(b). The first element in the embedded clause can be a noun, adverb or postpositional phrase, as long as it begins with a prosodic word. We will see in section 4.3 that this same distributional restriction applies to subject PGN clitics. Similar inversion patterns are found in Bulgarian and Old French, though in those languages inversion is restricted to main clauses (see Halpern 1998, Anderson 2005 and references therein). In Khoekhoe, the driving force seems to be a prohibition on clitics in clause-initial positions, because clause-initial positions are also phrase-initial positions, and phrase-initial positions must be occupied by a prosodic word. This generalization is supported by the tone sandhi facts described in Chapter 7. Though the picture is muddled somewhat by the monomoraic conjunctions described in Chapter 6, I argue it is the rule, rather than the exception.

In addition to sentential and verbal particles, we find a handful of other monomoraic function words. Sub-minimal postpositions and complementizers will be addressed in Chapter 6, but other examples are shown in (7).

- (7) [ti] possessive [re] imperative
 [ʔo] emphatic declarative

Syntactically, these morphemes are either phrase-medial ([ti]) or phrase-final ([re] and [ʔo]), and phonotactically they pattern with the sentential and verbal particles. Taken together, the examples in this section show that function words of these types are subject to phonotactic constraints that distinguish them from roots.

4.2 Suffixes

The inventory of derivational suffixes in Khoekhoe is not large, but there are enough examples to show that these morphemes pattern phonotactically with the particles. The suffixes mentioned in Hagman (1977) and Haacke and Eiseb (2002) are listed in Table 4.1.

Table 4.1 Derivational suffixes.

Noun	Verb	Adjective
[-rò] diminutive (<N)	[-pâ] applicative	[-ʔò] ‘without X’
[-ró] diminutive (<V,A)	[-kù] reciprocal	[-xâ] ‘full of X’
[-sî] ‘X-ness’	[-hê] passive	[-sâ] trans. V→A
	[-rí] intensifying	[-sá] intrans. V→A
	[-rô] causative	
	[-xâ] ventive	
	[-sə̀n] reflexive	

Syntactically and auditorily, suffixes are more closely bound to roots than particles are. They can never be separated from a root by a pause, for instance, and they are always written conjunctively in the orthography. Phonotactically, however, suffixes and particles pattern together. These morphemes are all monomoraic, they can begin with either a pulmonic obstruent or an approximant, and none begin with a click.

This tidy picture is complicated somewhat by “suffixes” that look like roots. A selection of these is listed in (8).

- | | | |
|-----|---|---|
| (8) | [-kàra] augmentative | [-sáa] ‘to mis-X’ |
| | [-ʔàðp/s] ‘person who does X’ | [- ^ù ùni] ‘to bother by X-ing’ |
| | [-mà ⁿ a ⁿ] ‘child of X’ | [- ^ù !ʔári] ‘to be obliged to X’ |
| | [- ^ù ʔúí] ‘to X-out’ | [-ʔúú] ‘to X with’ |
| | [-má ⁿ a ⁿ] ‘to do X here and there’ | |

Morphologically, some of these are bound morphemes (e.g., [-kàra]), while others are clearly related to roots. The suffix [-ʔàðp/s], for instance, must derive diachronically from [ʔáop] ‘man’,³¹ though the suffix version applies equally well to women as to men. But prosodically and phonotactically, these suffixes are no different from the second element in a compound (see Chapter 7). None, for instance, begin with [r], and there are no examples where the overall shape or tone pattern is different from that found in roots. I take this as evidence that “suffixes” of this type are interpreted prosodically as the second element in a compound. That is, they are subject to the phonotactic constraints that hold on roots, not those that hold on clitics. I assume that the prosodic category a particular suffix belongs to is an idiosyncratic property of that morpheme, though there seems to be general a tendency for more “grammatical” functions to be associated with clitics.

This type of prosodic distinction among elements in the morphological category of “suffix” is not unprecedented. Urbanczyk (2006), for example, makes similar arguments about Lushootseed, in which certain “suffixes” behave phonotactically like bound roots. Similarly, Alderete (2003) shows that Navajo suffixes can be divided into those that pattern phonotactically with roots and those that

³¹ See Chapters 5 and 7 for discussion of the tonal differences between the root and suffix forms.

do not, and Hall and Hildebrandt (2008) argue that suffixes in the Kyirong dialect of Tibetan can be internal clitics, free clitics or independent prosodic words. Crucially, however, morphological suffixes in Khoekhoe must pattern phonotactically with either the clitics or the roots—they never diverge from those templates.

The distributional patterns in monomoraic suffixes are also relevant to the analysis of “exceptional” root shapes. As mentioned in Chapter 3, there is a set of synchronically non-decomposable roots with CVVCV, CVNVCV and CVCVCV forms. Unlike trimoraic roots in Jul’hoansi, these cannot be analyzed as a special subset of the standard pattern. Rather, they look tonally and segmentally like suffixed roots. The representative examples listed by Haacke (1999a:89-93) are given in (9)-(12). In order to facilitate comparisons, the “root-like” and “suffix-like” portions of these words are separated with a hyphen, even though there is no synchronic morpheme boundary.

(9) *Exceptional CV₁V₁CV roots*

[^{ɔ̃} l̥o-râ] ‘baboon’	[^{ɔ̃} li-râ] ‘to roast on a stick’
[pòò-ròp] ‘jewel beetle’	[kà ⁿ a ⁿ -ré] ‘foolish’
[^{ɔ̃} χú ⁿ u ⁿ -ké] ‘foolish, dumb’	[há ⁿ á ⁿ -síp] ‘orphan lamb’
[^{ɔ̃} !à ⁿ a ⁿ -nîp] ‘lower jaw bone’	[kòo-nâs] ‘cloven hoof’

(10) *Exceptional CV₁V₂CV roots*

[ʔái-râ] ‘to fry’	[^{ɔ̃} ?àa-râ] ‘to fill up’
[!óa-rép] ‘zebra’	[^{ɔ̃} !æ-rús] ‘stingray’
[sáú-rû] ‘to give chase’	[^{ɔ̃} !hóá-pép] ‘wild asparagus’
[^{ɔ̃} !háu-kép] ‘dassie rat’	[!ài-sí] ‘ugly’
[!áú-tâp] ‘one who points’	[^{ɔ̃} !óé-tê] ‘clumsy, awkward’
[^{ɔ̃} !ɸí ⁿ n-ńás] ‘egg of louse’	[^{ɔ̃} !?óé-ńís] ‘mopane tree’

(11) *Exceptional CVNVCV roots*

[^{ɔ̃} !òm-ríp] ‘rectum’	[^{ɔ̃} !?ám-kú] ‘proper, tidy’
[!àm-mê] ‘to flow together’	[!ám-mê] ‘to marry’

(12) *Exceptional CVCVCV roots*

[tsäβi-rûp] ‘rainbow

[hàra-páp] ‘rabas tea’

[l̥háβa-kâs] ‘south’

[háre-pê] ‘to be of value’

[^hð̥ora-póp] ‘wild cotton’

[^háro-màs] ‘reason, cause’

These exceptions all begin with a CVV, CVN or CVCVCV element that conforms to the segmental and tonal patterns found in roots, and they all end with a monomoraic syllable that has a pulmonic onset, including both [r] and [t]. Rather than complicate the straightforward prosodic structure of roots motivated in Chapter 3, I argue these should be regarded as lexically encoded exceptions that are treated by the prosody as combinations of a root and a suffix. Nakagawa (2006) reports that the same type of exception is also found in G|ui.

We now turn to the final category of sub-minimal morphemes, namely the PGN markers.

4.3 PGN markers

One of the distinguishing features of Khoe languages is their use of clitics that indicate person, gender and number (PGN) (cf. König 2008). In Khoekhoe, PGN markers are used in three basic contexts: 1) As a marker of the gender and number of a noun (e.g., /xám/ ‘lion’ + /-s/ 3.F.S → [xám̥s] ‘lioness’); 2) As a subject or object clitic; 3) As the second morpheme in a full pronoun. This section will focus on the phonotactic patterns in these morphemes and on the distribution of subject and object clitics. Pronouns will be addressed in Chapter 6.

We look first at the distribution of segments in the PGN paradigm. The full set of basic PGN markers is given in Table 4.2. These markers occur with subjects, the objects of most postpositions and non-final elements in conjoined and appositive objects (see Chapter 7 for examples).

Table 4.2 Basic PGN markers (Hagman 1977:42)

		1 st	2 nd	3 rd
Masculine	<i>Singular</i>	[ta]	[ts]	[p]/[i]
	<i>Dual</i>	[k ^h əm]	[k ^h o]	[k ^h a]
	<i>Plural</i>	[ke]	[ko]	[ku]
Feminine	<i>Singular</i>	[ta]	[s]	[s]
	<i>Dual</i>	[m]	[ro]	[ra]
	<i>Plural</i>	[se]	[so]	[ti]
Common	<i>Dual</i>	[m]	[ro]	[ra]
	<i>Plural</i>	[ta]	[tu]	[n]
Indefinite	<i>Singular</i>			[ʔi]

Basic PGN markers can be single segments ([-p], [-s], [-n]) or monomoraic syllables ([-ti], [-ra], [-k^həm]). Single-segment PGN markers surface as codas, though [-p] has the allomorph [-i] with CVN roots, and the nasal markers [-n] and [-m] can either be syllabic, or produced with an epenthetic schwa in the rare contexts where they follow another consonant. Phonotactically, syllabic PGN markers resemble the particles and suffixes discussed above. That is, they begin with both pulmonic obstruents and approximants, but never with a click. Because PGN markers can begin with either [t] or [r], these segments must be considered contrastive in this environment.

One challenge presented by this paradigm is the difference between the 3.S.M allomorph [-i], which occurs only with CVN roots (e.g., [xám'-i] '(male) lion', but [ʔ^hʔàmi-p] '(male) ostrich'), and the 3.I.S marker [-ʔi], which is used with roots of all types (e.g., [xám'-ʔi] 'lions', and [ʔ^hʔàmi-ʔi] 'ostriches'). As mentioned in Chapter 3, this is the one case where a phonemic glottal stop seems necessary, because there is

never a glottal stop in the former case, but there is always at least some degree of glottalization in the latter. One possible explanation might be that the two PGN markers are different prosodically, and that the glottal stop appears only in certain prosodic environments. There is not, however, any evidence to suggest this is the case. Though the markers do differ tonally (see Chapter 5 for details), there is no durational difference to suggest that [-ʔi], for instance, is a foot while [-i] is not.

Orthographically, nouns with [-i] are written as if the nasal were a geminate (e.g., *xammi*), while nouns with [-ʔi] are written with a hyphen (e.g., *xam-i*). Both distinctions are necessary to differentiate between words of these types and words like /*gami* ‘to wink’. This convention raises the question of whether the 3.S.M marker is really [-mì]/[-nì]. Durationally, however, there is no reason to think that the nasal in *xammi* is longer than any other, as illustrated by the duration plots of minimally different CVN-s, CVN-i, CVN-ʔi and CVNV-p words in Figures 4.3 and 4.4.

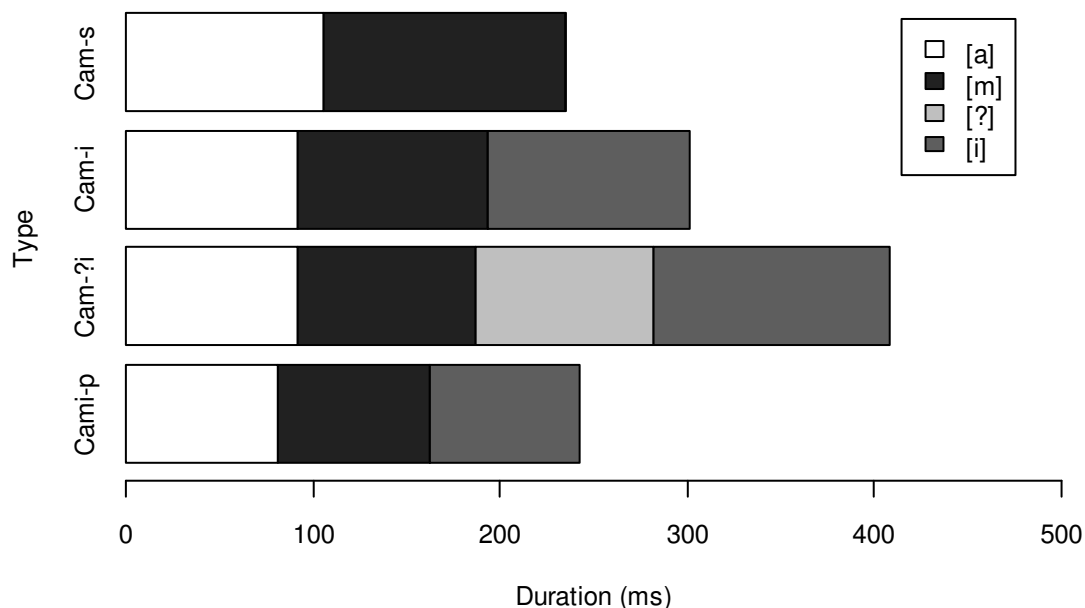


Figure 4.3 Durations of segments in CVN and CVNV roots with different PGN markers (morpheme boundary marked with “-”): [xám̃-s], [xám̃-i], [xám̃-ʔi] ‘lion(s)’ and [sám̃-p] ‘whip’ (n=24, Speakers F2 and F3).

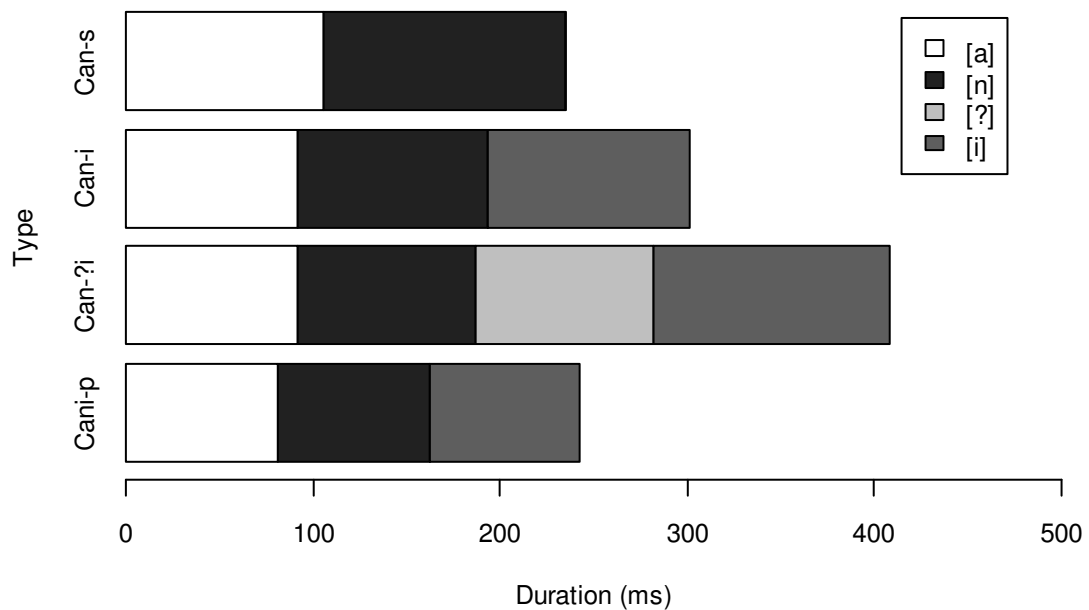


Figure 4.4 Durations of segments in CVN and CVNV roots with different PGN markers (morpheme boundary marked with “-”): [ʔãḥ-s], [ʔãḥ-i], [ʔãḥ-ʔi] ‘meat’ and [tãḥi-p] ‘honey’ (n=24, Speakers F2 and F3).

These data show that nasal durations are essentially the same in each context. Since the nasal in orthographic *xammi* is not longer than that in *xam-i*, it is inappropriate to treat the 3.S.M allomorph as [-mì]. This then requires us to assume the glottal stop in [-ʔi] is phonemic.³² Though this is the only environment in which a phonemic glottal stop is strictly necessary, it should be noted that glottal stops are not uncommon in either the root or the clitic vocabulary.

In addition to their role in marking nouns and pronouns, subject PGN markers occur as clitics in the second position of clauses that lack a lexically-specified subject or full pronoun. Subject clitics in a matrix clause always precede the sentential particle. Examples are shown in (13), where the relevant forms are underlined.

³² I attribute the differences in the duration of [i] in these three contexts to phonetic detail, not a difference in syllable weight. The vowel is shortest in forms like [tãḥi-p] because of the final consonant. It is longest in forms like [ʔãḥ-ʔi] because of difficulty in segmenting the glottal “stop” and the slightly greater duration associated with a falling tone.

- (13) a. Tita ge nē ||naina go xoa.
 I DEC these berries PST pick
 ‘I picked these berries.’
- b. Nē ||naina ta ge go xoa.
- c. Xoa go ta ge nē ||naina.

In (13)(a), the full form of the pronoun occurs in sentence-initial position, the default position for subjects. Note that the pronoun consists of a PGN marker and an initial element that serves as a prosodic base (see Chapter 6 for details). In (13)(b), however, the object has been topicalized and the full form of the pronoun is absent. Here, the initial object is obligatorily followed by the subject and declarative clitics. Significantly, these clitics follow the full constituent, not the first prosodic word. Similarly, the verb and tense marker have been topicalized in (13)(c), and again the subject and declarative clitics follow in second position.³³

The same basic pattern is found in embedded clauses that lack a lexically-specified subject. In cases like these, subject PGN markers cannot occur clause-initially, much like the tense particles in (6). But unlike the tense particles, subject clitics always occupy second position in the clause. This is illustrated by the relative clauses in (14). Again, examples are given in orthography, but the embedded clause is set off with “[” for clarity.

³³ The only case in which second position clitics do not obligatorily follow the whole topicalized constituent is when that constituent is a verb and a tense particle. That is, sentences like (13)(c) have the alternate form *Xoa ta ge go nē ||naina*, where both second position clitics precede the tense marker. Though this difference is clearly important for a full account of Khoekhoe syntax, all that is relevant for the present discussion is that all three clitics are prohibited in clause-initial positions.

- (14) a. [||Ari ta go xoa] ||naina ge a ||khoaxa.
 yest. I PST pick berries DEC COP delicious
 ‘The berries I picked yesterday are delicious.’
- b. [Xoa ta go] ||naina ge a ||khoaxa.
 ‘The berries I picked are delicious.’
- c. Nē [xoa ta go] ||naina ge a ||khoaxa.
 these pick I PST berries DEC COP delicious
 ‘These berries I picked are delicious.’

In (14)(a), the relative clause begins with the adverb *//ari* ‘yesterday’. I will argue in Chapter 6 that the syntactic distribution of such adverbs suggests they have prosodic word status. The second morpheme in this clause is the subject clitic *ta*, followed by the tense particle and the verb in its default, clause-final position. In (14)(b), on the other hand, the verb obligatorily occupies clause-initial position. I argue that this is because it is the only element with prosodic word status. The sentence in (14)(c) shows that this requirement holds at the level of the clause, not the level of the utterance, because the initial demonstrative *nē* ‘these’ does not affect clause-internal word order. We will see in Chapter 7 that an initial demonstrative also fails to trigger tone sandhi on clause-internal roots, supporting the idea that clause-initial positions are also phonological phrase-initial. Taken together, the sentences in (13) and (14) show that the subject clitic is consistently barred from clause-initial position, just like the tense and aspect markers in (6), and I argue that the most reasonable explanation for this type of prohibition is their prosodic status as unparsed syllables.

In addition to the basic PGN markers, Khoekhoe has two sets of object markers. The first set, which I call *oblique* clitics (Hagman 1977), occur with direct and indirect objects (nouns and pronouns), with the objects of certain postpositions, with the subjects of interrogatives and with subjects that have been “deposed” from initial

position.³⁴ Compositionally, oblique clitics look like they derive from the basic PGN marker and the suffix [-â], but all are monomoraic and there are enough irregularities in the paradigm that it is preferable to treat them synchronically as independent clitics. In addition, a slightly different set of PGN markers is used in sentences that lack a lexically-specified object. Object markers of this type cliticize to and move with the verb, and are often analyzed as suffixes. These look as if they arose diachronically from a combination of the basic PGN markers and a suffix [-i]. The different syntactic distributions of oblique and object PGN clitics are illustrated with the sentences in (15), where the relevant PGN markers are underlined.

- (15) a. Namas ge daroba go mû.
 Nama-PGN DEC boy-PGN PST see
 ‘The Nama saw the boy.’
- b. Namas ge go mûbi.
 Nama-PGN DEC PST see-PGN
 ‘The Nama saw him.’

In (15)(a), the lexical object takes the marker [-pâ], while in (15)(b), object clitic [-pi] follows the verb. Like basic PGN markers, then, oblique and object PGN

³⁴ Such “deposed” subjects always co-occur with a second-position subject clitic. For instance,

- a. Namas ge ||naina go xoa. ‘The Nama picked berries’
 Nama DEC berries PST pick
- b. ||Nainas ge Namasa go xoa.
 berries-PGN DEC Nama PST pick

This seems comparable to the type of clitic doubling found in Bulgarian and some Romance languages, though in Khoekhoe the clitic occurs in second position rather than adjacent to the verb (see e.g., Halpern 1998, Anderson 2005 and references therein). The lexical subject *Namasa* is optional in sentences like (b), so I assume that the clitic is the “true” subject in clauses of this type, and that the lexical “subject”, which takes an oblique PGN marker, is actually an adjunct. Such deposition is possible only in matrix clauses that have second-position sentential clitics.

markers obligatorily follow prosodic words. The markers themselves are shown in Table 4.3.

Table 4.3 Oblique and object PGN markers (Hagman 1977:58, 80)

		1 st	2 nd	3 rd
Masculine	<i>Singular</i>	[ta], [te]	[tsa], [tsi]	[pa]/[a], [pi]
	<i>Dual</i>	[k ^h əma], [k ^h əm]	[k ^h o]	[k ^h a]
	<i>Plural</i>	[ke]	[ko]	[ka], [ku]
Feminine	<i>Singular</i>	[ta], [te]	[sa], [si]	[sa], [si]
	<i>Dual</i>	[ma], [m]	[ro]	[ra]
	<i>Plural</i>	[se]	[so]	[te], [ti]
Common	<i>Dual</i>	[ma], [m]	[ro]	[ra]
	<i>Plural</i>	[ta]	[to], [tu]	[na], [n]
Indefinite	<i>Singular</i>			[ʔê], [ʔi]

From a phonotactic perspective, the most interesting characteristic of these clitics is the prevalence of short vowels. Though the vowel quality patterns suggest that these markers arose diachronically from the addition of a vowel suffix to the basic PGN markers, these forms are all synchronically monomoraic.³⁵ That is, oblique and object PGN markers differ from the basic forms only in vowel quality or tone—never in vowel quantity. This cannot be because the vowel sequences are disfavored (e.g., [ea] or [ua]), because vowel sequences that are permissible in roots (e.g., [oa]) are also absent. Rather, the driving force here seems to be a dispreference for bimoraic clitics. The intuition is that bimoraic syllables are more marked than monomoraic syllables in this environment. One way to capture this formally is with a constraint from the

³⁵ Though the 1.M.D marker is bisyllabic, the first vowel is arguably epenthetic.

*STRUC family (Prince and Smolensky 1993) that targets moras not required by a higher-ranked constraints like FTBIN or REALIZE. This constraint is shown in (16).

(16) *STRUC- μ : No moras.

Gouskova (2003), however, argues that *STRUC-type constraints are both unnecessary and undesirable. Instead, she shows that independently motivated constraints account for the same data without predicting unattested patterns. One important component of Gouskova's argument is the idea of the harmonic scale, which ranks elements on the basis of markedness. In the domain of quantity and metrical prominence, Gouskova proposes the harmonic scales shown in (17).

- (17) a. Stressed syllables: $\acute{\sigma}_{\mu\mu\mu} \succ \acute{\sigma}_{\mu\mu} \succ \acute{\sigma}_{\mu}$ (i.e., STRESS-TO-WEIGHT:
Heads of feet are heavy)
b. Unstressed syllables: $\check{\sigma}_{\mu} \succ \check{\sigma}_{\mu\mu} \succ \check{\sigma}_{\mu\mu\mu}$ (i.e., WEIGHT-TO-STRESS:
If heavy, then a head)

The best stressed syllable is superheavy, followed by a syllable that is heavy, followed by one that is light, and the sequence is reversed for unstressed syllables. These harmonic scales translate into distinct markedness hierarchies, as shown in (18).

- (18) a. Stressed syllables: $*\acute{\sigma}_{\mu} \gg * \acute{\sigma}_{\mu\mu}$
b. Unstressed syllables: $*\check{\sigma}_{\mu\mu\mu} \gg * \check{\sigma}_{\mu\mu}$

The crucial feature of these markedness hierarchies is that no constraint targets the least marked (i.e., top) element in a harmonic scale. In this case, that means that unstressed bi- and trimoraic syllables violate markedness constraints, but unstressed monomoraic syllables do not. As long as we interpret these constraints broadly to refer

to any type of metrical prominence, not just prominence realized with duration, intensity and fundamental frequency (F0), we can use these hierarchies to account for the Khoekhoe data.

I showed in Chapter 3 that feet in Khoekhoe can consist of a single heavy syllable or two light syllables. Khoekhoe must, therefore, allow light syllables to serve as the head of a foot, indicating that the hierarchy in (18)(a) is not active in Khoekhoe. The hierarchy in (18)(b), however, is active, as demonstrated by the fact that non-head syllables in Khoekhoe are always monomoraic. In CVCV roots, one syllable (presumably the left) is the head, and the other is not, but both syllables are light. Similarly, clitics are always unfooted and always monomoraic. This can be attributed to high-ranked $*\check{\sigma}_{\mu\mu}$. Because there are no alternations, we cannot say what the repair strategy for a hypothetical input would be, but one crucial difference between clitic maximality driven by $*\check{\sigma}_{\mu\mu}$ rather than $*\text{STRUCT-}\mu$ is that the former permits but does not prefer clitics with the shape -C rather than -CV. The quantity differences between roots and clitics in Khoekhoe, therefore, reflects the fact that roots are always footed, but clitics are unparsed.

We now turn to the issue of segment distribution in roots and clitics.

4.4 Differences between roots and clitics

The previous sections have demonstrated that particles and suffixes are different from roots in terms of quantity, segment distribution and morphosyntactic behavior. All three distinctions can be accounted for, at least in part, by recognizing that roots obligatorily head prosodic words, but clitics do not. I have already shown that quantity constraints on roots and clitics fall out naturally from universal markedness constraints on syllable weight and language-specific rankings of constraints on prosodic alignment. It is also significant that the prosodic distinction

between roots and clitics correlates with distinct morphosyntactic patterns. While roots occur freely in any position within a clause (i.e., initial, medial, final), clitics are prohibited in initial positions: there are no prefixes in the language,³⁶ and the examples in (6)(b) and (14)(b-c) show that grammatical particles cannot occur at the beginning of a clause. The most straightforward explanation for this is that phonological phrases must begin with a prosodic word, but I will not attempt to address the question of how constraints on prosodic output can influence morpheme order, because the problem extends far beyond the scope of this dissertation (see e.g., Halpern 1998, Anderson 2005 and references therein). We can, however, make the descriptive generalization that the morphosyntax conspires to keep clitics out of clause-initial positions, and that this prohibition satisfies a prosodic requirement that phonological phrases begin with prosodic words. The interaction of this restriction with tone melody distribution will be considered in Chapter 7.

Turning to the question of segment distribution, the patterns presented in Chapter 3 and the previous sections show that we must acknowledge a three-way distinction among root-initial, clitic-initial and root-medial syllables. Possible onsets in each of these environments are shown in Table 4.4. If we take the order of segments in the first column to correlate roughly with “strength”, we see that root-initial position is occupied by the strongest segments, that root-medial position is occupied by the weakest, and that clitic onsets fall somewhere in-between. Traill (1985:164-180) motivates a similar pattern for !Xóǎ, though he attempts to construct a single scale that obscures the significance of prosodic position. Table 4.5 shows a version of

³⁶ Haacke and Eiseb (2002) do list one nominal “prefix”, namely *dana-* ‘main, chief’. Prosodically, this is simply the root *danab/s* ‘head, leader’, which combines productively with a variety of nouns to form compounds.

Trail’s “strength hierarchy” (after Hooper 1976) that has been adapted to emphasize the interactions of onset strength and position.

Table 4.4 Khoekhoe onsets in different morpho-prosodic positions.

Segment	Root-initial	Clitic-initial	Root-medial
[χ̂ ^ʉ ^ʉ ĥ ^ʉ ^ʉ ?] [! χ̂ ^ʉ ^ʉ ĥ ^ʉ ^ʉ ?] [χ̂ ^ʉ ^ʉ ĥ ^ʉ ^ʉ ?] [††χ̂ ^ʉ †† ^ʉ ĥ ^ʉ †† ^ʉ ?]	✓		
[p t k ?] [tŝ kx̂] [s x h]	✓	✓	(p)
[m n]	✓	✓	✓
[r]		✓	✓
[β]			✓

Table 4.5 !Xóõ onsets in different morpho-prosodic positions. Phonation and airstream contrasts are illustrated with alveolar stops, but most are also found with labial, velar and uvular stops. Chart based on Trail (1985) and Güldemann (2001).

Segment	Root-initial	Clitic-initial	Root-medial
Clicks	✓		
[t' ṭ ^χ ḍ ^χ ṭ ^{χ'} ḍ ^{χ'}] [tŝ' d̂z' tŝ ^χ d̂z ^χ tŝ ^{χ'} d̂z ^{χ'}]	✓		
[?m ?n]	✓		
[t ^h tŝ ^h d d ^h d̂z d̂z ^h]	✓		
[q ? tŝ f x h]	✓		
[p t k s]	✓	✓	
[m n]	✓	(n)	✓
[l]		✓	✓
[β j ɲ]			✓

As has been noted elsewhere (e.g., Zoll 1996, Beckman 1999), we find massive positional neutralization in syllables that are not root-initial. Clitic-initial

onsets are occupied by unmarked pulmonic obstruents or sonorants, and root-medial consonants are either sonorants or have sonorant variants. Significantly, however, Tables 4.4 and 4.5 show that there are also restrictions on the segments that occur in root-initial position. I will show that neutralization in each position is the result of qualitatively different constraints on segmental and positional markedness.

It is important to remember that the restriction of clicks to root-initial position in Khoekhoe and other southern African Khoesan languages is a matter of language-specific phonology, and not an inherent feature of clicks. As Beckman (1999) notes, Zulu allows clicks both initially and medially in roots, but never in affixes. This same root/affix asymmetry is also found in Sandawe, as illustrated in Table 4.6.

Table 4.6 Sandawe onsets in different morpho-prosodic positions (based on examples in Eaton 2006b, Hunziker et al. 2007).³⁷

Segment	Root-initial	Suffix-initial	Root-medial
[^h ^ʘ ^ǀ ^ǂ ^ǃ ^Ǆ] [! ^h ^ʘ ^ǀ ^ǂ ^ǃ ^Ǆ] [^h ^ʘ ^ǀ ^ǂ ^ǃ ^Ǆ]	✓		✓
[p b p ^h t d t ^h] [k g k ^h ?]	✓	(p t t ^h k g ?)	✓
[tʃ dʒ tʃ ^h tʃ ^h dʒ]	✓	(tʃ ^h)	✓
[ts' tʃ' k']	✓	(ts')	✓
[f s ʃ x h]	✓	(s x)	✓
[m n]	✓	(m n)	✓
[r l j w]	✓	(j w)	✓

³⁷ I am ignoring some gaps I take to be accidental. The lateral affricates [tʃ dʒ], for instance, are very low-frequency, so their absence in word-medial position is difficult to interpret, especially since medial [tʃ^h] is attested. There are also differences with respect to word-medial click phonation. Hunziker et al. cite only one example of a word-medial aspirated click ([ʔú^hú] 'to cough'), and medial [||], [ʘ] and [ǂ] are unattested in their corpus. In fact, the vast majority of medial clicks are glottalized. It is also important to note that even though clicks do occur medially in Zulu and Sandawe, they are far more frequent in root-initial position.

Though the set of Sandawe suffixes described in the sources is limited, it is sufficient to show that clicks are conspicuously absent in this environment.³⁸ Such root/affix asymmetry in the distribution of marked segments is not uncommon cross-linguistically (see Beckman 1999 for discussion). Laryngeal contrasts in Cuzco Quechua, for instance, are restricted to roots (Parker and Weber 1996), and comparable restrictions are found in Lushootseed affixes (Urbanczyk 2006) and Navajo conjunct prefixes (Alderete 2003). But the Zulu and Sandawe cases do serve to underscore the fact that southern African Khoesan languages are characterized by two distinct asymmetries: initial vs. internal, and root vs. clitic. These two asymmetries interact to give the three observed positions that I refer to as word-initial (σ_{1W}), morpheme-initial (σ_{1M}) and “elsewhere” (i.e., morpheme-internal). Each of these is characterized by a distinct type of neutralization.

The remainder of this section will show that onset distribution patterns in Khoekhoe and other southern African Khoesan languages require two distinct approaches to position-specific neutralization, namely positional faithfulness (Beckman 1999, Lombardi 1999), and a type of positional markedness (Zoll 1998, 2004) known as positional augmentation (Smith 2000, 2005). Both approaches account for distributional asymmetries by allowing constraints of a particular type to preferentially target segments in certain positions. Positional faithfulness requires elements in strong positions to remain faithful to inputs that are prohibited elsewhere (i.e., $F/str \gg M \gg F$), leading to neutralization in weak environments. This is the classical type of positional neutralization described by Trubetzkoy (1939a) and others. Positional augmentation, on the other hand, prohibits marked elements in strong positions (i.e., $M/str \gg F \gg M$), leading to neutralization in strong environments.

³⁸ I do not include postpositional suffixes here, and there is one such suffix with a click.

Neutralization of this type is argued to be possible only when it enhances a position's perceptual prominence (Smith 2000, 2004, 2005).

There is some debate in the literature (Prince and Tesar 2004, Smith 2009) as to whether positional faithfulness constraints can or should be replaced by positional markedness constraints relativized to weak positions. But because analyses with F/str and M/wk constraints typically produce the same results, it is unclear how the question will ultimately be resolved. For simplicity, I follow Smith (2000, 2005) in assuming that positional constraints must refer to strong positions (i.e., F/str and M/str). Though the Khoekhoe data could be analyzed with a combination of M/str and M/wk constraints, doing so obscures the generalization that neutralizations in all three environments enhance the perceptual prominence of initial position, while decreasing the prominence of prosodic word-internal onsets.

We begin with the prohibition on high-sonority onsets in word-initial position, which is a straightforward example of positional augmentation. This type of restriction is not unique to Khoesan (de Lacy 2001, Smith 2000, 2004, 2005), and it serves to enhance prominence by maximizing the auditory distinctiveness of syllable onsets and nuclei (see Smith 2000, 2005 for discussion). Smith (2000, 2005), building on Prince and Smolensky (1993), argues that such patterns can be captured with a universal, sonority-based onset markedness hierarchy (see also de Lacy 2001). A version of this hierarchy that includes only the categories relevant for Khoekhoe is shown in (19).³⁹

(19) *Hierarchy of constraints on onset markedness*

*ONSA(pproximant) >> *ONSN(asal) >> *ONSO(bstruent)

³⁹ In Gouskova's (2003) terms, the harmonic scale associated with onsets would include $ONSO \succ ONSN \succ ONSA$, with the corresponding markedness hierarchy $*ONSA > *ONSN$, but no $*ONSO$. But because the results are the same, I retain Smith's hierarchy.

Because approximants are the most sonorous consonants, they are the least distinct from vowels and, therefore, the most marked of onsets. Obstruents, on the other hand, are the most distinct from vowels and so constitute the least marked onset type. When these markedness constraints are relativized to word-initial position (σ_{1W}), and ranked appropriately with IDENT[Manner], which requires faithfulness to the manner of the input segment, the result is a prohibition on word-initial approximants. The relevant rankings are shown for roots in (20) and for clitics in (21). For simplicity, I focus on the contrast between [r] and [t]. Recall that nasals are found in all environments, indicating that $*ONSN/\sigma_{1W}$ must rank below IDENT[Manner].

(20)

/raa/	$*ONSA/\sigma_{1W}$	IDENT[Manner]	$*ONSO/\sigma_{1W}$
☞ a. taa		*	*
b. raa	*!		
/taa/	$*ONSA/\sigma_{1W}$	IDENT[Manner]	$*ONSO/\sigma_{1W}$
☞ a. taa			*
b. raa	*!		

(21)

/-ra/	IDENT[Manner]	$*ONSA$	$*ONSO$
a. -ta	*!		*
☞ b. -ra		*	
/-ta/	IDENT[Manner]	$*ONSA$	$*ONSO$
☞ a. -ta			*
b. -ra	*!	*	

In (20), the contrast between initial [t] and initial [r] is neutralized in the direction of [t], because high-ranking $*ONSA/\sigma_{1W}$ penalizes candidates with initial approximants. This ranking accounts for loan adaptations like /jonap/ → [conap] ‘Jonas’ (see Chapter 3 for discussion). In (21), however, the contrast between [t] and [r] in clitics is maintained because IDENT[Manner] outranks the general form of

*ONSA. Position-specific restrictions on onset markedness can, therefore, succinctly capture the direction of neutralization in word-initial position. As has been noted elsewhere (e.g., Zoll 1998, Smith 2000, 2005, de Lacy 2001), this type of neutralization cannot be attributed to positional faithfulness, because contrast is lost in the stronger position. The result of this neutralization is an increase in the perceptual salience of word-initial onsets (see Smith 2005 for discussion).

Functionally, the markedness-reducing neutralization in initial position is clearly related to the markedness-increasing licensing of clicks in the same environment. Though rare cross-linguistically, clicks are very salient perceptually (Ladefoged and Traill 1994). If the goal of initial augmentation is increased salience, it is unsurprising that clicks occur in the same environment. Formally, however, we need a very different mechanism to account for their distribution. The relative markedness of clicks, demonstrated by their cross-linguistic rarity and phonotactic distributions in the languages that have them, presumably reflects the general markedness of complex segments. This is appropriately expressed with a context-free markedness constraint along the lines of that in (22).

(22) *COMPLEXSEG: Segments should not be complex.

In Khoekhoe, this general prohibition on complex segments is outranked by a positional constraint that requires faithfulness to complex segments in word-initial position. The rankings for a root and a hypothetical clitic onset are shown in (23).

(23)

/ʘaa/	IDENT[Complex]/σ _{1W}	*COMPLEXSEG	IDENT[Complex]
☞ a. ʘaa		*	
b. kaa	*!		
/taa-ʘa/	IDENT[Complex]/σ _{1W}	*COMPLEXSEG	IDENT[Complex]
a. taa-ʘa		*!	
☞ b. taa-ka			*

In (23), the root input surfaces with a click, while the hypothetical clitic input surfaces with a pulmonic stop. Together, then, positional markedness constraints on approximants and positional faithfulness constraints on clicks conspire to increase the perceptual prominence of word-initial position.

Finally, we come to the neutralization found in root-internal positions. Though clitics in Khoekhoe can begin with any pulmonic consonant, root-medial onsets are restricted to [β ɾ m n]. The neutralization of [t] and [ɾ] in this environment cannot, however, be the result of positional augmentation, because any ranking of faithfulness constraints and the onset markedness hierarchy in (19) that allows sonorant onsets must also allow obstruent onsets. This is demonstrated in (24). Violations incurred by the word-initial onset are ignored.

(24)

/ʘara/	IDENT[Manner]	*ONSA	*ONSO
a. ʘata	*!		*
☞ b. ʘara		*	
/ʘata/	IDENT[Manner]	*ONSA	*ONSO
⊖ a. ʘata			*
b. ʘara	*!	*	

In (24), the input with a medial sonorant produces the observed pattern, but the input with the medial obstruent does not, because the ranking cannot favor a sonorant

over an obstruent. Functionally, neutralization in root-internal position serves to signal morpho-prosodic constituency by minimizing the sonority difference between vowels and internal onsets (Miller-Ockhuizen 2003, Kingston 2008). This is exactly the opposite of neutralization in word-initial position, where a sonority decrease marks the edge of higher-level morpho-prosodic elements. These two types of neutralization must be driven by qualitatively different types of constraints, but in Optimality Theory, all neutralization must be driven by constraints on markedness. How can markedness constraints drive neutralizations in different directions?

Smith (2009) argues that the solution to this apparent conundrum depends crucially on the distinction between *positions* and *contexts*, and on recognizing that what qualifies as marked in a particular position might be unmarked in a given context. A segment's position is its place in the prosodic structure (e.g., onset, coda), while its context is defined by linear phonological order (e.g., VCV). The hierarchy in (19) is an example of a constraint that holds on onset position, without making reference to its context. Here, obstruents are less marked than sonorants. A contextual constraint, on the other hand, would be one that prohibited obstruents intervocalically, where sonorants would be less marked. Such a constraint can be motivated by the observation that lenition is common intervocalically (see e.g., Kirchner 1998, Lavoie 2001), and as Smith (2009) notes, lenition and sonority-increasing neutralization are formally identical in an Optimality Theory framework. Though the driving force behind lenition is often assumed to be articulatory (e.g., Kirchner 1998), Kingston (2008) makes the case that it should be regarded as a perceptually-motivated mechanism for marking prosodic domains. For our present purposes, it is sufficient to formulate the relevant constraint as in (25). See Kirchner (1998, 2004) and Smith (2009) for discussion of the phonetic bases of such a constraint.

(25) *VOV: No obstruents in intervocalic contexts.

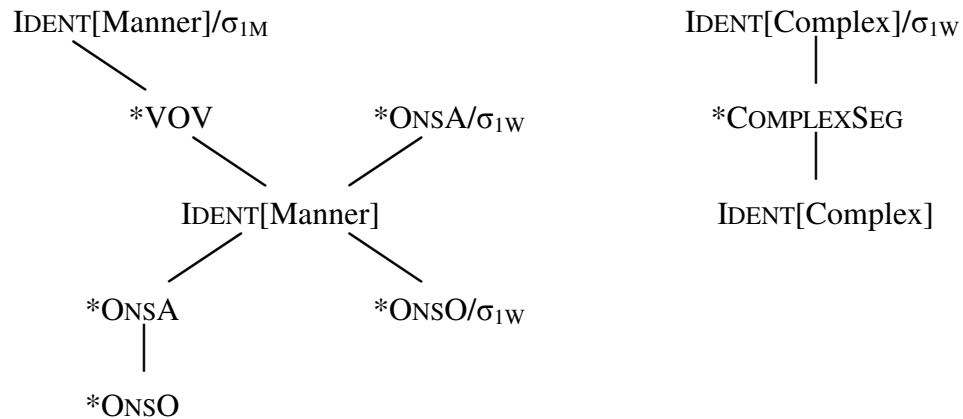
Clearly this constraint cannot affect obstruents in all positions, because most consonants in Khoekhoe connected speech are intervocalic (see Kingston 2008 for discussion intervocalic lenition at the phrase level). Rather, contrast is maintained in morpheme-initial position (σ_{1M}), but neutralized in the direction of increased sonority in morpheme-internal syllables. The relevant ranking is shown in (26).

(26)

/#ata/	IDENT[Manner]/ σ_{1M}	*VOV	IDENT[Manner]
a. #ata		*!	
☞ b. #ara			*
/#aa-ta/	IDENT[Manner]/ σ_{1M}	*VOV	IDENT[Manner]
☞ a. #aa-ta		*	
b. #aa-ra	*!		*

In root-medial position, violation of *VOV favors the candidate with the sonorant, but in clitics, the ranking of IDENT[Manner]/ σ_{1M} requires faithfulness to the input obstruent. So even though onset *position* favors segments with lower sonority, intervocalic *context* favors segments with greater sonority. By relativizing markedness and faithfulness constraints to the appropriate strong position, we capture the observed patterns in a straightforward manner. The relevant constraints are summarized in (27).

(27) *Constraints on Khoekhoe onsets*



This analysis is consistent with the observation that word-internal onsets in bisyllabic function words can be obstruents if and only if they are morpheme-initial. The need for such a distinction is demonstrated by morphologically complex pronouns and demonstrative adverbs, in which medial consonants pattern with clitics, not root-internal consonants. Examples of such words are listed in (28). Morpheme boundaries are indicated with “-”.

- | | | | | |
|------|------------------------------------|-----------------|------------------------------------|------------------|
| (28) | [ne-pa] | ‘here’ | [ne-ti] | ‘in this way’ |
| | [ne-tse] | ‘today’ | [ti-ta] | ‘I’ |
| | [si-k ^h əm] | ‘we (M.D.EXCL)’ | [si-se] | ‘we (F.PL.EXCL)’ |
| | [^h i ⁿ -ku] | ‘they (M.PL)’ | [^h i ⁿ -ra] | ‘they (F.D)’ |

I show in Chapter 6 that pronouns and demonstrative adverbs have the same syntactic distribution as roots and so should be treated as prosodic words. Since prosodic words must contain a foot and feet must be binary, the word-internal onsets in (28) must be in foot-medial position. Though there is a tendency for phonetic voicing in onsets of this type, there is no neutralization, which shows that constraints on root-internal segment distribution must make reference to morphological

information, not just prosodic structure. These data are problematic for attempts to capture phonotactic generalizations in strictly prosodic terms, because there is no obvious way to distinguish between the medial consonants in roots and those in pronouns/demonstrative adverbs without appealing to morphological constituents. But morphology alone is not enough, either. Recall that morphological affixes can be divided into those that pattern as roots and those that pattern as clitics, not just in Khoekhoe, but also in Lushootseed (Urbanczyk 2006), Navajo (Alderete 2003) and Kyirong Tibetan (Hall and Hildebrandt 2008).⁴⁰ Moreover, my category “clitic” is heterogeneous, including both suffixes and particles, the latter of which are morphologically independent of the grammatical words that precede them.

4.5 Summary

This chapter and the last have shown that roots are always exactly a foot, while suffixes are always a light syllable. Quantity constraints on roots arise because of the requirement that they serve as the head and only foot in a prosodic word, and feet are obligatorily bimoraic. Clitics, on the other hand, are monomoraic because they are unfooted, and heavy unfooted syllables are prohibited. Quantity, then, is a function of prosodic status, as is the ability to occupy clause-initial position.

Roots and clitics also pattern differently in terms of segment distribution. Root-initial position, which is also word-initial position, is subject to both sonority-decreasing neutralization and position-specific licensing of clicks, both of which serve to enhance the perceptual prominence of the word’s left edge. Root-medial position is subject to sonority-increasing neutralization, which signals morpho-prosodic constituency. In clitics, on the other hand, only the clicks are prohibited. One crucial

⁴⁰ Distinctions of this sort might explain why the survey in Bybee (2005) found so few cases of root/affix asymmetry. It is certainly a confound in her discussion of “!Kung” (i.e., Ju!’hoansi).

observation about segment distribution patterns across southern African Khoesan languages is that all positions are subject to some type of neutralization, so that there is no environment in which all segmental contrasts occur.

CHAPTER 5: LEXICAL TONE ON ROOTS AND CLITICS

5.0 Introduction

Like the majority of African languages, Khoekhoe distinguishes lexical items on the basis of tone. Its tone system, however, is typologically very different from those evoked by the term “African tone language”. Since the advent of autosegmental phonology (Goldsmith 1976), in which tones and segments are regarded as independent but associated phonological entities (see e.g., Odden 1995, Yip 2002 for discussion), African tone languages have come to be identified with mobile—that is floating, spreading and shifting—tones. Khoesan languages do pattern with other African languages in their use of abstract tone melodies that associate with words of different shapes and of contours that can be shown to consist of two level tones (Miller-Ockhuizen 1998, 2003, Nakagawa 2006), but no floating, spreading or shifting phenomena have yet been reported in any Khoesan language. Khoe languages do, however, exhibit a type of paradigmatic melody substitution that is typically associated with east Asian tone systems. Indeed, the two most striking features of Khoekhoe tone are the distinct inventories found in different prosodic contexts, and the paradigmatic replacement of melodies in prosodically and morpho-syntactically conditioned environments. This chapter will focus on the structures of the inventories and the nature of paradigmatic substitution. The environments in which substitutions occur will be addressed in Chapter 7.

The inventory of Khoekhoe tones has been described in slightly different ways in the three major works that deal with Khoekhoe lexical contrasts (Beach 1938, Hagman 1977, Haacke 1999a). While there is widespread agreement that roots of all three possible shapes (CVV, CVCV and CVN) can associate with any of six tonal

categories, previous analyses have differed in the number of tone levels they propose (three or four) and the nature of the melodies they assume (atomic contours or sequences of level tones). The first question to be addressed here is how best to characterize Khoekhoe tone. I argue that none of the previous accounts is entirely adequate, and I motivate an analysis that incorporates the best features of each.

In addition, I show that a full account of Khoekhoe tone must acknowledge the prosodic distinction between roots and clitics, as well as the distribution of citation and sandhi forms. The result is an analysis with three distinct inventories that occur in complementary distribution. Significantly, we also find a correlation between inventory markedness and prosodic prominence; root melodies that occur in phonological phrase-initial position are more marked typologically than those that occur phrase-internally, and both are more marked than the melodies that occur on clitics. This type of pattern is not confined to Khoesan languages (e.g., Yip 2002:189-194), but it parallels the prosodic constraints on segment distribution demonstrated in Chapters 3 and 4 in that marked structures highlight the left edges of morpho-prosodic constituents.

Finally, I turn to the patterns of melody replacement found in different morpho-prosodic contexts. Khoekhoe roots are subject to two orthogonal processes of paradigmatic substitution, which are referred to as “sandhi” and “flip-flop” (Haacke 1999a), and we also find morphologically-conditioned melody substitution on reduplicants. There has been considerable debate in the literature on southern Min languages as to whether sandhi rules of this type result from phonological rules/constraints that produce sandhi forms from citation inputs (e.g., Wang 1967, Yip 1980, Barrie 2006, Thomas 2008), or whether the pairings are simply listed in the lexicon and the alternation is a matter of positional allomorphy (e.g., Schuh 1978, Tsay and Myers 1996, Yip 2002, Myers 2006). I take this second position to be

most appropriate for the Khoekhoe data. Though some diachronic path must have led to the observed pairings, today they are simply an idiosyncratic, lexically-specified fact about the language.

Our first step in accounting for the nature and distribution of tone in Khoekhoe is to look at the inventory of tones found both on roots (section 5.1) and clitics (section 5.2). This is followed by consideration of the constraints necessary to generate the observed patterns (section 5.3). Finally, we look at the range of paradigmatic melody substitution found on Khoekhoe roots (section 5.4). Conclusions are summarized in section 5.5.

5.1 Root tone

We begin with an overview of the tone melodies that occur on roots. Section 5.1.1 covers the melodies that occur in citation contexts, while section 5.1.2 addresses the sandhi inventory. The phonological representations of these melodies are discussed in section 5.1.3, and the present analysis is compared with previous accounts in section 5.1.4.

5.1.1 Citation melodies

One way that Khoekhoe seems to pattern more like an “African” than an “Asian” tone language is in the free association of tone melodies with words of different shapes. I argued in Chapter 3 that mono- and bisyllabic roots pattern together in terms of quantity and segment distribution. This section will show that the same is true when it comes to tone. For clarity, my discussion distinguishes between *tone categories* or *classes*, which are made up of roots that pattern together in their tonal behavior, *tone melodies*, which are the contours associated with roots of a given category in a particular context, and *tones*, which are the elements tone melodies are made up of. For convenience, I often refer to tone categories in terms of their citation

melodies. Near-minimal pairs illustrating the citation tonal contrasts on CVV, CVCV and CVN roots are listed in (29).

(29)	SL:	[!àas] ‘servant’	[tsànas] ‘song’	[ʰ!àams] ‘blanket’
	L:	[àas] ‘tie’	[ʰ!ʔàrab] ‘aorta’	[ʰ!ʔàams] ‘bead’
	SL-L:	[ʰ!ààs] ‘story’	[tsàràb] ‘dust’	[ààs] ‘meat’
	H:	[!áas] ‘plain’	[sáras] ‘clothing’	[!áams] ‘two’
	SH:	[ʰ!áas] ‘tortoise’	[káras] ‘bead’	[sáams] ‘breast’
	H-SH:	[!ááb] ‘spittle’	[tárás] ‘woman’	[xááms] ‘lion’

As the transcriptions show, the four monotonal melodies associate with the first mora of the root, leaving the second mora unspecified, while the two tones in contour melodies associate with one mora each. Phonetic support for this analysis will be provided below. The important point for the present discussion is that each melody can associate with each type of root. The distribution of melodies in the corpus discussed in Chapter 3 is shown in Table 5.1.⁴¹

Table 5.1 Number of roots with each root shape in each tone category.

	SL	L	SL-L	H	SH	H-SH	
CVV	129	78	183	113	118	251	872/47%
CVCV	107	83	136	124	162	189	801/43%
CVN	30	19	27	34	40	46	196/10%
	266/14%	180/10%	346/19%	271/14%	320/17%	486/26%	1869

All melodies occur on all root shapes, but not all melodies have the same overall frequency. The H-SH category, for instance, is more than twice as common as L. There are also small differences in the frequencies with which root shapes and tone

⁴¹ The count excludes 23 words from the corpus that are listed in Haacke and Eiseb (2002) with exceptional melodies, but are otherwise well-formed roots.

melodies associate. We see this more clearly when we look at the percentage of roots in each tone category with a particular shape, as in Table 5.2.

Table 5.2 Percentage of roots with each root shape in each tone category.

	SL	L	SL-L	H	SH	H-SH
CVV	49%	43%	53%	42%	37%	52%
CVCV	40%	46%	39%	46%	50%	39%
CVN	11%	11%	8%	12%	13%	9%
	100%	100%	100%	100%	100%	100%

There is a slight tendency for rising melodies to associate more frequently with CVV shapes, and for L, H and SH melodies to associate with CVCV shapes, but the differences are not large and I will not attempt to account for them here.

Significantly, fundamental frequency (F0) traces on roots with a given melody are essentially the same across roots of different shapes. This is demonstrated for CVV, CVCV and CVN roots with the SH melody in Figure 5.1 and for roots with the H-SH melody in Figure 5.2.

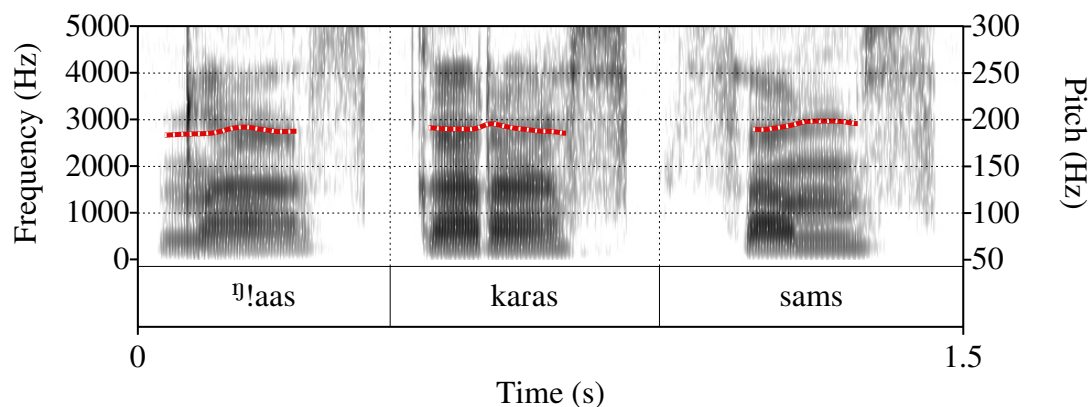


Figure 5.1 Spectrogram and F0 traces of the SH words: [ʰ!ãas] ‘tortoise’, [kãras] ‘bead’ and [sãms] ‘breast’. Extracted from the sentence *___ xa ta ra ði.* ‘I am thinking about ____.’ (Speaker M3).

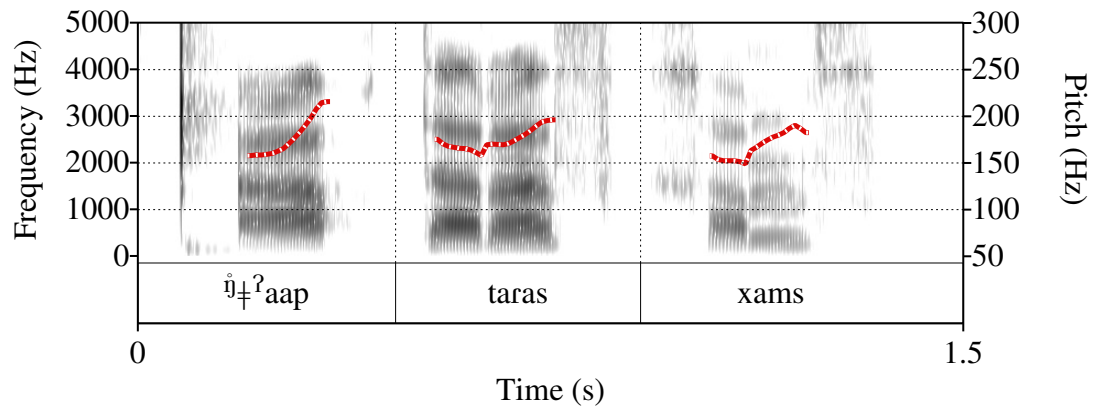


Figure 5.2 Spectrogram and F0 traces of the H-SH words: [ʔɪʔááp] ‘spittle’, [tárás] ‘woman’ and [xáám] ‘lion’. Extracted from the sentence *__ xa ta ra ʔâi*. ‘I am thinking about ____.’ (Speaker M3).

These examples support the argument that roots constitute a coherent class for the distribution of tone, just as they do in matters of segment distribution and morpheme quantity. Average F0 traces for CVV roots with all six citation melodies produced by a single speaker are shown together in Figure 5.3.

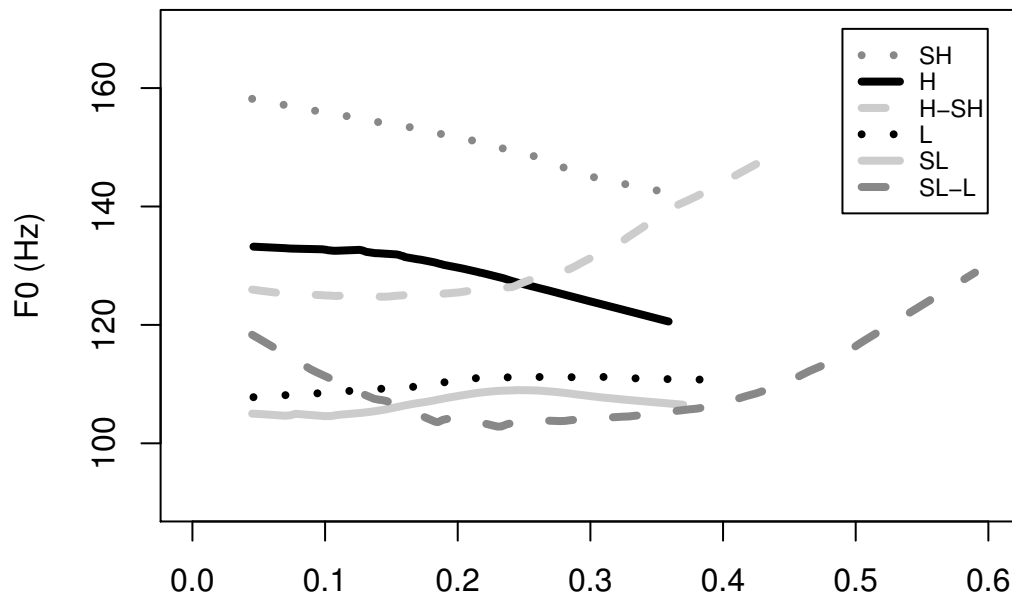


Figure 5.3 Average F0 traces of the words: [ʔää] ‘chicken breast’, [ʔää] ‘necktie’, [kää] ‘to lie’, [!ää] ‘poison’, [pää] ‘to cook porridge’ and [!ää] ‘awaken’. Words recorded in isolation. (Speaker M1, n=8).

These representative F0 contours are consistent with the analysis of four level (SL, L, H, SH) and two rising (SL-L, H-SH) tone melodies, but there are several details that require comment. First of all, though the rising melodies rise consistently in these tokens, the “level” melodies are hardly static. Both SH and H fall significantly through the course of their production, while the SL melody rises slightly. Such realizations are common, and this has led previous researchers to conclude that all Khoekhoe melodies must be phonological contours. It is not, however, the case that perfectly level realizations are either unacceptable or uncommon, and it is significant that F0 movement is always towards the center of the pitch range. I argue in section 5.1.2 that it is most appropriate to attribute this to the phonetic implementation of a mora that is unspecified for tone.

One issue raised by this plot is whether the L and SL melodies are truly distinct. The acoustic distance between them is quite small, and individual tokens are often very close together, sometimes overlapping. It should be noted, however, that the two *categories* are clearly distinguished by their behavior in the tone sandhi and flip-flop environments discussed below. Moreover, Khoekhoe speakers can and do distinguish the two levels when necessary in careful speech. Since we must differentiate them, and since average F0 is always in the same direction, I argue it is appropriate to characterize the melodies as SL and L.

This similarity in the phonetic realization of SL and L melodies may, however, reflect their near-complementary distribution in many segmental contexts and the consequently low functional load of F0 differences between them. As Haacke (1999a, 1999b) notes, this contrast seems to have arisen diachronically from a phonation-related split. Though the distribution is no longer quite complementary, there is a high degree of correlation, as shown in Table 5.3. Shaded cells indicate combinations with particularly low counts.

Table 5.3 Distribution of tones with respect to onsets (K=pulmonic stops and fricatives, KX=pulmonic affricates, H=[h], ʔ=[ʔ], N=[m n], !=all click types).

	SL	L	SL-L	H	SH	H-SH	
K	29	26	55	41	45	78	274
KX	28	0	25	0	21	18	92
H	9	0	10	1	5	7	32
ʔ	4	11	12	22	11	20	80
N	8	3	5	3	9	11	39
!	51	24	63	52	43	64	297
ᵀχ	1	55	10	65	46	75	252
ᵀʔ	1	56	22	65	41	86	271
ᵀʰ	76	2	84	5	56	64	287
ᵀ!	59	3	60	17	43	63	245
	266	180	346	271	320	486	1869

Though the SL and L melodies do contrast robustly after pulmonic stops, fricatives and plain clicks, there is near-complementary distribution after pulmonic and lingual affricates, the glottal fricative, nasal clicks and clicks with glottal or nasal aspirated phonation. One interesting pattern in these data is that the categories KX, H, ᵀ! and ᵀʰ constitute a natural class with respect to tone distribution, in opposition to ᵀχ and ᵀʔ. This suggests that the pulmonic affricates, but not the lingual affricates, may have been aspirates at the time of the tone split. Synchronically, however, I argue that both are more consistently affricated than aspirated.

The relatively low functional load of the contrast between the SL and L melodies is not actually surprising. The large segment inventories found in Khoesan languages means that the functional load of any individual contrast is typically fairly low. Khoekhoe roots begin with one of 31 possible onsets that are followed by one of 32 possible VV, VN and VCV sequences. If we assume no co-occurrence restrictions, this yields a theoretical total of 992 possible word shapes, even without tonal contrasts; adding tone brings this number to 5952. The functional load of tone in

actual speech is decreased even more by the fact that nouns obligatorily take PGN markers, which means there is little potential for confusing nouns and verbs. This situation contrasts with Mandarin, in which there are 406 different syllable/morpheme types, and the addition of tone only raises the number of possible morphemes to 1256 (Yip 2002:172). Though the high degree of feature economy inherent in Khoesan systems could mitigate the low functional load of individual phonemes, it is important to keep in mind that the range of consonantal, vocalic and tonal contrasts available in Khoesan languages means that minimal pairs can be hard to find, and true minimal sets are usually impossible to construct.

A challenge for my analysis is the realization of the SL-L melody. The tokens used for Figure 5.3 all rose significantly, but this is not always the case. While the H-SH melody tends to rise early and dramatically, and is realized consistently across speakers, contexts and repetitions, the low rising melody usually rises only at the very end, and then by a much smaller amount. In fact, this melody often fails to rise at all, and some tokens make it tempting to argue that the SL-L category is really a fifth level tone. But F0 in SL-L melodies does rise at least some of the time. Variation in tokens recorded with a single speaker in a single recording session are shown in Figure 5.4.

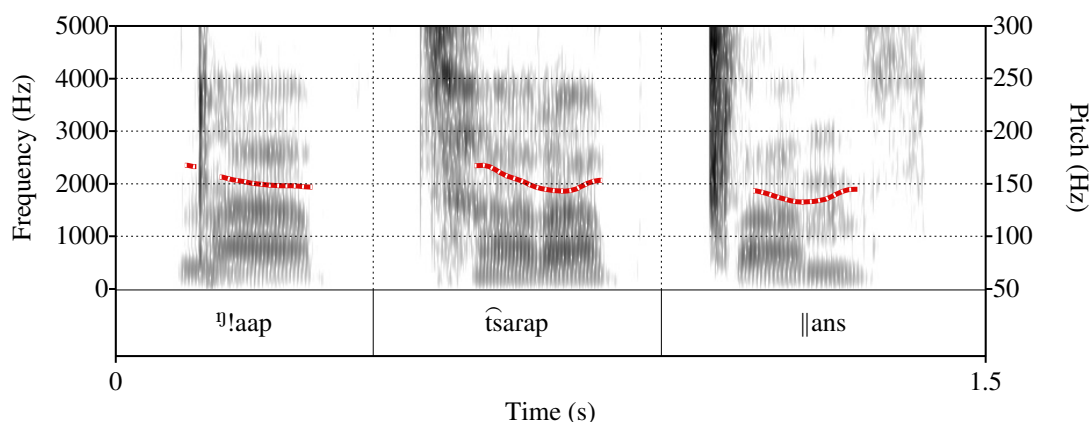


Figure 5.4 Spectrogram and F0 traces of the SL-L words: [ʔ!ààp] ‘belly’, [tsàràp] ‘dust’ and [||àns] ‘meat’. Extracted from the frame sentence *__ xa ta ra #âi* ‘I am thinking about ____.’ (Speaker M3).

In these tokens, F0 fails to rise in [ʰ!ààp], rises somewhat in [tsàràp] and rises more noticeably in [ʰ!àns]. One consistent difference between the SL-L and SL melodies is that F0 in SL-L roots falls to a very low level at the beginning of the word and rises from there. I argue that this melody should be regarded phonologically as SL-L with the caveat that the rise is often delayed so long that the target is not reached until the (typically voiceless) onset of the next syllable. The rise is realized most consistently in the absence of an obstruent PGN marker, and when the root is followed by a nasal-initial morpheme, as in Figure 5.5.

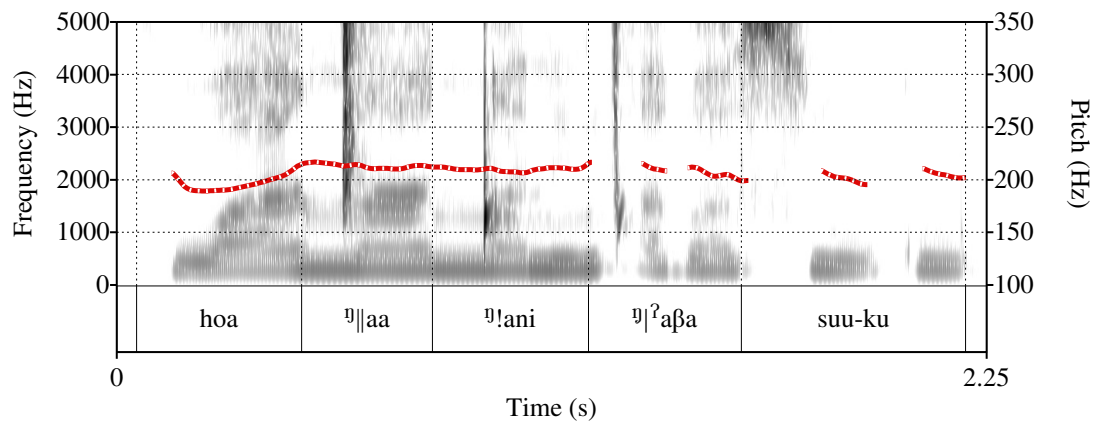


Figure 5.5 Spectrogram and F0 trace of the phrase [hòà ʰ!àa ʰ!àni ʰ!ʔàβa sùu-kù] ‘all those six red pots (M.PL)’. (Speaker F2).

In cases like this, the initial fall and subsequent rise are quite apparent. Note that the analysis of this melody as a rise is also consistent with all previous descriptions of this category (Beach 1938, Hagman 1977, Haacke 1999a). The timing difference between the high- and low-rising melodies is simply a matter of language-specific phonetic implementation, the details of which are an important matter for future research.

Now that we have established the inventory found on roots in citation environments, we turn to their sandhi counterparts.

5.1.2 Sandhi melodies

When we look only at the citation inventory, the Khoekhoe case does not seem so different from many African tone languages. Though it lacks mobile tones, there are tone classes in which the same melody applies to words with different numbers of syllables, in direct parallel with Leben's (1973) analysis of Mende. This is a classic attribute of "African" tone systems. When, however, we turn to the sandhi process identified by Haacke (1999a), we see very "un-African" patterns. The distribution of these sandhi melodies will be explored in detail in Chapter 7, but I anticipate that discussion by noting that citation melodies occur at the left edge of a phonological phrase, while sandhi melodies are found elsewhere.

In order to demonstrate the relationship between citation and sandhi melodies, disyllabic nouns from all six tone classes were recorded in four frame sentences: one in which the noun was unmodified, one in which it was preceded by [nèe] 'that', one in which it was preceded by [láⁿiⁿ] 'good', and one in which it was preceded by [ká*i*] 'big'. Unmodified nouns appear in citation form, while modified nouns take sandhi form. For clarity, F0 traces in this section have been plotted so that the onset of a given word occurs at the same time in each trace. This was done by plotting each word separately. Durations of individual words are unaltered.

We look first at [tsàmas] 'tsama melon', a word with the SL melody, shown in Figure 5.6. Here we see that the citation and sandhi forms are, indeed, different, and that the sandhi melody is identical with all three modifiers. That is, the melody on the modifier is irrelevant; all that matters is that the noun is preceded by another word. The citation form is basically level, while the sandhi form falls in the lower part of the speaker's range. I argue that the fall should be analyzed as L-SL.

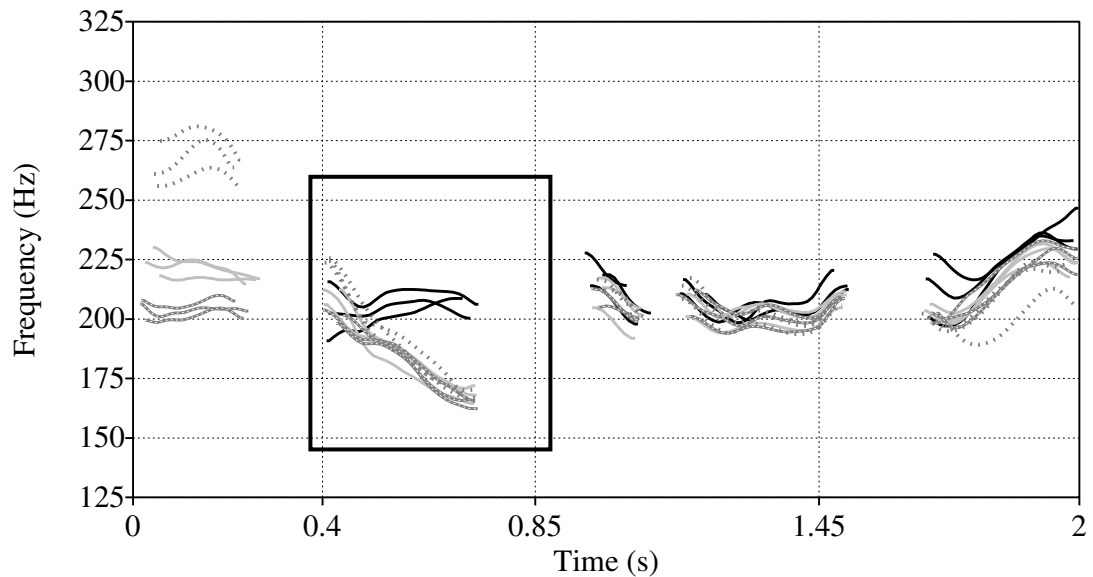


Figure 5.6 F0 traces for the noun [tsàmas]/[tsàmäs] ‘tsama melon’ unmodified (black) and preceded by [nèe] ‘that’ (speckled grey/white), [!áːiⁿ] ‘good’ (solid silver) and [káï] ‘big’ (dotted grey) in the frame sentence ____ *xa ta ra #âi*. ‘I’m thinking about the ____.’ (Speaker F2).

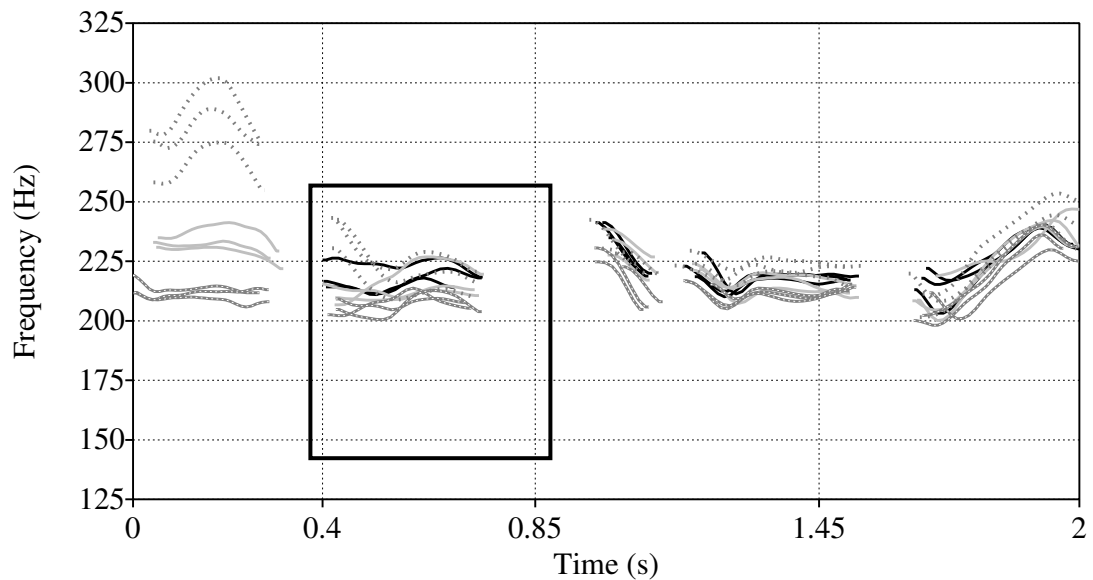


Figure 5.7 F0 traces for the noun [!ʰ!ʰàrap]/[!ʰ!ʰàrap] ‘aorta’ unmodified (black) and preceded by [nèe] ‘that’ (speckled grey/white), [!áːiⁿ] ‘good’ (solid silver) and [káï] ‘big’ (dotted grey) in the frame sentence ____ *xa ta ra #âi*. ‘I’m thinking about the ____.’ (Speaker F2).

We turn next to [ʔ̚ʔ̚arab] ‘aorta’, a word with a low level (L) melody.⁴² This is shown in Figure 5.7. Apart from some minor coarticulation with the SH modifier, F0 on the bare and modified nouns is the same. That is, L roots differ from SL roots in that their citation and sandhi forms are identical. The same is true of the low rising melody shown in Figure 5.8.

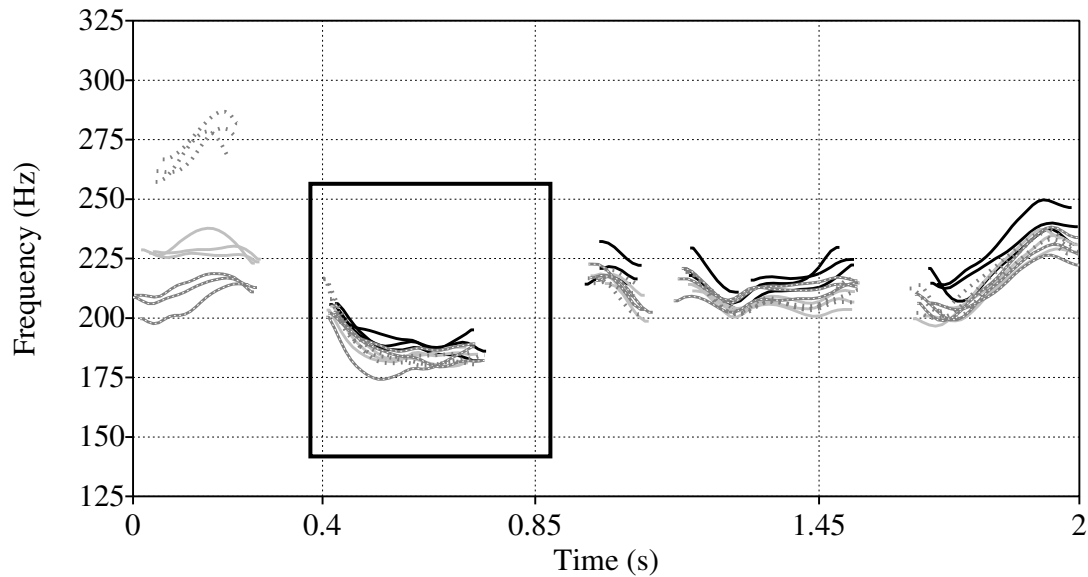


Figure 5.8 F0 traces for the noun [tànàp]/[tànàp] ‘leader’ unmodified (black) and preceded by [nèe] ‘that’ (speckled grey/white), [!á'ni] ‘good’ (solid silver) and [kái] ‘big’ (dotted grey) in the frame sentence ___ *xa ta ra #âi*. ‘I’m thinking about the ___.’ (Speaker F2).

Although F0 does not rise significantly in these tokens, it is clear that the citation and sandhi forms are again identical. As discussed above, the sharp fall at the very beginning of SL-L roots is characteristic of this melody, but it is crucially different from the sandhi L-SL melody in that it does not extend over the whole root. Rather, the fall is necessary to reach the very low F0 from which low rises begin.

⁴² There were no semantically appropriate roots with a voiceless unaspirated onset. I assume that the glottal closure has a minimal effect on F0 after the first few milliseconds.

Turning to the higher melodies, we find that the high level melody (H), exemplified by [sáras] ‘clothing’ in Figure 5.9, changes significantly in sandhi environments. Though the citation form is high and essentially level, the sandhi melody falls dramatically in the low part of the speaker’s range, just like the sandhi form of the SL melody shown in Figure 5.6. This is, in fact, one of two neutralizations found in sandhi contexts.

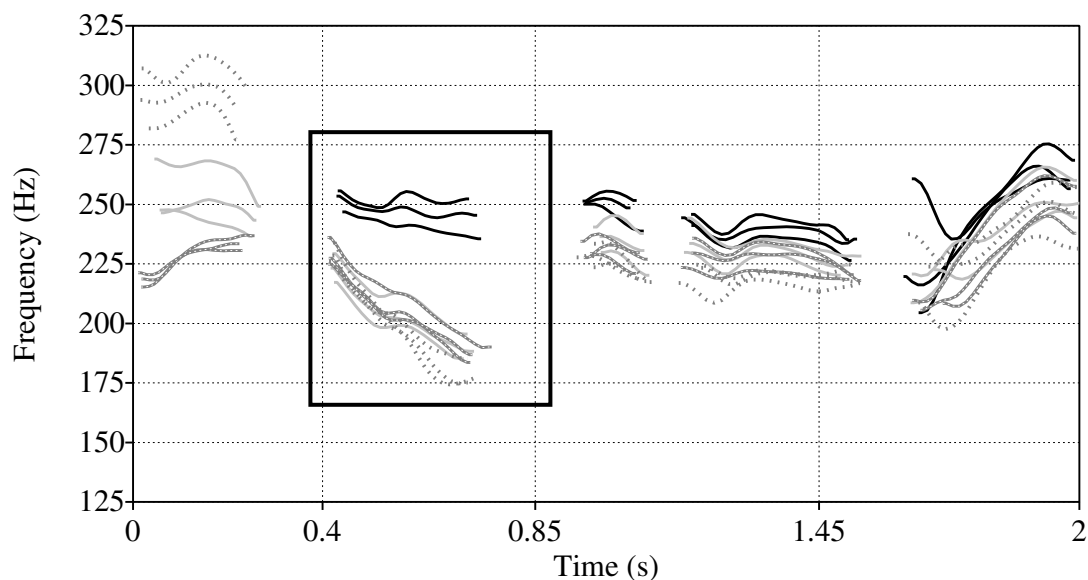


Figure 5.9 F0 traces for the noun [sáras]/[sàràs] ‘clothing’ unmodified (black) and preceded by [nèe] ‘that’ (speckled grey/white), [!á'ni] ‘good’ (solid silver) and [kái] ‘big’ (dotted grey) in the frame sentence ___ xa ta ra #âi. ‘I’m thinking about the ___.’ (Speaker F2).

The final level melody is SH, illustrated by [káras] ‘bead’ in Figure 5.10. Here, both melodies are level, but the sandhi form is significantly lower than its citation counterpart. Phonologically, I argue that this melody is always H, but that the F0 at which it is realized depends in part on the tone that precedes it. This seems to reflect a more general tendency for the initial element in a domain to influence its pitch range. Significantly, there is always a clear auditory difference between this category and the low level melody, indicating that there is no neutralization.

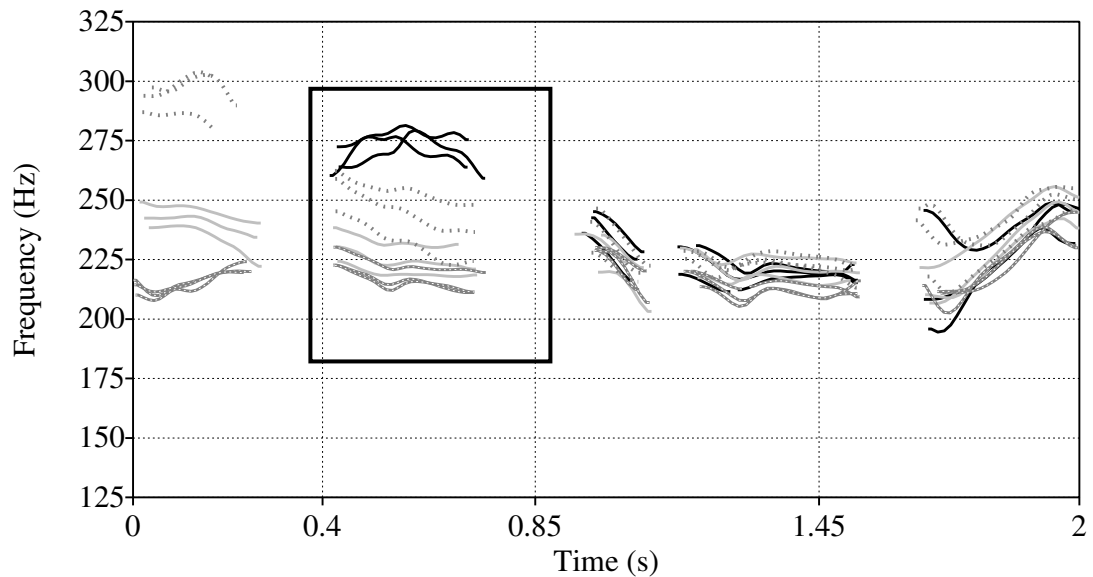


Figure 5.10 F0 traces for the noun [káras]/[kárás] ‘bead’ unmodified (black) and preceded by [nèe] ‘that’ (speckled grey/white), [!áni] ‘good’ (solid silver) and [káii] ‘big’ (dotted grey) in the frame sentence ___ xa ta ra #âi. ‘I’m thinking about the ___.’ (Speaker F2).

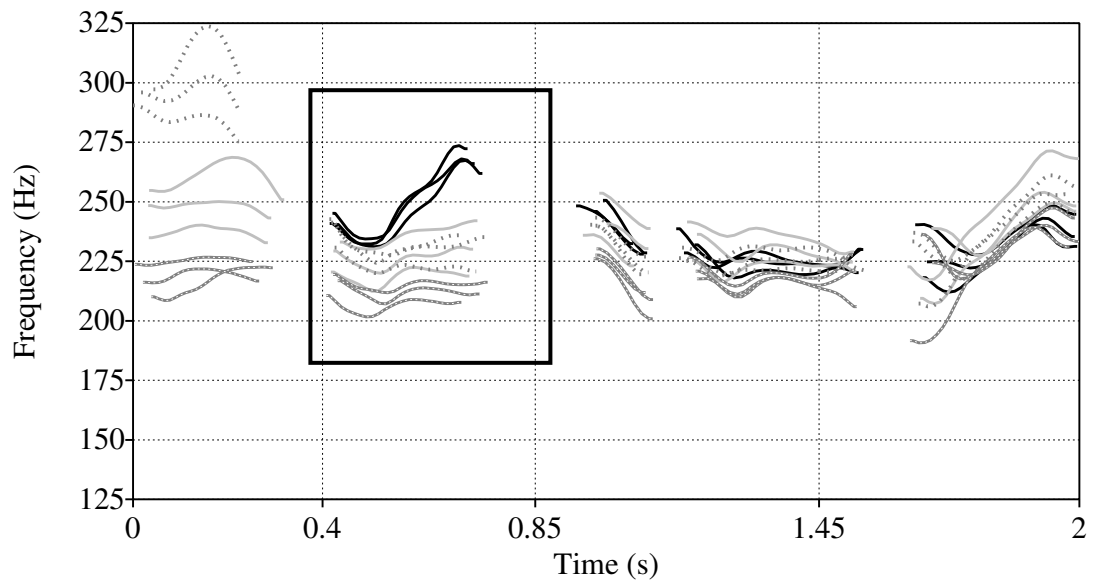


Figure 5.11 F0 traces for the noun [tárás]/[tàras] ‘leader’ unmodified (black) and preceded by [nèe] ‘that’ (speckled grey/white), [!áni] ‘good’ (solid silver) and [káii] ‘big’ (dotted grey) in the frame sentence ___ xa ta ra #âi. ‘I’m thinking about the ___.’ (Speaker F2).

Finally, we come to the high rising melody, illustrated in Figure 5.11 for the root [tárás] ‘woman’. Words of this class tend to have the most consistently dramatic difference between their citation and sandhi forms. The citation rise is usually quite pronounced, while the sandhi melody is low and distinctly level. In fact, there is neutralization between the H-SH and L categories in sandhi environments. Because the difference between citation and sandhi melodies is so clear and because roughly a quarter of roots belong to this class, I typically use H-SH roots to illustrate the difference between citation and sandhi contexts, but it is important to remember that roots from other categories also take sandhi forms in these environments.

The relationship between melodies is summarized in (30), along with examples of the transcription conventions I have adopted to represent them, and the citation and sandhi melodies from the above examples are summarized in Figure 5.12 (level melodies) and Figure 5.13 (rising melodies plus L). Taken together these plots show the clear difference between the melodies found in citation and sandhi contexts.

(30)

Citation	Sandhi
SL-L (‡ää)	SL-L (‡ää)
SL (‡ää)	L-SL (‡ää)
H (‡áa)	
L (‡ää)	L (‡ää)
H-SH (‡áá)	
SH (‡áa)	H (‡áa)

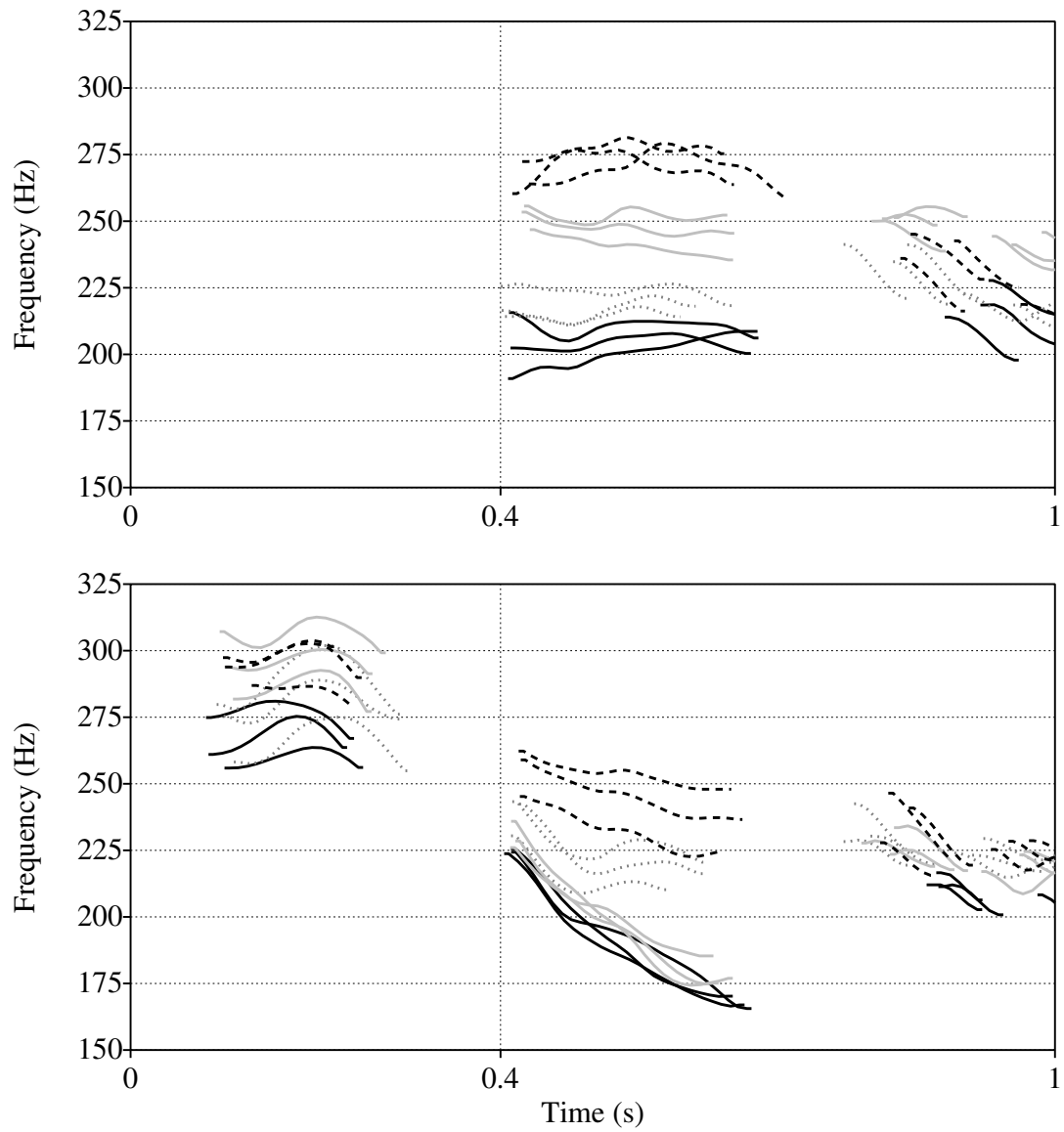


Figure 5.12 F0 traces for citation (top, unmodified) and sandhi (bottom, modified by [káí] ‘big’) melodies on the words: [tsàmas] ‘tsama melon’ (solid black), [ʔàrab] ‘aorta’ (dotted grey), [sáras] ‘clothing’ (solid silver) and [káras] ‘bead’ (dashed black). (Speaker F2).

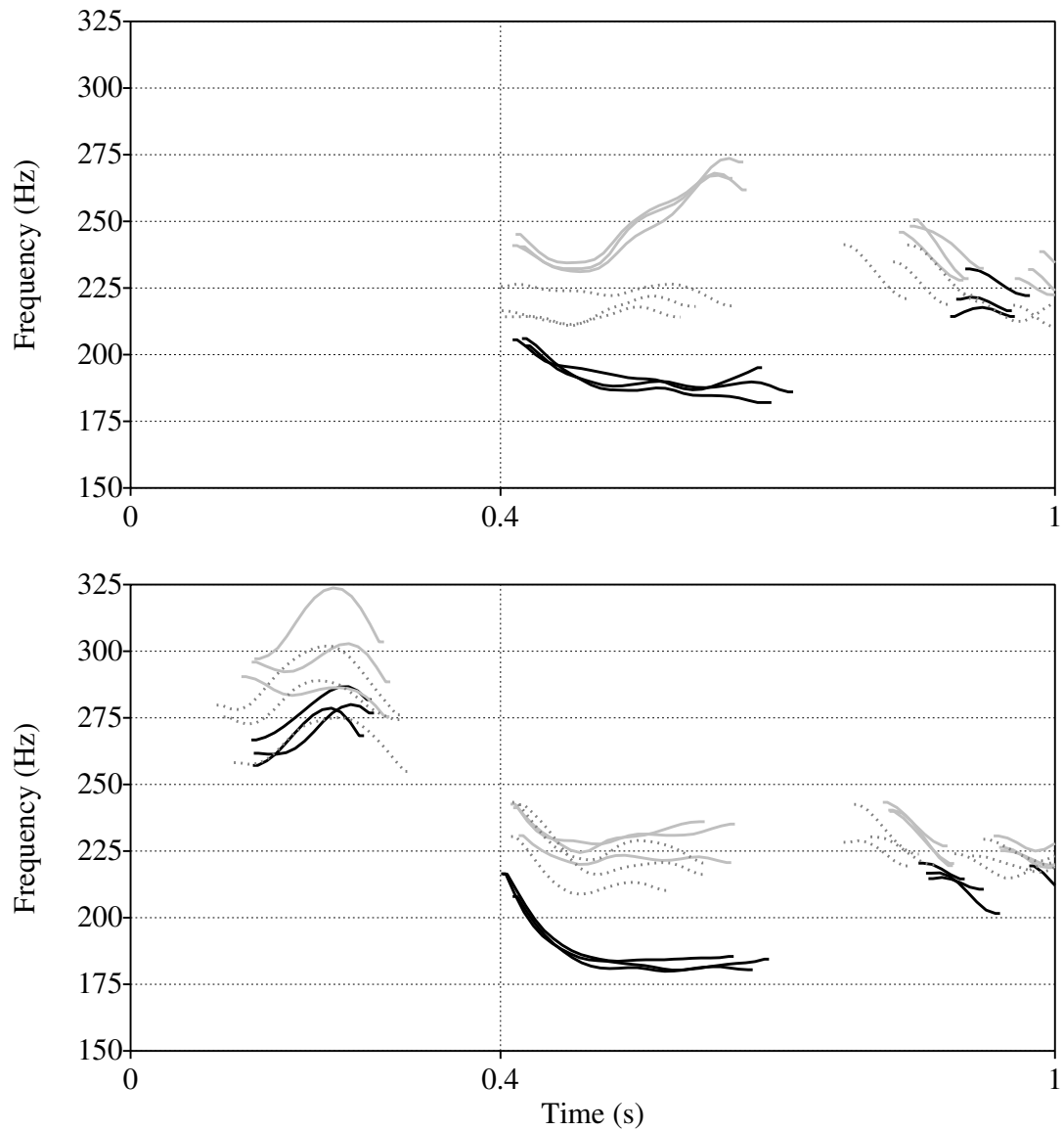


Figure 5.13 F0 traces for citation (top, unmodified) and sandhi (bottom, modified by [kái] ‘big’) melodies on the words: [tànàb] ‘leader’ (solid black), [ʔàrab] ‘aorta’ (dotted grey) and [tárás] ‘woman’ (solid silver). (Speaker F2).

Now that we have established the inventories in both citation and sandhi contexts, we turn to the question of how these melodies are represented in the phonology.

5.1.3 Tone representation

The Khoekhoe tone system, though richer than those found in many African languages, falls well within the range of cross-linguistic variation. Indeed, the analysis proposed here, with four tone levels, is easily captured with the model motivated by Yip (1989), which distinguishes between an upper and lower register (represented here with *H* and *L*), each of which has a high and low tone (represented with *h* and *l*). That is, registers associate with tone bearing units (TBUs) and tones associate with registers to produce four distinct levels. If we temporarily set aside the question of the TBU, the level citation melodies can be represented as in (31).

(31)	a. SL = [ɬǎa]	b. L = [ɬǎa]	c. H = [ɬáa]	d. SH = [ɬǎa]
	<i>L</i>	<i>L</i>	<i>H</i>	<i>H</i>
	<i>l</i>	<i>h</i>	<i>l</i>	<i>h</i>

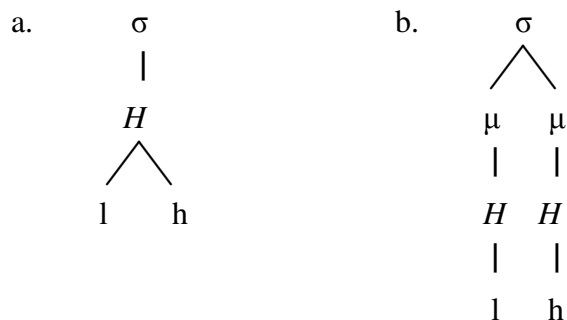
This distinction between *H* and *L* registers may not be strictly necessary for the analysis of Khoekhoe, but it is motivated by patterns in other languages and has useful consequences for the discussion of inventory markedness in section 5.3. Though this is not the only representation that fits the Khoekhoe data (see e.g., the more powerful model in Bao 1990, 1999), it is explicit and sufficient for my purposes, so I adopt it here without modification.

Yip’s representations easily account for the four level melodies, but the proper analysis of contours is a complex issue that has long been a matter of debate in the phonological literature. The crucial question is whether contours are independent units that are defined by a pitch “glide” (i.e., a rise or a fall), or whether they made up of constituents (tones) that define the contour’s endpoints, with the transition from one to

the other a matter of interpolation. Contours of this second type are clearly attested in African languages, and it has been argued that this approach serves for east Asian languages, as well (e.g., Duanmu 1994). Others, however, maintain that languages differ parametrically in the nature of their contours, and that our representations should reflect these differences (e.g., Pike 1948, Wang 1967, Yip 1989, Bao 1990, 1999, Barrie 2007).

Assuming the representations in (31), the question can be framed for Khoekhoe as a choice between treating contours as a single unit that takes the syllable as its tone bearing unit (TBU), as in (32)(a), or as a sequence of two tones linked to separate moras, as in (32)(b).

(32) *Possible representations for contours*

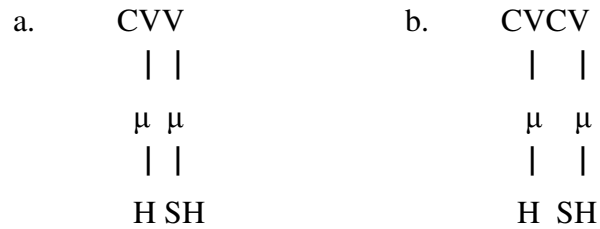


On the one hand, the representation in (32)(a) has the advantage of naturally limiting the number of possible contours to four—two rises and two falls—and this seems to be appropriate for Khoekhoe, which has a citation inventory with two rises and a sandhi inventory with one rise and one fall. Logically, a system with four tones should be able to generate four level melodies and twelve contour melodies, yet most languages have fewer contours than are logically possible, and the structure in (32)(a) provides a principled way of ruling them out (see Yip 2002 for discussion).

That said, (32)(a) is highly problematic for Khoekhoe when we remember that the same melodies appear on both mono- and bisyllabic roots. If the contour is a unit, how do we explain the fact that it can be realized on distinct syllables? It might be possible to salvage the contour-as-unit analysis by assuming that a higher level of prosodic structure, like the foot or the prosodic word, is the tone-bearing unit, but this would introduce undesirable complications when we try to account for clitic tone, because clitics are always unfooted monosyllables, some of which are arguably outside the prosodic word. An even greater problem is the observation that rising melodies (but not falling melodies) are restricted to bimoraic morphemes (i.e., roots). This suggests that mora count is relevant in licensing rising melodies, which can be explained most directly with representation in (32)(b). Given these considerations, I assume that the mora is, in fact, the tone bearing unit in Khoekhoe and that the representation in (32)(b) is the appropriate way to analyze Khoekhoe contours. Similar analyses of contour melodies have previously been proposed for Khoekhoe (Hagman 1977, Haacke 1999a), !Xóõ (Miller-Ockhuizen 1998), Ju|'hoansi (1998, Miller-Ockhuizen 2003) and |Gui (Nakagawa 2006).

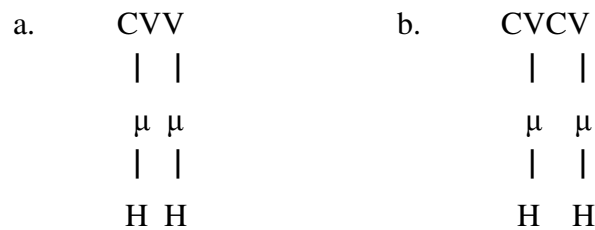
The mapping of contours to roots of different shapes is straightforward, as illustrated in (33), but the structure in (32)(b) does raise the question of how level melodies should be represented. For the remainder of this section, I use H as a stand-in for any level melody, H-SH for any contour, and CVV for all monosyllabic roots. For clarity, I use the cover symbols H and SH rather than the more detailed representations in (31).

(33) *Contour melodies*

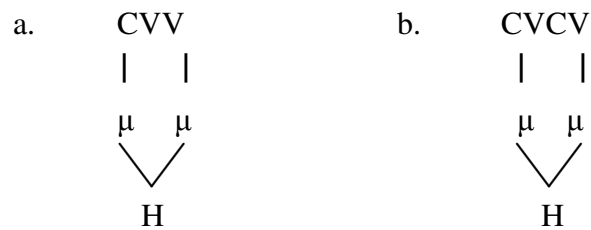


In contour melodies, there is a one-to-one mapping of moras to tones that is appropriate for either mono- or bisyllabic roots, but with level melodies, we are faced with three logical possibilities, shown in (34), (35) and (36).

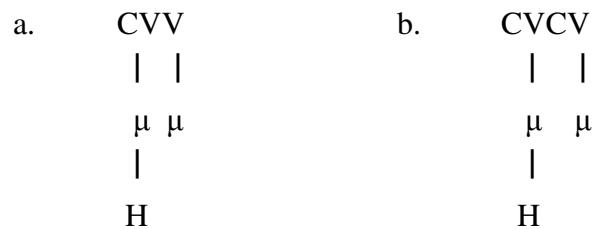
(34) *Level melody option 1: Two tones*



(35) *Level melody option 2: Double-linking*



(36) *Level melody option 3: Underspecification*



Each of these representations violates some type of constraint on output well-formedness. The structure in (34) is a violation of the Obligatory Contour Principle (Leben 1973), while the structure in (35) has a doubly-linked tone and the structure in (36) has an unspecified mora. While each of these representations has been argued for in the literature, each can also be shown to be an unacceptable surface representation in some language (see e.g., Chapter 4 of Yip 2002 for formal constraints). The question here is which structure best fits the Khoekhoe data. I argue that the representation in (36), in which the second mora of a root can be unspecified for tone, is most consistent with the phonetic realization of Khoekhoe tone melodies.

As mentioned above (see also section 5.1.4), previous analyses of Khoekhoe tone have all recognized a tendency for F0 in level melodies to move toward the middle of the pitch range at the end of a root. Beach (1938), for example, took this as evidence that Khoekhoe should be regarded as a Chinese-style tone language with atomic tone contours, while Haacke (1999a) treats the melodies I analyze as level as bitonal contours (i.e., SH-H, H-L, L-L and SL-L). But in my recordings, this tendency to fall is highly variable. Roots uttered in isolation or in careful speech are often realized with completely level F0. I argue that this variability is most appropriately attributed to phonetic implementation, rather than phonological structure.

Differences in the implementation of level and rising melodies can be seen most clearly when we look at affixed forms. For instance, nouns marked with the third person, common gender PGN marker [-n̂], which takes a falling melody (see section 5.2), show that contour melodies behave very differently than their level counterparts. Examples of the H-SH melody are shown in Figure 5.14 and examples of the SH melody are shown in Figure 5.15.

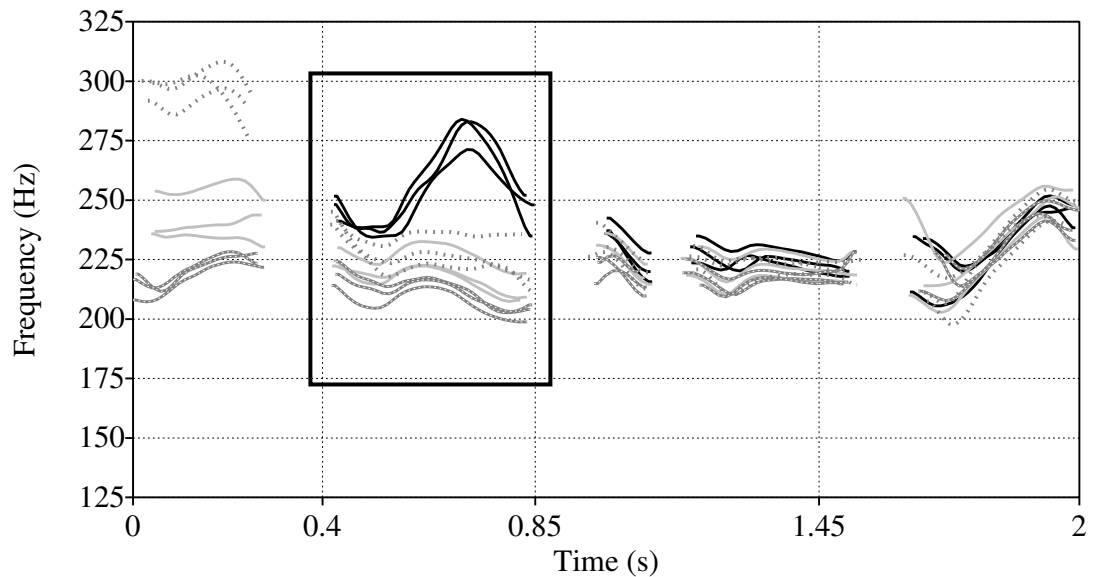


Figure 5.14 F0 traces for the noun [táraân]/[târaân] ‘women’ unmodified (black) and preceded by [nèe] ‘that’ (speckled grey/white), [!á'ni] ‘good’ (solid silver) and [kái] ‘big’ (dotted grey) in the frame sentence ___ *xa ta ra #âi*. ‘I’m thinking about the ___.’ (Speaker F2).

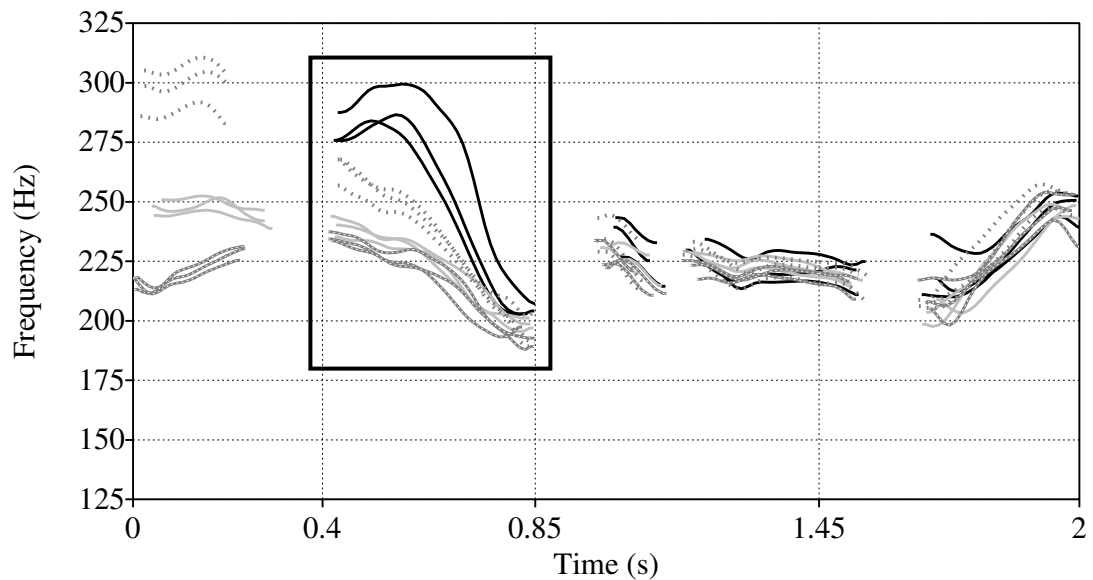


Figure 5.15 F0 traces for the noun [káraân]/[kâraân] ‘bead’ unmodified (black) and preceded by [nèe] ‘that’ (speckled grey/white), [!á'ni] ‘good’ (solid silver) and [kái] ‘big’ (dotted grey) in the frame sentence ___ *xa ta ra #âi*. ‘I’m thinking about the ___.’ (Speaker F2).

On the H-SH root, F0 rises sharply on the second syllable, and then falls again on the [h̃], suggesting that both root moras are specified for tone. F0 for the SH melody, on the other hand, begins to fall in the middle of the root, just after the onset of the second syllable (visible in the pitch track as a v-shaped disruption). We see similar patterns with the other level melodies, as shown in Figure 5.16 for the SL melody, Figure 5.17 for the L melody and Figure 5.18 for the H melody. Though falls are somewhat less likely on the second syllables of SL and L roots than on their H and SH counterparts, this can be attributed to the fact that F0 on SL and L roots starts off closer to that of the PGN target. The most interesting observation is that F0 on L-SL sandhi forms falls continuously across the root and PGN marker until it reaches the bottom of the speaker's range. This is, however, a reasonable phonetic realization of successive phonological falls in the same grammatical word.

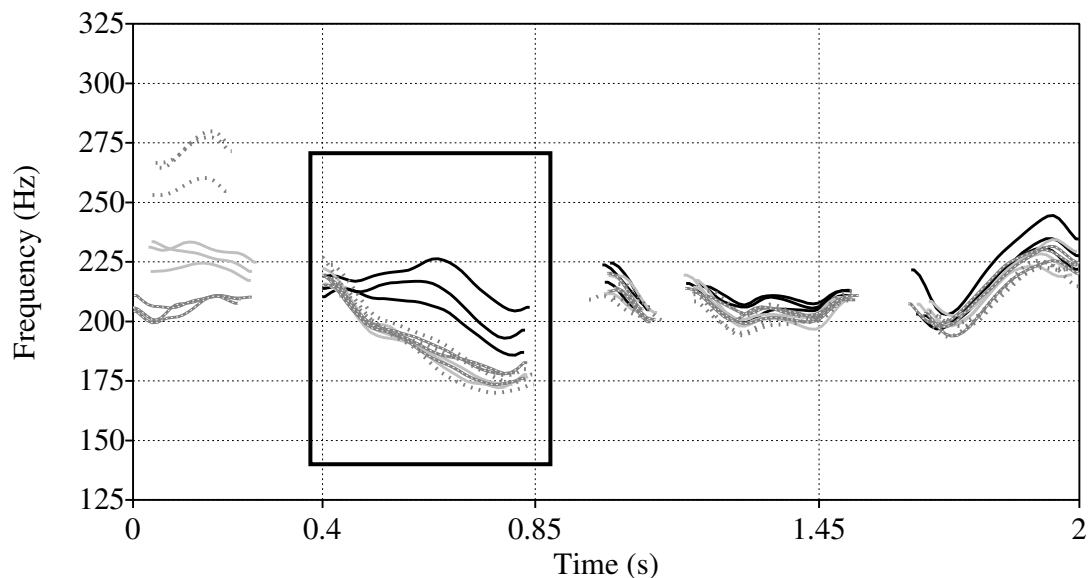


Figure 5.16 F0 traces for the noun [tsãmañ]/[tsãmâ] ‘tsama melons’ unmodified (black) and preceded by [nèe] ‘that’ (speckled grey/white), [!á'íñ] ‘good’ (solid silver) and [káí] ‘big’ (dotted grey) in the frame sentence ____ *xa ta ra #âi*. ‘I’m thinking about the ____.’ (Speaker F2).

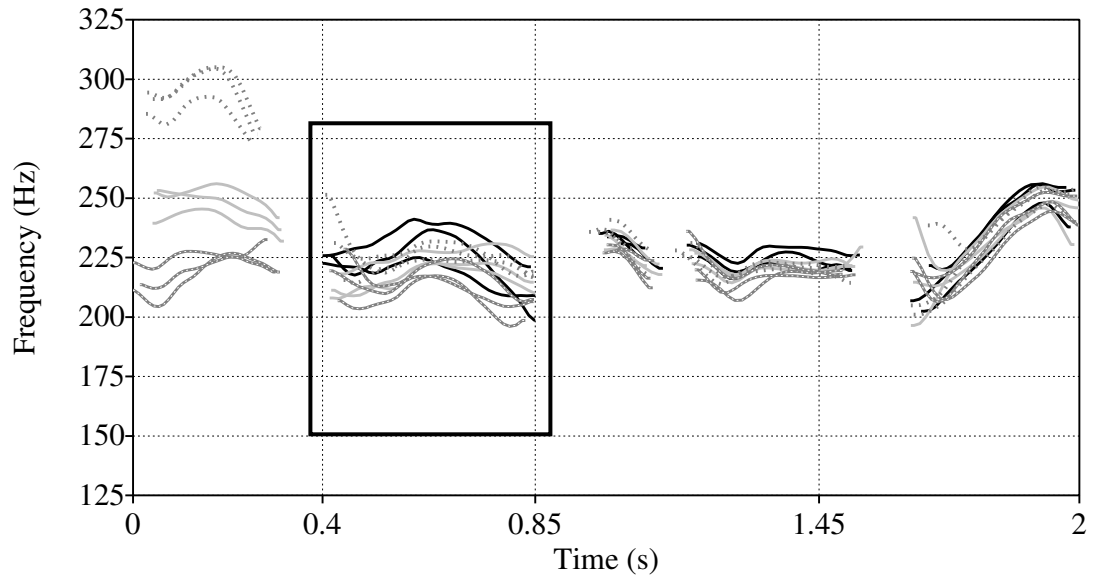


Figure 5.17 F0 traces for the noun [ʔáːraŋ̃]/[ʔáːraŋ̃] ‘aortas’ unmodified (black) and preceded by [nèe] ‘that’ (speckled grey/white), [!áːni] ‘good’ (solid silver) and [káːi] ‘big’ (dotted grey) in the frame sentence ____ *xa ta ra #âi*. ‘I’m thinking about the ____.’ (Speaker F2).

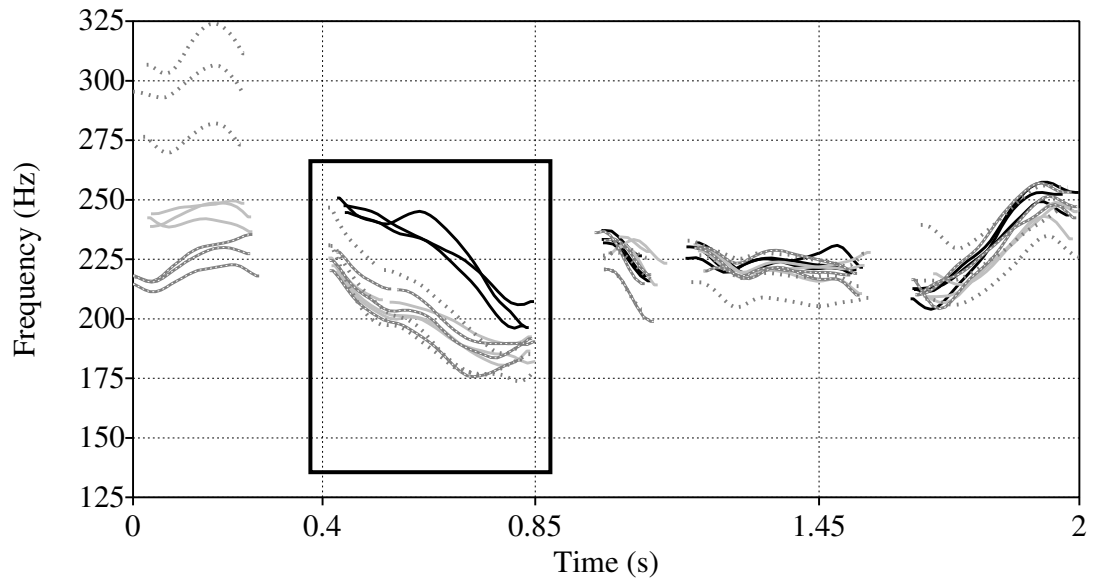


Figure 5.18 F0 traces for the noun [sáraŋ̃]/[sáraŋ̃] ‘clothing’ unmodified (black) and preceded by [nèe] ‘that’ (speckled grey/white), [!áːni] ‘good’ (solid silver) and [káːi] ‘big’ (dotted grey) in the frame sentence ____ *xa ta ra #âi*. ‘I’m thinking about the ____.’ (Speaker F2).

Finally, the low rising melody offers suggestive evidence that the rise on the root takes precedence over the fall on the PGN marker, as shown in Figure 5.19.

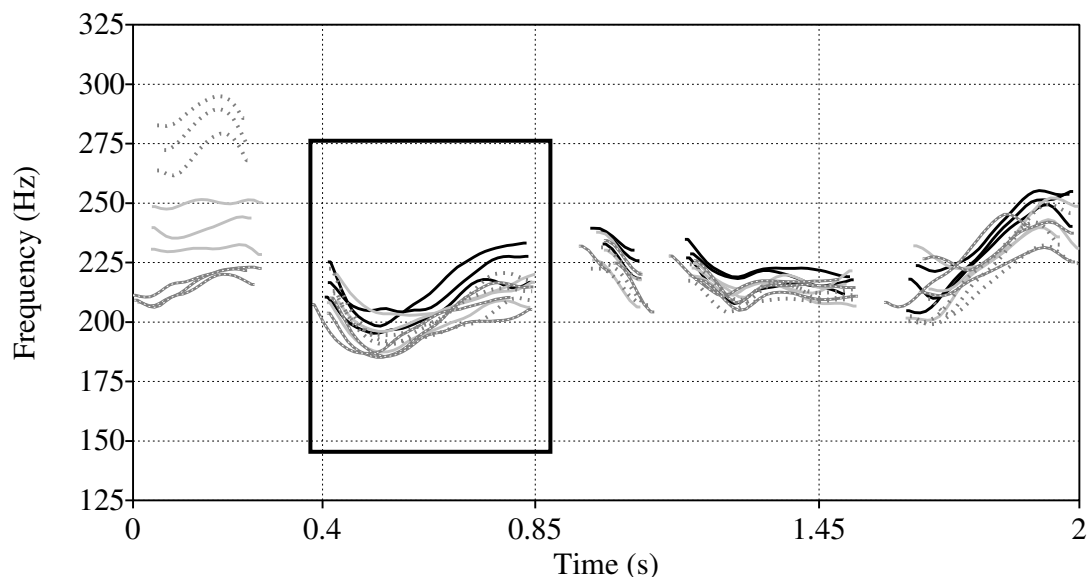


Figure 5.19 F0 traces for the noun [tànàh̃]/[tànàh̃] ‘leaders’ unmodified (black) and preceded by [nèe] ‘that’ (speckled grey/white), [!á'ni] ‘good’ (solid silver) and [kái] ‘big’ (dotted grey) in the frame sentence ___ *xa ta ra #âi*. ‘I’m thinking about the ___.’ (Speaker F2).

As in Figure 5.8, we see a rapid initial fall and a slow rise over the course of the root. In some cases, there is a very slight fall at the end of the PGN marker, but for the most part, its tone is displaced by the late rise on the root.

Together, these examples suggest that the second mora of roots with level, but not rising, melodies are unspecified for tone, and that F0 on the second vowel is the result of interpolation. I, therefore, assume that the appropriate representation of Khoekhoe level melodies is monotonal with an unspecified second mora, and that contour melodies are bitonal. Representations for the six citation melodies are shown in (37)(a-f), while the falling sandhi melody is shown in (37)(g).

(37) *Khoekhoe root melodies*

a.	CVCV	b.	CVCV	c.	CVCV
	μ μ		μ μ		μ μ
	SL		L		SL L
d.	CVCV	e.	CVCV	f.	CVCV
	μ μ		μ μ		μ μ
	H		SH		H SH
g.	CVCV				
	μ μ				
	L SL				

Having motivated my account of the citation and sandhi inventories, I now provide a brief comparison with previous analyses.

5.1.4 Comparison with previous descriptions

The Khoekhoe tone inventory was first described in a phonetically accurate way by Beach (1938). On the basis of his instrumental analysis, Beach proposed six “tonemes”, which he labels high-rising, mid-rising, low-rising, high-falling, mid-falling and low-mid level. Beach understood these tonemes as examples of “contour” (e.g., Chinese-type) rather than “register” (e.g., Bantu-type) tones (Pike 1948). That is, he took them to be atomic units rather than combinations of more basic elements. I have, however, shown that a compositional analysis is more appropriate for the Khoekhoe data. Beach makes reference to three tone levels (low, mid, high), but his

categories cannot simply be reduced to combinations of L, M and H tones because there are three distinct rising contours. Beach also noticed the tone sandhi phenomenon later described by Haacke (1999a), though he did not identify all of the environments or conditioning factors.

Hagman (1977), whose primary concern was Khoekhoe syntax, also identified six tone categories, but he assumed that each was associated with a compositional melody. Hagman argues that each root consists of two moras (a vowel or a nasal), and that each mora is associated with one of three tones: H, M or L. This makes for nine logical possibilities, and Hagman claims six of these are attested. These are shown bolded in (38). Hagman argues that melodies ending in L (shown in parentheses) are excluded by constraints in the grammar.

(38) *Root melodies in Hagman (1977)*

(L-L)	L-M	L-H
(M-L)	M-M	M-H
(H-L)	H-M	H-H

This analysis assumes three tone levels and has four contour melodies and two bitonal level melodies. The biggest problem here is that Hagman does not recognize enough tone levels, which forces him to analyze the melodies I call SL-L and H-SH as L-H and M-H, respectively, even though the endpoints of these rises are clearly distinct. He is also forced to distinguish my H and SH melodies as H-M and H-H, an analysis that is clearly at odds with the phonetic realizations demonstrated in the previous sections. Hagman did observe that citation melodies are subject to change in certain morpho-syntactically conditioned environments, but he did not attempt a holistic account of the patterns.

The third and most detailed analysis of Khoekhoe tone comes from Haacke (1999a), whose approach is similar to Hagman’s in spirit, though it crucially recognized the necessary four tone levels. Haacke refers to these levels with the numbers 1 (=SL) through 4 (=SH), following the convention in work on Chinese languages. Like Hagman, Haacke proposes that each root is associated with a citation melody that consists of two tones, but unlike Hagman, Haacke also identified the sandhi melodies, including the falling melody that is unique to this environment. Haacke’s proposed citation and sandhi forms for the six main tone categories are shown in (39).

(39)

Citation	Sandhi
[12]	[21]
[22]	[22]
[13]	[13]
[24]	[22]
[32]	[21]
[43]	[32]

Thus far, Haacke’s analysis uses only seven of the sixteen logically possible combinations of four level tones. He addresses this, in part, by identifying a handful of roots he argues have exceptional melodies (those marked with * are quite rare). These are shown in (40).

(40)

Citation	Sandhi
[14]*	[14]
[23]	[23]
[31]*	[31]
[41]*	[31]
[42]*	[31]

Unfortunately, I was unable to elicit any of these melodies with my consultants, in part because the words they occur with are rare or unfamiliar to urban speakers. My consultants are also significantly younger than Pastor Eiseb, Haacke’s collaborator on the Khoekhoe dictionary (Haacke and Eiseb 2002) and his primary consultant. In any case, the primary and exceptional melodies together account for twelve of the sixteen logical possible combinations, as illustrated in (41).

(41) *Root melodies in Haacke (1999a)*

(11)	12	<u>13</u>	14
<u>21</u>	<u>22</u>	23	24
31	<u>32</u>	(33)	(34)
41	42	43	(44)

T = Citation form of main melody

T = Sandhi form of main melody

T = Exceptional melody

(T) = Unattested

This system has eleven contour melodies and one that is level, but still bitonal. As Yip (2002:29) notes, “systems with more than three contrasting contours of the same shape are extremely rare”, though she also concedes that there are cases like San Juan Copala Trique where such contours are well-motivated. Crucially, however, such languages always have level tones in addition to the contours. I, therefore, argue that it is more appropriate to attribute the slight fall sometimes found at the ends of high

level melodies and the slight rise at the end of the SL melody to phonetic implementation, rather than phonological specification. Doing so leaves us with a typologically unexceptional system that still fits the phonetic data.

The biggest challenge for my proposal is presented by Haacke’s exceptional melodies. Though I was unable to elicit them, Haacke’s consultant produced them consistently, and they could reflect either dialectal or diachronic variation. These melodies are, however, relatively few in number, just like the exceptions to otherwise robust segment distribution patterns discussed in Chapter 3. Moreover, the mechanism I propose in Chapter 7 for implementing the paradigmatic alternations found on roots would have no problem dealing with exceptional melodies.

The differences among the analyses discussed in this section are summarized in Table 5.4.

Table 5.4 Tone categories for the three previous analyses of Khoekhoe tone and a hypothesis for a simplified system.

Beach (1938)	Hagman (1977)	Haacke (1999)	Present Analysis
L-rising	LM	SL-L (L-SL)	SL (L-SL)
M-rising	LH	SL-H	SL-L
L/M-level	MM	L-L	L
H-rising	MH	L-SH (L-L)	H-SH (L)
M-falling	HM	H-L (L-SL)	H (L-SL)
H-falling	HH	SH-H (H-L)	SH (H)

Now that the root inventories have been accounted for, we turn to the patterns found in clitics.

5.2 Clitic tone

We saw in Chapter 4 that suffixes and particles pattern together with respect to quantity, segmental phonotactics and morpho-syntactic distribution, and that such

prosodic clitics pattern in opposition to roots. This section will show that clitics also differ from roots in the tonal contrasts they can carry. Specifically, I show that clitics can have either a high or a low level tone, or else a fall. This analysis differs somewhat from Hagman (1977) and Haacke (1999a), who both recognized the three-way distinction but treat it as a contrast among three level tones.

In suffixes and the PGN paradigm, we find both low-level and falling tones, which I transcribe as [-à] and [-â], respectively. The realization of these tones is illustrated in Figure 5.20 for a root with the SL melody, and in Figure 5.21 for roots in the SH and SL-L categories.

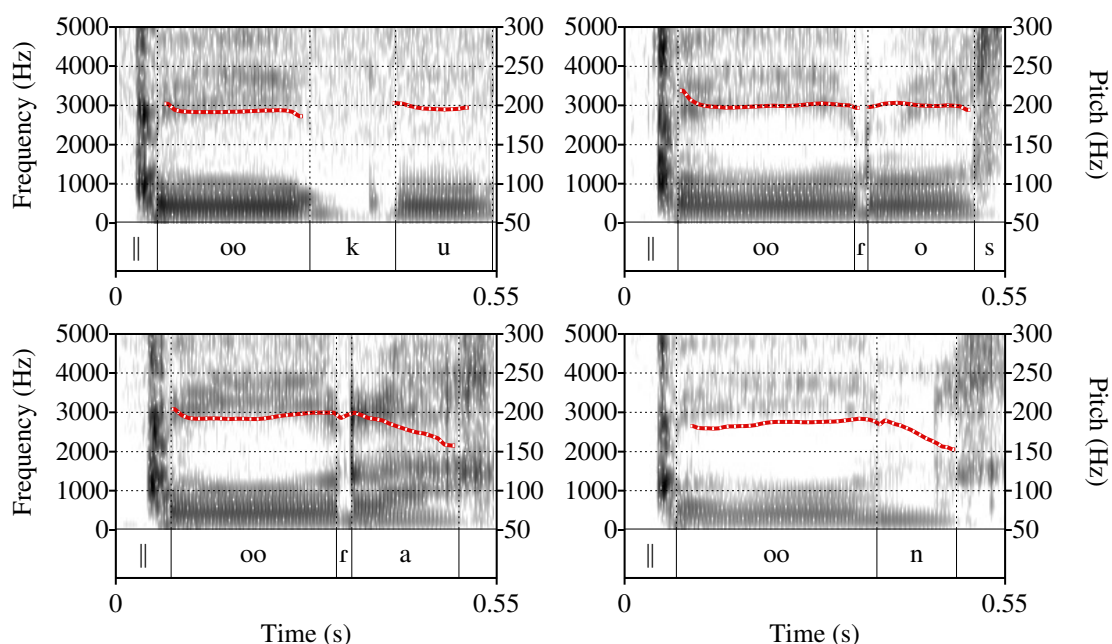


Figure 5.20 Spectrograms and F0 traces for the suffixes [-kù] (3.M.PL), [-ròs] (diminutive-3.F.S), [-râ] (3.F.D) and [-n] (3.C.PL), following the root [||òo] ‘goat’. Extracted from the sentence *Namas ge ____ xa ra #âi*. ‘The Nama is thinking about ____.’ (Speaker F2).

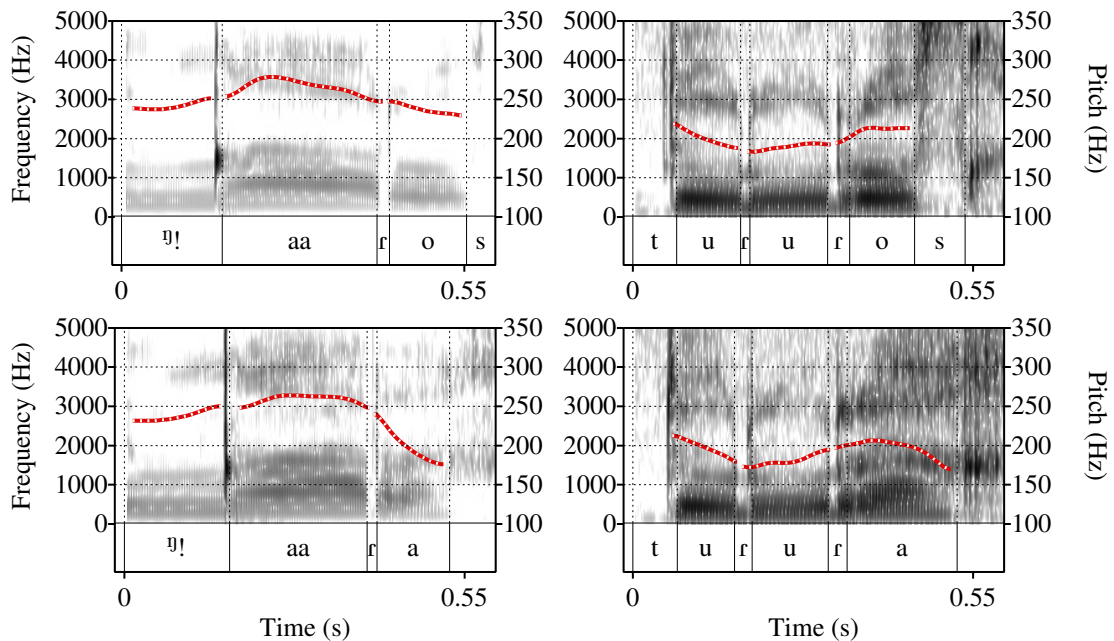


Figure 5.21 Spectrograms and F0 traces for the suffixes [-ròs] (diminutive-3.F.S) and [-râ] (3.F.D), attached to the roots [ʔ!áa] ‘tortoise’ and [tùrù] ‘mouse’. Extracted from the sentence *Namas ge ____ xa ra #âi*. ‘The Nama is thinking about ____.’ (Speaker F2).

These examples show that the clitic melodies on the 3.M.PL marker [-kù] and the 3.F.S diminutive [-ròs] are level, while those on the 3.F.D marker [-râ] and 3.C.PL marker [-#] are falling, even when cliticized to a word with the SL melody. Falls are particularly common in the paradigm of oblique PGN markers, which seems to have arisen diachronically from combination with a suffix [-â].

In addition to these low and falling clitic melodies, we also find a high level melody on certain suffixes and particles. Haacke and Eiseb (2002) typically transcribe clitics of this type with an SH tone, which is somewhat surprising given that the SH melody is otherwise confined to phonological-phrase initial positions. Though it is certainly possible to come up with an analysis that allows for SH clitic melodies, there is some reason to think it is not strictly necessary. This melody is infrequent, but my corpus does include several examples (mostly of the coordinating particle *tsî* ‘and’),

and F0 in these tokens tends to span the range occupied by root H and SH melodies. If we assume that such variability is permitted in this environment because of the neutralization between H and SH, it is not unreasonable to interpret this melody as phonologically H. Because doing so simplifies the analysis in section 5.3 somewhat, I will assume that H is the appropriate analysis, with the caveat that the question requires further acoustic investigation.

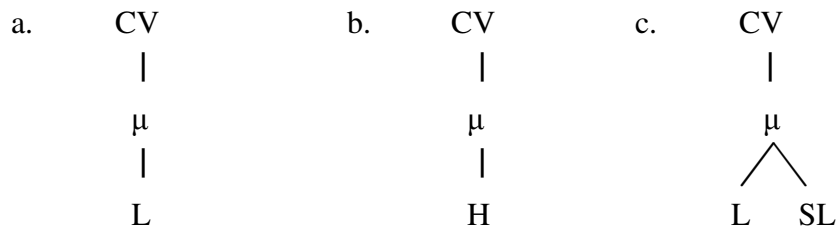
Examples of suffixes with each of the clitic melodies are shown in Table 5.5 (table repeated from Chapter 4).

Table 5.5 Suffixes associated with different parts of speech.

Noun	Verb	Adjective
[-rò] diminutive (<N)	[-pâ] applicative	[-ʔò] ‘without X’
[-ró] diminutive (<V,A)	[-kù] reciprocal	[-xâ] ‘full of X’
[-sî] ‘X-ness’	[-hê] passive	[-sâ] trans. V→A
	[-rí] intensifying	[-sá] intrans. V→A
	[-rô] causative	
	[-xâ] ventive	
	[-sôh] reflexive	

The representations for clitic melodies are shown in (42).

(42) *Khoekhoe clitic melodies*



We now turn to the question of markedness, both within and across tone inventories.

5.3 Tone inventories and markedness

The previous two sections presented the tone inventories that occur in three distinct environments: roots in citation positions, roots in sandhi positions and clitics. The most contrasts are found on the citation forms of roots, with contrast reduction in sandhi position and even fewer contrasts on clitics. The inventories are summarized in (43).

(43)

	Citation	Sandhi	Clitic
Level	SL	--	--
	L	L	L
	H	H	H
	SH	--	--
Falling	--	L-SL	L-SL
Rising	SL-L	SL-L	--
	H-SH	--	--

Looking at the elements in these inventories, we see that citation positions contrast four level melodies, while the sandhi and clitic environments allow only two. Moreover, the sandhi and clitic environment prohibit exactly those level melodies that are most extreme. This greater number of contrasts suggests that the inventory of melodies associated with citation forms is the most marked typologically. Turning to the contours, we see that the citation inventory has two, both rises, while the sandhi inventory has one rise and one fall, and the clitic environment has only a fall. Cross-linguistically, contours are more marked than level tones, and rises are more marked than falls (see e.g., Yip 2002 for discussion), so we again see a net reduction in markedness in the sandhi and clitic contexts.

This decrease in markedness is consistent with cross-linguistic observations about citation, sandhi and “elsewhere” inventories. Yip (2002), for instance, notes that

the Min language Chaoyang has distinct inventories in citation, sandhi and post-tonic/unstressed position. She argues that though the pairings of particular citation and sandhi melodies may be arbitrary, the content of the respective inventories correlates with the prominence of each environment, so that marked elements are dispreferred in less prominent positions (in Chaoyang, these are non-final and unstressed). This also seems to be the case for Khoekhoe. The question is how we should account for such positional restrictions in formal terms.

The crucial observation is that citation, sandhi and clitic environments can be distinguished on the basis of their distribution in prosodic domains: citation melodies occur on the leftmost root in a phonological phrase (RT_{1Ph}), sandhi melodies occur on roots (which are always prosodic words) in other contexts (RT), and clitics occur prosodic word-internally. We saw in Chapter 4 that the distribution of segments can be accounted for by appealing to distinctions of this type. Given this similarity, we might ask whether the distribution of tone inventories can also be captured with positional markedness and positional faithfulness constraints. I argue that they can.

Before turning to position-specific constraints, we must first preclude certain logically possible, but unattested melodies. If we look at the inventory of attested contours in Khoekhoe, we see that they are always restricted to a single register. Rather than attribute this to the phonological representation, as advocated by proponents of unit contour representations (e.g., Yip 1989, Bao 1990, 1999), we can capture it with the constraint in (44).

(44) *CROSSREGISTER: Melodies may not consist of tones from different registers.

If we assume that this constraint is undominated, the number of possible contours is significantly reduced to those shown in the unshaded boxes in (45).

(45)

	SL	L	H	SH
SL	--	SL-L	SL-H	SL-SH
L	L-SL	--	L-H	L-SH
H	H-SL	H-L	--	H-SH
SH	SH-SL	SH-L	SH-H	--

Only one of the four remaining contour melodies is not attested in some Khoekhoe inventory, namely the high fall SH-H. I will show that this melody can be excluded on independent grounds.

We now turn to the markedness constraints necessary for the analysis of Khoekhoe tone distribution. First of all, we need a constraint that targets rising and falling melodies. Cross-linguistically, there are many languages that permit level tones and prohibit contours, but no language that cannot be analyzed with at least one level tone. This suggests that contours are more marked than level melodies. Similarly, languages that do allow contours are more likely to license falls than rises. This suggests a harmonic scale with the ranking: LEVEL \succ FALL \succ RISE. This scale translates into the intrinsically ranked constraints in (46). Note that these constraints are defined explicitly in terms of melodies. This is a crucial element of the constraint rankings below.

- (46)
- a. *RISE \gg *FALL
 - b. *RISE: Melodies may not rise.
 - c. *FALL: Melodies may not fall.

Next, we need to address the relative markedness of individual tones. De Lacy (2002) motivates the idea of a tonal prominence scale for stressed syllables, namely H \succ M \succ L, which translates into the positional markedness hierarchy *L/ó \gg *M/ó.

Unfortunately, Khoekhoe shows no preference for high tones, and there is no evidence that headedness (as opposed to prosodic alignment) is a key factor in Khoekhoe tone distribution. But as we saw in Chapter 4, an element that is marked in one position can be unmarked in another, and de Lacy also argues that the reverse ranking holds in non-head positions. If we assume “non-head” to apply broadly not just to unstressed syllables, but to systems in which headedness is not relevant, the relative markedness of high tones provides a useful starting point. If we take the restriction of SH and SL tones to citation positions as an indication of markedness, and assume that the high register feature of SH means it is more marked than SL, we can construct the ranking in (47).

- (47) *Tone markedness*
 *SH >> *SL >> *H

This ranking turns out to have useful consequences for the analysis of Khoekhoe, but I leave the question of its cross-linguistic applicability to future research.⁴³

If we look first at those melodies that occur in citation environments but not elsewhere (i.e., SH, H-SH, SL), we can capture the distribution of these relatively marked structures with positional faithfulness constraints directly parallel to those motivated in Chapter 4 for segment distribution. The ranking in (48) shows that SH melodies can be excluded from positions that are not initial in a phonological phrase with a faithfulness constraint that targets them specifically. The same is true for the SL melody, shown in (49). Note that these are hypothetical inputs and outputs, *not*

⁴³ Comparison of this ranking and de Lacy’s is complicated by cross-linguistic ambiguity about the status of mid tones. That is, it is unclear whether de Lacy’s “H, M, L” corresponds to my “SH, H, L” or “H, L, SL”.

citation and sandhi forms. Our goal here is to account for the elements found in each position. The mapping of tone categories to melodies will be taken up in section 5.4.

(48)

RT _{1Ph} /SH/	IDENT[SH]/RT _{1Ph}	*SH	IDENT[SH]
☞ a. SH		*	
b. H	*!		
RT: /SH/	IDENT[SH]/RT _{1Ph}	*SH	IDENT[SH]
a. SH		!*	
☞ b. H			*

(49)

RT _{1Ph} : /SL/	IDENT[SL]/RT _{1Ph}	*SL	IDENT[SL]
☞ a. SL		*	
b. L	*!		
RT: /SL/	IDENT[SL]/RT _{1Ph}	*SL	IDENT[SL]
a. SL		!*	
☞ b. L			*

In each case, the position-specific faithfulness constraint protects the extreme melody in citation positions, even though it is prohibited elsewhere. Conveniently, the ranking in (48) also eliminates high-register contour melodies (i.e., H-SH and SH-H) in non-initial positions. But what about SL? Both SL-L and L-SL are found in sandhi position, so how do we reconcile this observation with the ranking in (49)? I argue that the difference between SH, which is prohibited in sandhi contours, and SL, which is permitted, reflects the influence of constraints that require faithfulness to contour melodies, namely IDENT[Fall] and IDENT[Rise]. The interaction of these constraints is demonstrated in (50).

(50)

RT: /SL/	*SH	IDENT[Fall]	IDENT[Rise]	*SL
a. SL				*!
☞ b. L				
RT: /SL-L/	*SH	IDENT[Fall]	IDENT[Rise]	*SL
☞ a. SL-L				*
b. L			!*	
RT: /H-SH/	*SH	IDENT[Fall]	IDENT[Rise]	*SL
a. H-SH	*!			
☞ b. H			*	

Because the faithfulness constraints are ranked between the markedness constraints, we find low-register contours in environments that prohibit the SL melody, but the same is not true of melodies with SH. Crucially, this restriction on contour melodies is *not* being driven by *FALL or *RISE, but rather by constraints that target the tones of which the melodies are composed. Note that this ranking is also relevant for clitics, in which we find a low-register fall, even though SL itself is prohibited.

Thus far, we have accounted for the restriction of certain marked elements to citation positions, but what about the marked elements that are prohibited in this environment? In particular, we find no falling contours, which are more marked than level melodies. Because this is a markedness-reducing, rather than a markedness-increasing neutralization, we must formulate the relevant constraint in terms of positional markedness, as shown in (20). Again, these are hypothetical input and output forms, not alternating melodies.

(51)

RT _{1Ph} : /L-SL/	*FALL/RT _{1Ph}	IDENT[Fall]	*FALL
a. L-SL	*!		*
☞ b. L		*	
RT: /L-SL/	*FALL/RT _{1Ph}	IDENT[Fall]	*FALL
☞ a. L-SL			*
b. L		*!	

This ranking prevents falls in citation environments (RT_{1Ph}), but allows them elsewhere. Though formally parallel to the restriction on initial approximants, this instance differs in that it prevents a marked element (i.e., falls), but there is no constraint preventing a more marked element (i.e., rises). This was not the case with the sonorant onsets discussed in Chapter 4, and it is not in the spirit of positional markedness constraints. One possibility is that the ranking of *RISE and *FALL is reversed in this environment, perhaps because falls are perceptually worse than rises phrase-initially.

Turning now to restrictions on rising contours in sandhi positions, we can account for the licensing of low but not high rises with the ranking shown in (52).

(52)

RT: /SL-L/	*SH	IDENT[Rise]/RT	*SL	IDENT[Rise]
☞ a. SL-L			*	
b. L		*!		*
RT: /H-SH/	*SH	IDENT[Rise]/RT	*SL	IDENT[Rise]
a. H-SH	*!			
☞ b. H		*		*

Here the high, but not low rise is eliminated. In clitics, however, both types of rises are prohibited, as shown in (53).

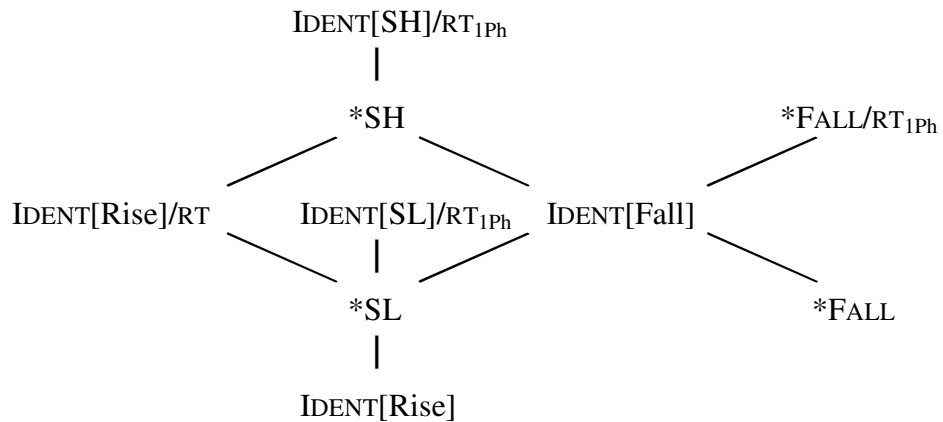
(53)

σ : /SL-L/	*SH	IDENT[Rise]/RT	*SL	IDENT[Rise]
a. SL-L			*!	
☞ b. L				*
σ : /H-SH/	*SH	IDENT[Rise]/RT	*SL	IDENT[Rise]
a. H-SH	*!			
☞ b. H				*

The ranking of Ident[Rise] below the two tone markedness constraints eliminates the possibility of rises on clitics. Once again, *RISE is not involved in this ranking.

Constraints are summarized in (54). Note that IDENT[SH], IDENT[SL] and *RISE, which play no active role, are omitted for clarity.

(54) *Constraints on tone melodies*



Like segment distribution, tone distribution makes a crucial distinction between roots and clitics, and tends to confine elements that are more marked to the left edges of prosodic structure.

We now turn to the patterns of melody substitution.

5.4 Melody substitution

Though Khoekhoe lacks the floating and spreading phenomena found in many African languages, tones are not immutable. Rather, the melody that surfaces on a root in a particular utterance reflects both its lexical category and its morpho-syntactic context. This section takes a closer look at these patterns of paradigmatic substitution. We have already seen examples of tone sandhi, which will be explored in more detail in Chapter 7. But Khoekhoe also has a second, orthogonal pattern of paradigmatic substitution that occurs primarily in verbs. This is discussed briefly in section 5.4.1. Melody substitution is also found in reduplication (section 5.4.2). My discussion takes the description in Haacke (1999a) as a starting point, though it is supplemented with data from Deoskar (2003) and my own fieldwork.

5.4.1 Flip-flop and circular chain-shifts

In addition to the sandhi phenomenon discussed in the previous sections, Khoekhoe roots are also subject to a form of melody substitution known as “flip-flop” (Haacke 1999a). The term was introduced by Wang (1967) to describe a range of synchronic and diachronic processes, primarily in east Asian languages, in which tone melodies switch category affiliation, for instance when a high tone becomes a low tone and a low tone becomes a high tone. In Khoekhoe, alternation of this type is found primarily on the first element of a verbal compound, though it can also be triggered by certain suffixes (see Haacke 1999a for details). Flip-flop differs crucially from sandhi in that it always requires some morpho-syntactic trigger. It should be noted that flip-flop is applied somewhat less frequently by younger speakers. I was able to confirm that my consultants do use flip-flop in at least some constructions, but I did not investigate every context described in Haacke (1999a). For our present

purposes, it is enough that the relationships among tone categories remains the same and that it is used in some environments.

Flip-flop in Khoekhoe is a productive process whereby the melodies associated with two categories switch affiliation (e.g., SH ↔ H-SH). The “flipped” form can subsequently undergo tone sandhi, in which it takes the sandhi form of the flipped, not citation melody. This means that a given root can surface with one of four melodies (M_C , M_S , M_{FC} , M_{FS}), depending on its morpho-prosodic context. Moreover, Khoekhoe flip-flop comes in two forms, which I call “weak” and “strong”.⁴⁴ With weak flip-flop, only three of the six categories take their flipped forms, which results in a neutralization to just three tonal contrasts, but with strong flip-flop, all six categories switch and all contrasts are maintained. Weak flip-flop is far more common than strong flip-flop, which is largely restricted to causative reduplication (see section 5.4.2). A schematic of the relationships among the different categories is shown in (55).

(55)

“Weak”	Citation	“Strong”
SL-L	SL-L	SL
	SL	SL-L
H	L	H
	H	L
H-SH	SH	H-SH
	H-SH	SH

No tone has a flip-flop melody that is the same as its sandhi form, and there is no obvious phonological relationships between the melodies in each pair. Pairings can be both within (e.g., SL and SL-L) and across (e.g., L and H) register, and it is not the

⁴⁴ Haacke uses the terms “unilateral” for my “weak” and “bilateral” for my “strong”.

case that the rising tones exchange with each other. Though there is a reduction in the number of tone categories, the neutralization cannot be driven by markedness since the most marked member of each pair is retained. Though some diachronic path must have led to these pairings, the relationship among the melodies cannot be motivated phonologically and like sandhi, must simply be treated as arbitrary and lexically-specified.

Weak flip-flop is illustrated by the initial elements of the compound in Figure 5.22, in which a SH root takes a H-SH melody, and the compound in Figure 5.23, which shows a H-SH root surfacing with its citation melody in a comparable construction. As we will see in Chapter 7, the failure of the second element to take its sandhi form is characteristic of compounds of this type. Note that F0 on the second syllable of [ʔúnu] in Figure 5.23 falls slightly. I attribute this to declination in the absence of phonological specification. Strong flip-flop will be illustrated in section 5.4.2 in the discussion of reduplication.

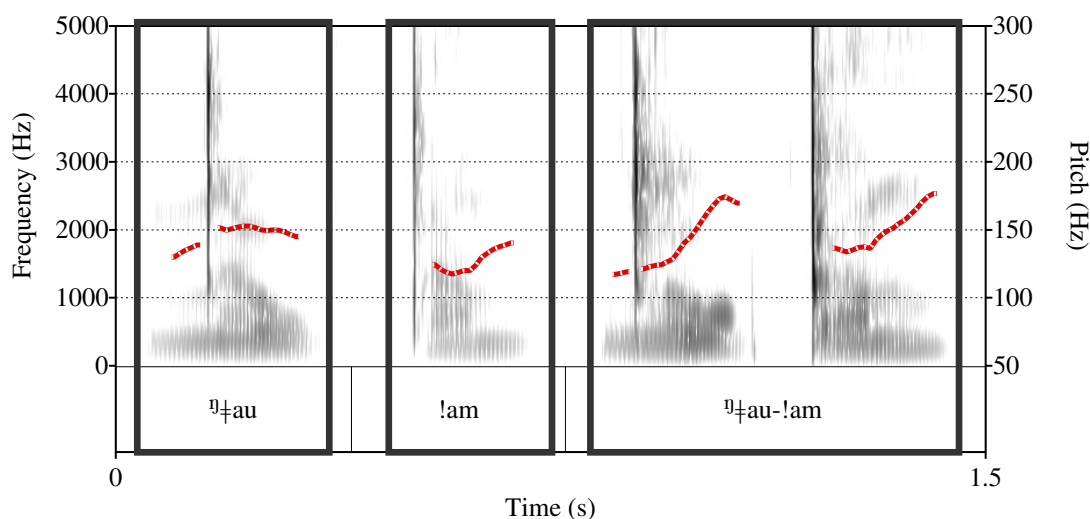


Figure 5.22 Spectrogram and F0 traces for citation forms of: [ʔɛ́u] ‘hit’, [!ám] ‘kill’ and the coordinating compound [ʔɛ́u-!ám] ‘hit-kill’. Words recorded in isolation. (Speaker M1, recording courtesy T. Deoskar).

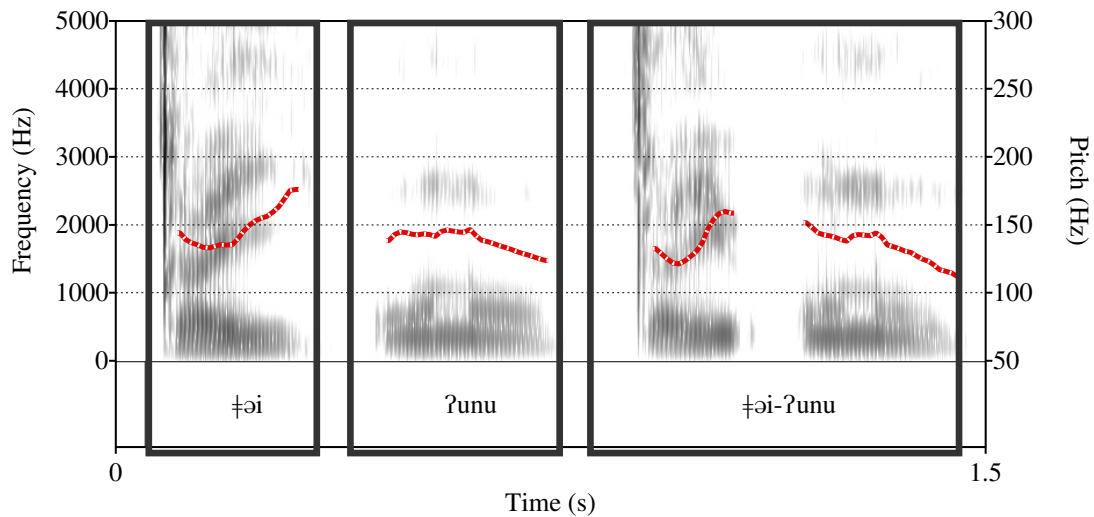


Figure 5.23 Spectrogram and F0 traces for citation forms of: [ʔəi] ‘to call’, [ʔunu] ‘to change’ and the coordinating compound [ʔəi-ʔunu] ‘to call to change’. Words recorded in isolation. (Speaker M1, recording courtesy T. Deoskar).

Before we move on, it is important to note that flip-flop differs from sandhi in that the strong form involves non-neutralizing circular chain shifts (i.e., $A \rightarrow B$ and $B \rightarrow A$), which are the tone melody equivalent of segmental exchange rules (see Anderson and Browne 1973 for discussion, see also discussion of tonal polarity rules, e.g. Yip 2002:159-162, Cahill 2004). Crucially, however, flip-flop also differs from sandhi in that it is always morphologically-conditioned. This is consistent with Anderson and Browne’s apparently correct observation that segmental exchange rules always have morphological triggers. This is important in the context of Optimality Theory, which cannot account for chain shifts that are not triggered by morphological or prosodic considerations (Moreton 1999). For further discussion of the problems posed by tone circles, see Schuh (1978), Tsay and Meyers (1996), Moreton (1999), Mortensen (2002), Hsieh (2005), Barrie (2006), Myers (2006), Zhang et al. (2006) and Thomas (2008)

We now turn to the patterns found in reduplicated morphemes.

5.4.2 Reduplication and morphemic melodies

Khoekhoe has three distinct types of reduplication, all of which produce verbs. Segments are always reduplicated in full, but the tone melody of the reduplicant varies with the type of reduplication and must, therefore, be morphologically specified. Reduplication also triggers either weak or strong flip-flop in the base.

We begin with causative reduplication, which is characterized by a flip-flop melody on the base and a falling L-SL melody on the reduplicant. This is the only environment in which strong flip-flop is consistently applied. The pattern is illustrated with words of all six tone classes in (56). For clarity, the base and reduplicant are separated by a hyphen, and the reduplicant is underlined.

(56) *Causative reduplication*

- | | | | |
|----|---------------------------------|---|---|
| a. | [^ᵀ ǎm] ‘to love’ | → | [^ᵀ ǎm- <u>^ᵀǎm</u>] ‘to inspire to love’ |
| b. | [kòn] ‘to move’ | → | [kón- <u>kòn</u>] ‘to move to and fro’ |
| c. | [^ᵀ !ùβù] ‘short’ | → | [^ᵀ !ùβu- <u>^ᵀ!ùβù</u>] ‘to shorten’ |
| d. | [sóms] ‘shade’ | → | [sòm- <u>sòm</u>] ‘to make shady’ |
| e. | [^ᵀ ǒm] ‘to smile’ | → | [^ᵀ ǒm- <u>^ᵀǒm</u>] ‘to make smile’ |
| f. | [^ᵀ ǒó] ‘to measure’ | → | [^ᵀ ǒo- <u>^ᵀǒò</u>] ‘to estimate’ |

Here we see that the melody on the first element is always replaced by its flipped counterpart, while the second element takes L-SL. Haacke (1999a) refers to such replacement as “final drop”, but note that it is identical to the sandhi form of H and SL melodies.⁴⁵ Spectrograms and F0 traces illustrating causative reduplication for H-SH and SH roots are shown in Figure 5.24.

⁴⁵ Odden (1995:465) cites Khoekhoe causative reduplication as an example in support of underspecification. Hagman’s (1977) description, on which Odden’s discussion is based, describes the tone on the second element as simply “slightly lowered mid”. Odden takes this as evidence that the tone is unspecified and mid tone is inserted later by default. This does not, however, seem to be an appropriate characterization in light of our improved understanding of the tone sandhi system.

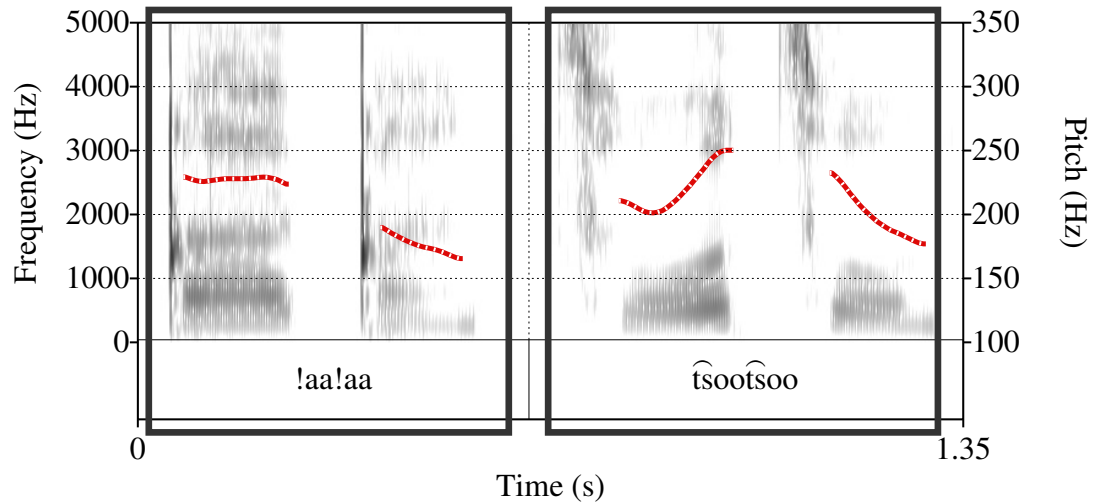


Figure 5.24 Causative reduplication of the roots [!áá] ‘clear’ → [!áa!àà] ‘to make clear’ and [tsóo] ‘to pull in’ → [tsóótsòò] ‘to make sink in’. Extracted from the frame sentence *Nēsi ra ____ Namas ge*. ‘Now the Nama is ____.’ (Speaker F2).

Pretense reduplication differs from causative reduplication in the melody of the reduplicant and the addition of the suffix [-sə̂n]. Moreover, this type of reduplication is characterized by weak flip-flop, rather than strong. Examples are listed in (57).

(57) *Pretense reduplication*

- | | | | |
|----|--|---|--|
| a. | [mù ⁿ ù ⁿ] ‘to see’ | → | [mù ⁿ ù ⁿ - <u>múⁿúⁿ</u> -sə̂n] ‘to pretend to see’ |
| b. | [kòn] ‘to move’ | → | [kòn- <u>kón</u> ’-sə̂n] ‘to pretend to move’ |
| c. | [^ɓ ǎ ⁿ ù ⁿ] ‘to hear’ | → | [^ɓ ǎ ⁿ ù ⁿ - <u>^ɓǎⁿúⁿ</u> -sə̂n] ‘to pretend to hear’ |
| d. | [táo] ‘to be ashamed’ | → | [tào- <u>táó</u> ’-sə̂n] ‘to pretend shame’ |
| e. | [xóá] ‘to write’ | → | [xóá- <u>xóá</u> ’-sə̂n] ‘to pretend to write’ |
| f. | [^ɓ !ó ⁿ á ⁿ] ‘to stumble’ | → | [^ɓ !ó ⁿ á ⁿ - <u>^ɓ!óⁿáⁿ</u> -sə̂n] ‘to pretend to fall’ |

Here we see that the SL, H and SH melodies have changed to their flipped counterparts, while L, L-SL and H-SH have not, that the second element of the reduplicant has taken H-SH tone, and that the final [-sə̂n] has a falling tone.

Spectrograms and F0 traces illustrating causative reduplication for H-SH and SH roots are shown in Figure 5.25.

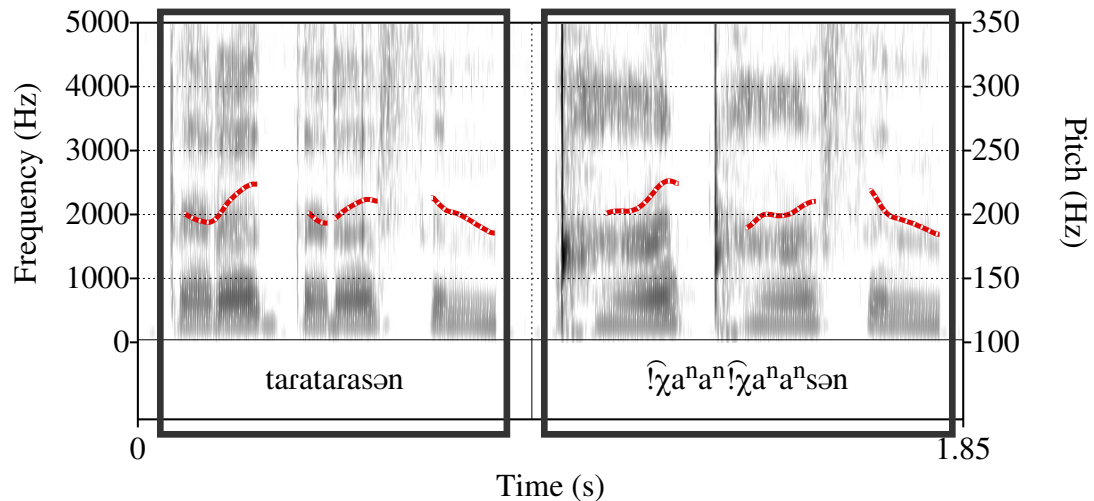


Figure 5.25 Pretense reduplication of the roots [tárás] ‘woman’ → [tárátárásèn] ‘to act like woman’ and [!χá^ná^n] ‘to squint (temporarily)’ → [!χá^ná^n!χá^ná^nəsèn] ‘to squint’ (intentionally). Extracted from the frame sentence *Nēsi ra _____ Namas ge*. ‘Now the Nama is _____.’ (Speaker F2).

The final type of reduplication is the progressive. Examples from Haacke (1999a:138) are shown in (58).

(58) *Progressive reduplication*

- | | | | |
|----|----------------------------------|---|--|
| a. | [!äap] ‘servant’ | → | [!äà-!äà] ‘to become dirty (like a servant)’ |
| b. | [^ɓ !òrèp] ‘ghost’ | → | [^ɓ !òrè- ^ɓ !òrè] ‘to turn into a ghost’ |
| c. | [sàa-ʔî] ‘San’ | → | [sàa-sàa] ‘to become San-ized’ |
| d. | [^ɓ !árép] ‘ice’ | → | [^ɓ !áré- ^ɓ !àrè] ‘to freeze’ |
| e. | [!χá^ná^n] ‘soot’ | → | [!χá^ná^n-!χá^ná^n] ‘to get discolored by smoke’ |
| f. | [^ɓ !húup] ‘distress’ | → | [^ɓ !húú- ^ɓ !húu-sâ] ‘distressing’ |

In these cases, the nouns on the left are reduplicated to form the verbs on the right, and the verbs have flipped melodies on the base and a low level melody on the reduplicant. Spectrograms and F0 traces illustrating progressive reduplication for a root with a citation L melody is shown in Figure 5.26.

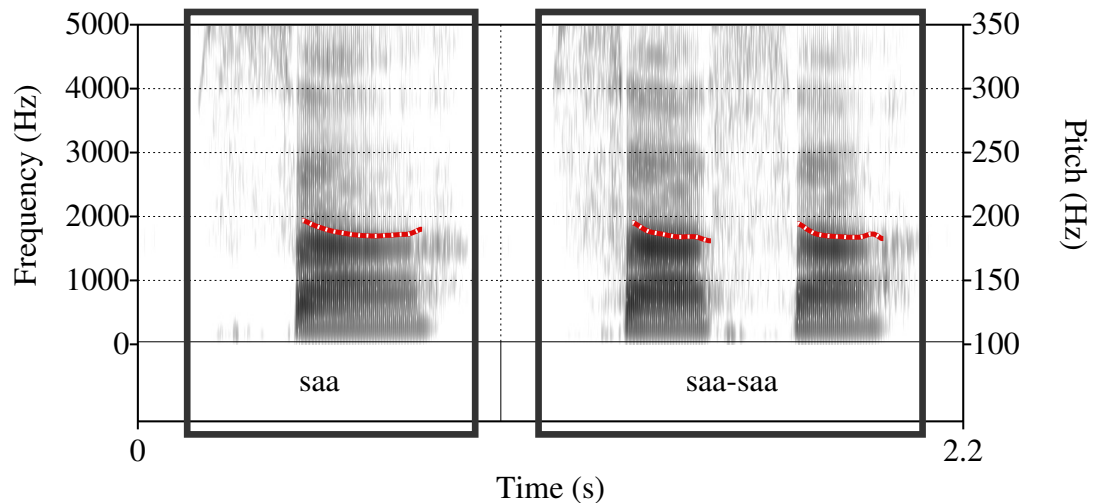


Figure 5.26 Progressive reduplication of the root [sàa] ‘San’→[sàasàa] ‘to become San-ized’. Words recorded in isolation. (Speaker F1).

These examples show that the citation melody is never retained on the reduplicant, indicating that the new melody is part of the reduplicated morpheme. This stands in contrast to the Ju|’hoansi case discussed in Chapter 3, in which the root’s melody is always retained. Note also that Ju|’hoansi reduplication is prefixing, even though the language otherwise lacks prefixes.

5.5 Summary

This chapter has outlined the tone patterns in Khoekhoe roots and clitics. I have shown that roots are associated with melodies that are either mono- or bitonal, and that the melody with which a root is realized depends on both its lexical specification and its morpho-syntactic context, but that clitic melodies are invariant. Moreover, we find striking patterns in the distribution of tone melodies that directly parallel the constraints on segment distribution outlined in Chapter 4. In both the segmental and tonal domains, marked elements tend to appear at the left edges of prosodic constituents.

CHAPTER 6: ROOT-LIKE FUNCTION WORDS

6.0 Introduction

One problem for Beach (1938:102) in his attempts to quantify the difference between long and short vowels was the distinction between “strong” and “weak” roots that had been posited in previous descriptions of Khoekhoe. Postpositions, for instance, were argued to be “weak” roots because of their grammatical function, but Beach observed that they pattern with the “strong” roots in that they can be bimoraic, they can begin with a click, and they can have tone patterns usually associated with roots. To the extent that subsequent work on Khoekhoe and other Khoesan languages has addressed the question at all, it has tended to follow Beach’s example and assume a bipartite division of morphemes into roots on the one hand and particles or suffixes on the other. In this chapter, I show that such a division is overly-simplistic. While roots are a prosodically homogenous category, function words are more varied in ways that reflect the complex interactions of grammatical function, prosodic structure and diachronic change.

Central to the topic under consideration here is the question: What is a function word? Though there is widespread agreement that nouns, verbs and adjectives are lexical items, the status of other categories, like adpositions, adverbs and auxiliaries, is less clear and often subject to cross-linguistic variation. At least some of this variation can be attributed to language-specific constraints on prosodic word status. But though prosodic differences *between* content and function morphemes are clearly necessary to account for certain types of phonotactic patterns (e.g., Selkirk 1995 for English, Hall 1999a for German, also Chapter 4 for Khoekhoe), it is also important to recognize the possibility of prosodic differences *within* functional categories (e.g., Zec 2005 on

Serbian pitch accent, Trommer 2008 on Hungarian vowel harmony). Cross-linguistically, content words tend to constitute a coherent prosodic class, but the same is not true of their functional counterparts.

Though the previous three chapters have shown that the distinction between roots and clitics is quite robust, there are also “functional” morphemes that do not fit neatly into either category. In some respects, these morphemes seem to resemble roots, but in others, their behavior is more irregular. The strict phonotactic patterns found in roots and clitics do, however, allow us to evaluate how these “irregular” function words differ from each category. I will show such morphemes differ from roots in: 1) their ability to undergo tone sandhi; 2) their ability to initiate an utterance; 3) their ability to take root tone melodies; 4) their ability to begin with a click; and 5) their obligation to be bimoraic. At least some of these distinctions correlate with prosodic word status, but prosody is only part of the story. Rather than a bipartite distinction, we find a continuum, with lexical items on one end, highly functional elements on the other, and an array of “root-like” function words in-between. Synchronically, we can account for some of these discrepancies by appealing to the distinctions between “grammatical word”, “prosodic word” and “root”, but it seems likely that the idiosyncratic behavior of these words reflects a diachronic path from fully lexical to fully functional elements.

This chapter looks first at those function words that most resemble roots (section 6.1), and then turns to two prosodically heterogeneous categories, namely postpositions and complementizers (section 6.2). Finally, we consider the exceptional behavior of morphologically complex demonstrative adverbs and pronouns (section 6.3). Conclusions are summarized in section 6.4.

6.1 Prosodic function words

This section looks at the behavior of the most root-like of the function words. I will show that words in the closed grammatical classes of demonstratives, numerals, auxiliaries and adverbs largely conform to the phonotactic patterns found in roots, but that there is some divergence in terms of tone and segment distribution. Crucially, however, words in these categories do meet the requirements on minimality and syntactic distribution that suggest they have prosodic word status. Moreover, demonstratives and numerals also participate in the tone sandhi alternations that characterize Khoekhoe roots. This is not the case with other “functional” morphemes. Finally, we find that the distribution of sentence conjunctions suggests they are prosodic words, even though some of them are monosyllables with short vowels. The consistently bimoraic cases are discussed first, in section 6.1.1, while conjunctions are presented separately in section 6.1.2.

6.1.1 Modifiers, auxiliaries and adverbs

Together, demonstratives and numerals constitute the most root-like of the function words. The demonstratives are listed in (1) and the numerals are in (2).

(1) *Demonstratives*

[nèe] ‘this’ [ʰ||áá] ‘that (near)’ [nàù] ‘that (far)’

(2) *Numerals*

[ɸúú] ‘many’ [ʰ]òro] ‘few’ [||ú] ‘one’ [||ám] ‘two’
[ʰ!ònà] ‘three’ [hàka] ‘four’ [kóro] ‘five’ [ʰ!ání] ‘six’
[húⁿuⁿ] ‘seven’ [||χǎisá] ‘eight’ [kxòesè] ‘nine’ [tìsi] ‘ten’

Like roots, these are all bimoraic, all have root tone melodies, some begin with clicks and none begin with approximants. There are, however, four exceptions to root

phonotactic patterns. Two numerals ([hàka], [t̥isi]) have medial obstruents, and two ([χ̥ʷísâ], [kxðesè]) look like combinations of a root and a suffix (see Chapter 4). Both types of exception are also found in content words, though it is somewhat surprising that there are this many in such a small set. Syntactically, all can occur in utterance-initial position when they modify a noun. This, and the fact that they are consistently bimoraic, suggests that demonstratives and numerals are prosodic words. More important, words in these categories both participate in the tone sandhi alternation explored in Chapter 7. They are virtually the only “function words” that do, and I argue that they should be viewed as adjectives for the purposes of the morpho-syntax/prosody mapping (see Chapter 7 for details).

Like the demonstratives and numerals, verbal auxiliaries pattern phonotactically with the roots. Syntactically, these auxiliaries differ from tense and aspect particles discussed in Chapter 4 in that they follow, rather than precede, the verb, as demonstrated by the aspectual distinction between the imperfective, which is marked with a pre-verbal particle (*ra*), while the perfective is marked with a bimoraic auxiliary (*hâ*), which obligatorily follows the verb. The inventory of auxiliaries is listed in (3).

- (3) *Verbal auxiliaries*
- | | |
|---|--|
| [χ̥ʷáa] ‘be able to (do)’ | [tsá ⁿ á ⁿ] ‘try to (do)’ |
| [ʰʷóa] ‘be unable to (do)’ | [tóa] ‘finish (doing)’ |
| [ʰáa] ‘want to (do)’ | [ká ⁿ i] ‘make/cause/allow to (do)’ |
| [há ⁿ a ⁿ] future perfective | [ʔíi] future copula |
| [há ⁿ á ⁿ] past/present perfective | [ʔíí] past copula |

As with the demonstratives and numerals, auxiliaries are all bimoraic, none begin with an approximant and all take a melody found on roots. Even though auxiliaries never occur utterance-initially, I argue their bimoraicity, complementary

distribution with verbal particles and similarity to verbal compounds suggests that they are prosodic words. Though the falling melodies on the past/present perfective and the past copula are only found in the sandhi inventory, the auditory impression is of a subordinating compound, while the remaining auxiliaries sound like coordinating compounds (see Chapter 7). Crucially, however, auxiliary tone melodies are always invariant; even when “coordinating” auxiliaries appear in a context that would trigger sandhi on a lexical item, they retain their citation melodies (see Chapter 7). In this respect, they are very different from the demonstratives and numerals discussed above, which makes it seem that auxiliaries are simply exempt. This is, in fact, the case with the majority of root-like function words, and I argue in Chapter 7 that it reflects a parametric difference between Khoekhoe and other languages with tone sandhi of this type.

Finally, we come to the morphologically simple adverbs. There are relatively few of these, but the ones I am aware of are listed in (4).

(4) *Monomorphemic adverbs*

[⁰ áí ⁿ] ‘then’	[kóma] ‘supposedly’	[ʔékâ] ‘later’
[⁰ ǎì] ‘already’	[hà ⁿ nà] ‘actually’	[ǰúrô] ‘first’
[⁰ [?] àri] ‘yesterday’		

Like the cases discussed above, adverbs are always bimoraic, can begin with a click and never begin with an approximant. Syntactically, they can occupy the initial “topic” position of a sentence and the first position in an embedded clause, so I assume they are prosodic words. But when it comes to segment distribution, three of the seven examples diverge from the root template. Hagman (1977) transcribes ‘actually’ as [haⁿaⁿna], with a long nasal vowel in the first syllable, while Haacke and Eiseb (2002) give [hana], opting for a short vowel and presumably attributing the

nasalization to coarticulation with the medial [n]. In my recordings of this word (n=24), which are all in connected speech, the first vowel is clearly short, but also fully nasalized, as is the initial [h], so I propose that [hãⁿnà] is an appropriate transcription, despite the fact that short nasal vowels are not possible in a well-formed root. Similarly, the vowel sequence and tone pattern in [ɸúrô] are not found in roots. Hagman nonetheless transcribes it as such, but Haacke and Eiseb and give [ɸúurô] (as it is in the orthography), either because of dialect variation, or else to make the word conform to root phonotactic patterns. In my recordings, however, both vowels are clearly short. The same phonotactic issue is found with [ʔékâ], though this is never written with a long vowel.

These cases most likely arose historically from combinations of a bimoraic root and a monomoraic suffix. But because these words are now adverbs, the first element is no longer a root and no longer obligatorily coextensive with a foot. We saw in Chapters 3 and 4 that unparsed syllables are dispreferred, so it is unsurprising that the first vowel should shorten in a case like these. Synchronically, these exceptions satisfy the constraints on bimoraicity and word-initial segment distribution, and the retention of the medial obstruent in [ʔékâ] can be attributed to an idiosyncratic pseudo-morpheme boundary of the type described in Chapter 4 for exceptional trimoraic roots. Such a boundary would parallel the true morpheme boundaries found in demonstrative adverbs (see section 6.3.1). This explanation also accounts for the irregular tone patterns in [ɸúrô] and [ʔékâ], and we will see below that it is necessary for vowel duration patterns in conjunctions, demonstrative adverbs and pronouns. These words are exceptions, but they do not violate any of the constraints motivated in the previous three chapters as long as we distinguish between those that target roots and those that target grammatical words.

We now turn to the conjunctions, the first category in which all members are not either mono- or bimoraic.

6.1.2 Conjunctions

Unlike the examples we have considered thus far, conjunctions do not pattern together prosodically. Absolute sentence-initial position (i.e., pre-topic position) can be occupied by one of four conjunctions, which are listed in (5).

- (5) *Conjunctions (Hagman :117)*
[tsíⁿíⁿ] (*tsî*) ‘and’ [xàβe] (*xawe*) ‘but’ [ʔó] (*o*) ‘then’ [ʔá] (*a*) ‘that’

Such sentence-initial conjunctions serve to orient the clause in the larger discourse context. As we will see below in the discussion of postpositions and complementizers, this category is prosodically heterogeneous, with two conjunctions that fail to meet the minimality requirement imposed on roots. At first glance, this might suggest that the sub-minimal conjunctions are not prosodic words, but I will show that this is not necessarily the case.

Interestingly, the mono- and bimoraic conjunctions have slightly different syntactic distributions. While *tsî* and *xawe* can be followed by either a full subject or just a PGN marker, *o* and *a* cannot be followed by a full subject. That is, neither the subject nor any other element can occupy the initial topic position in sentences that begin with *o* and *a*. In concrete terms, this means that in the right discourse context, a matrix clause like (6)(a) will correspond to a *tsî*-initial sentence like (6)(b) or (6)(c). Note that these examples are in orthography, rather than transcription.

- (6) a. Namas ge ||ari ||naina go xoa.
 Nama DEC yest. berries PST pick
 ‘And the Nama picked berries yesterday.’
- b. Tsî Namas ge ||ari ||naina go xoa.
 and Nama DEC yest. berries PST pick
 ‘And the Nama picked berries yesterday.’
- c. Tsîs ge Namasa ||ari ||naina go xoa.
 and-PGN DEC Nama yest. berries PST pick
 ‘And the Nama picked berries yesterday.’

In (6)(b), *tsî* simply precedes the DP *Namas*, but in (6)(c), the subject *Namas* is “deposed” to a position immediately after *ge* and a subject PGN marker cliticizes to the initial *tsî* (see Hagman 1977 and Chapter 4 for details). In my recordings, the vowel in *tsî* is always long and the tone is always H-SH in constructions like (6)(b) and (6)(c). This bitonal melody is frequently found on roots, but not on monomoraic function words. The conjunction *xape* ‘but’ patterns with *tsî*, but monomoraic *o* and *a* are restricted to constructions like (6)(c).

It is, however, the case that most PGN markers are syllabic, so the conjunction and PGN marker in constructions like (7)(c) can potentially form a foot. Suggestive evidence that this is the case is provided by minimally different sentences like those in (7).

- (7) a. [tsíⁿíⁿ tíⁿá] ge ||ari ||naina go xoa
 and I DEC yest. berries PST pick
 ‘And I picked berries yesterday.’
- b. [tsíⁿta] ge tita ||ari ||naina go xoa.
 and-PGN DEC I yest. berries PST pick
 ‘And I picked berries yesterday.’

As with the examples in (6) the vowel in *tsî* in (7)(a) is long. In (7)(b), however, it is dramatically shortened, and the tone is no longer rising, but merely SH. This shortening is illustrated with the waveforms in Figure 6.1.

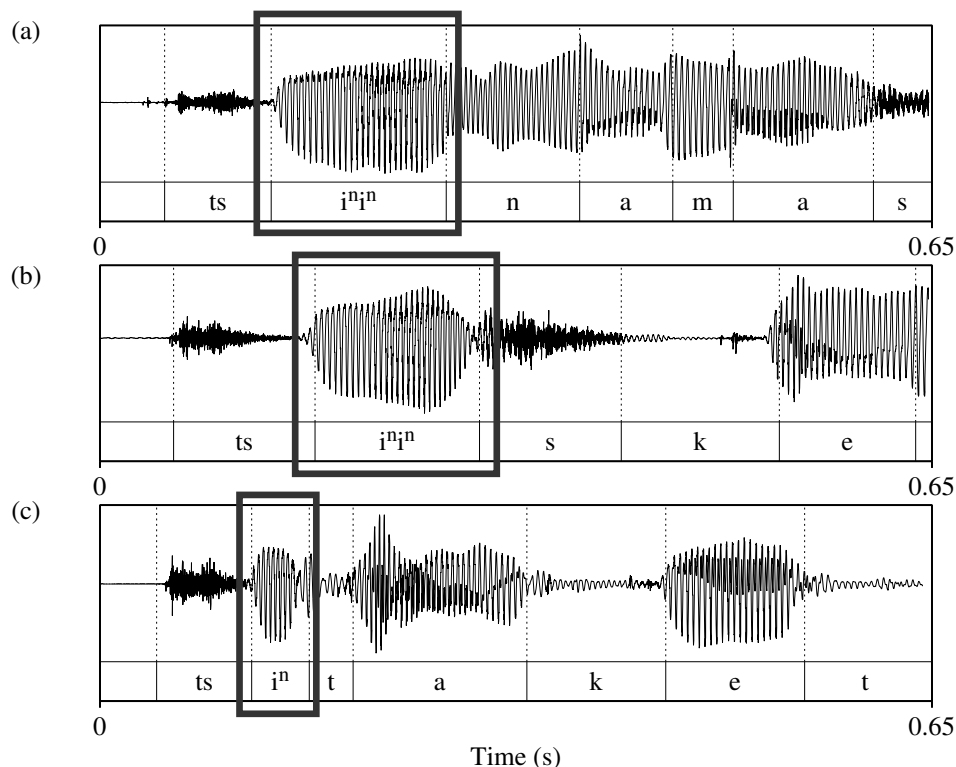


Figure 6.1 Waveforms showing the duration and intensity of: [tsí'í' námás] in sentence (6)(b), [tsí'í'ns kè] in sentence (6)(c), and [tsí'tâ gè] in sentence (7)(b). (Speaker F2).

The vowels in Figure 6.1(a-b) are noticeably longer than that in Figure 6.1(c) in a way that is consistent with the difference between mono- and bimoraic vowels. We will see in section 6.3 that a very similar pattern is found in pronouns and demonstrative adverbs.

More important, this short form of *tsî* is not confined to constructions like (7)(b). I do not have recordings of the adverbial usage mentioned below in Table 6.2, but in coordinated noun phrases like (8)(a) and coordinated predicates like (8)(b), *tsî* is always short and high-toned in my corpus.

- (8) a. Sa !gâs [tsíⁿ] Namab [tsíⁿra] ge ||naina go xoa.
 your sister and Nama and DEC berries PST pick
 ‘Your sister and the Nama picked berries.’
- b. [tsíⁿta] ge masena go ū [tsíⁿ] |Ae||amsa !oa go !kharu.
 and-PGN DEC train PST take and W. to PST proceed
 ‘And the next day, I took the train and proceeded to Windhoek.’

Together, these examples show that *tsî* takes a long vowel only in absolute sentence-initial position, and only when it is not followed by a syllabic PGN clitic. I argue that is because conjunction *tsî* differs from coordinating *tsî* in that its morpho-syntactic context requires it to be a prosodic word, while utterance-internal *tsî* is free to pattern like a particle. But because *tsî* is not a root, it need not be bimoraic when associated with a PGN marker. Taken together, these data suggest that the structures in (9) are appropriate for sentences like those in (6) and (7). Prosodic word boundaries are indicated with “[” and phonological phrase boundaries are indicated with “<”.

- (9) a. < [tsíⁿʔⁿ] > < [námá^s] kè > = (6)(b)
 b. < [tsíⁿʔ^s] kè > = (6)(c)
 c. < [tsíⁿʔⁿ] > < [títá^ː] kè > = (7)(a)⁴⁶
 d. < [tsíⁿtâ] kè > = (7)(b)

This analysis does not, however, account for the vowel duration patterns in sentence-initial *o* and *a*, which are always short, even with obstruent PGN markers like [-s] and [-p]. I argue that the difference between *tsî* on the one hand, and *o* and *a* on the other is that *tsî* has a double vowel underlyingly, while *o* and *a* have single vowels. But because *tsî* is not targeted by ANCHOR-R(Root;PrWd), its vowel shortens in

⁴⁶ I do not have any positive evidence for the phonological phrase boundary before *tita*, since function words do not participate in the diagnostic tone sandhi described in Chapter 7, but I include it here because it is consistent with the vowel length data, and because topics in *tsî*-initial constructions have a degree of semantic “prominence” that suggests such phrasing is appropriate.

contexts where it is followed by a syllabic PGN marker. The conjunctions *o* and *a*, on the other hand, are underlyingly short and cannot lengthen. These patterns are exactly what the constraints motivated in Chapters 3 and 4 would predict as long as some independent constraint penalizes moraic obstruents. Such constraints are well-motivated in the literature (e.g., Zec 1988, Morén 2001), so I simply adopt the formulation in (10).

(10) * μ -O: Moras must not be associated with obstruents.

When this constraint is ranked below DEP, but above MAX, the result is the observed output for both *tsí* and *o*, as demonstrated by the tableaux in (11) and (12). I only consider candidates that meet requirements that hold on prosodic words.

(11)

/ tsí ⁿ í ⁿ + s/	ANCHOR-R (Rt;Ft)	DEP	* μ -O	PARSE- σ	MAX
$\mu\mu$ ☞ a. [(tsí ⁿ í ⁿ s)]					
$\mu\mu$ b. [(tsí ⁿ s)]			*!		*
/ tsí ⁿ í ⁿ + ta /	ANCHOR-R (Rt;Ft)	DEP	* μ -O	PARSE- σ	MAX
$\mu\mu \mu$ b. [(tsí ⁿ í ⁿ ta)]				*!	
$\mu \mu$ ☞ c. [(tsí ⁿ ta)]					*

(12)

/ʔo + s/	ANCHOR-R (Rt;Ft)	DEP	*μ-O	PARSE-σ	MAX
a. μμ [(ʔoos)]		*!			
☞b. μμ [(ʔos)]			*		
/ʔo + ta /	ANCHOR-R (Rt;Ft)	DEP	*μ-O	PARSE-σ	MAX
a. μμ μ [(ʔoo) ta]		*!		*	
☞b. μ μ [(ʔota)]					

In (11), the underlying double vowel is shortened only when it is followed by syllabic PGN marker, but in (12) it is better for the obstruent PGN marker to associate with a mora than it is for a vowel to be inserted. The crucial difference between conjunctions and roots is that conjunctions are not targeted by ANCHOR-R(Root;Foot). I suggested in the discussion of adverbs that this type of constraint interaction might account for the observed irregularities, and we will see below that a similar explanation is needed to account for the patterns in pronouns and demonstrative adverbs.

We now turn to those categories that are prosodically mixed, in which elements do not seem to have prosodic words status.

6.2 Prosodically heterogeneous categories

The words discussed thus far have all been prosodic words, but this is not the case for all “root-like” function words. We now consider morpho-syntactic categories that are prosodically mixed and that include morphemes whose prosodic status is somewhat difficult to assess. We look first at postpositions (section 6.2.1), and then turn to complementizers (section 6.2.2).

6.2.1 Postpositions

As Beach (1938) noted, postpositions look very much like roots, and some even have transparent relationships with existing lexical items (e.g., [xu] ‘from’ < [xúú] ‘to leave’). But closer examination reveals that some postpositions violate the minimality constraints imposed on prosodic words, as illustrated by the transcriptions in Table 6.1. These include those examples from Hagman (1977:102) that I was able to confirm with my consultant.

Table 6.1 Light, heavy and bisyllabic postpositions in transcription [] and orthography ().

Light monosyllable	Heavy monosyllable	Bisyllabic
[xà] (xa) ‘about’	[ʔúú] (u) ‘along’	[k ^h ámí] (khami) ‘like’
[xù] (xu) ‘from’	[^h !à ⁿ a ⁿ] (lnâ) ‘into’	[^h !ʔàma] (ʔama) ‘about’
[^h χâ] (kha) ‘with’	[^h !ʔi ⁿ i ⁿ] (î) ‘to’	[táβa] (tawa) ‘at’
[!â] (!ga) ‘toward’	[ʔói] (ai) ‘on’	
	[!àò] (!gao) ‘under’	Other
	[^h !ʔóá] (!oa) ‘toward’	[^h !ʔáromà] ‘because of’
		[xó ^h χâ] (xō ^h khā) ‘along’

Postpositions always begin with an obstruent and otherwise conform to the segmental distribution patterns found in roots. Syntactically, however, they never occur in initial position, and it is unclear whether they should be regarded as prosodic

words. In terms of quantity, postpositions with two or three syllables or with a diphthong are unquestionably bimoraic, but status of the monophthongal monosyllables is more difficult to establish. In my recordings, the nasal vowels in [ʰ!àⁿaⁿ] and [ʰ!ʔiⁿiⁿ] are clearly long, but for my speakers, there is variability in the production of [xù] and to a lesser extent, [ʔúú]. In the orthography, the former is written with a short vowel, but it is transparently related to [xúú] ‘to leave’, and in my data, the realization of this postposition is variable. One speaker produces the postposition consistently with a short vowel and low level tone (Speaker M3, n=8), one produces it consistently with a longer vowel and a rising tone (Speaker M2, n=8), and one seems to alternate between the two productions (Speaker F2, n=8). More or less the same pattern is found with [ʔúú]. With such a small corpus, it is difficult to identify the source of the variability. In any case, the three monosyllabic postpositions with [a] are consistently produced with short vowels, at least in connected speech. This is illustrated by the waveforms in Figure 6.2, in which the postpositions follow a noun to which their vowel durations and intensities can be compared.

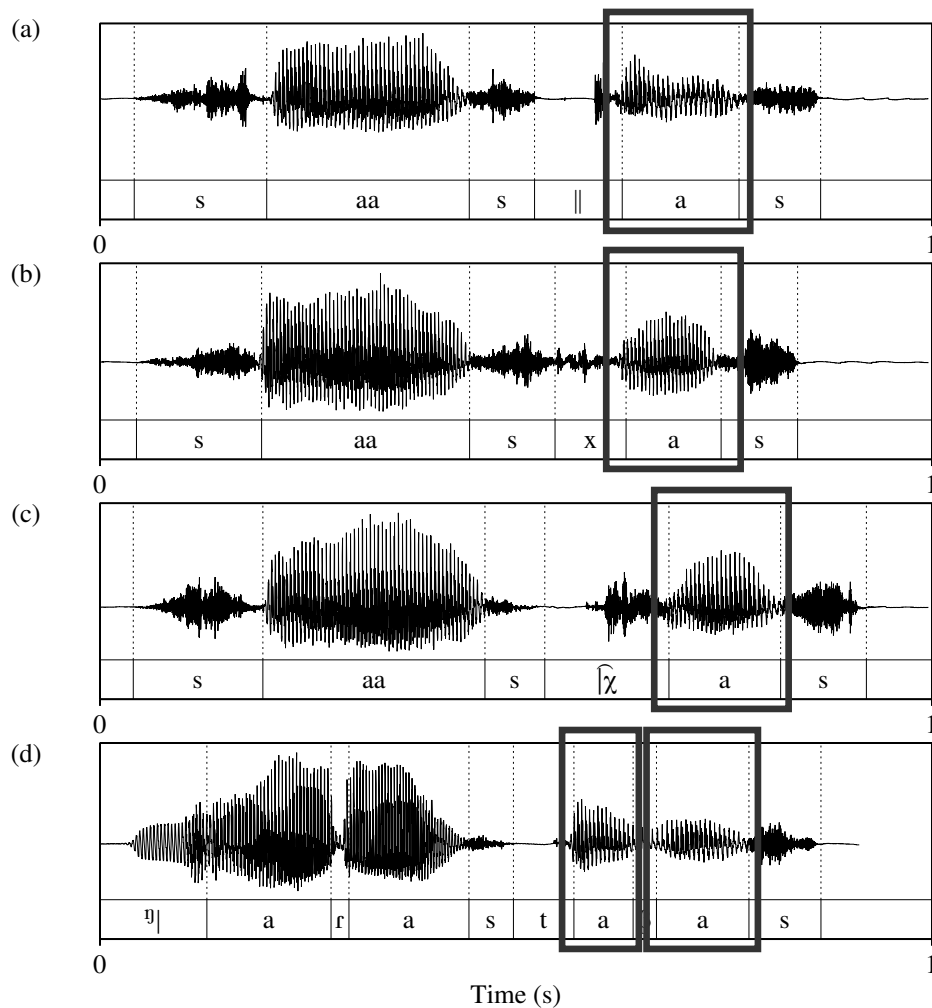


Figure 6.2 Waveforms showing the duration and intensity of nouns and postpositions: (a) [sàas ||âs] ‘toward the San’, (b) [sàas xàs] ‘about the San’, (c) [sàas |χâs] ‘with the San’, and (d) [ʔárás táβas] ‘under the umbrella thorn’. Extracted from initial, topic position of structurally and prosodically comparable sentences. (Speaker F2).

In examples Figure 6.2(a)-(c), the postposition vowels are consistently shorter and less intense than those of their objects. Moreover, their durations are roughly comparable to that of the second vowel in [táβa] in Figure 6.2(d), so I assume that they are, in fact, monomoraic. If we assume that FOOT-BINARITY is inviolable in Khoekhoe, this suggests that monomoraic postpositions cannot be prosodic words.

The most extraordinary exception is not, in fact, the monomoraic postpositions, but rather a bimoraic postposition with a medial click: [xóχâ] ‘along’. Though such words do occur in Sandawe and in some Bantu languages, they are not, to my knowledge, otherwise attested in southern African Khoesan. In the orthography, this word is written with two long vowels (i.e., *xō/khā*), but the waveform in Figure 6.3 shows that both vowels are clearly short, like the vowel in //ga ‘toward’.

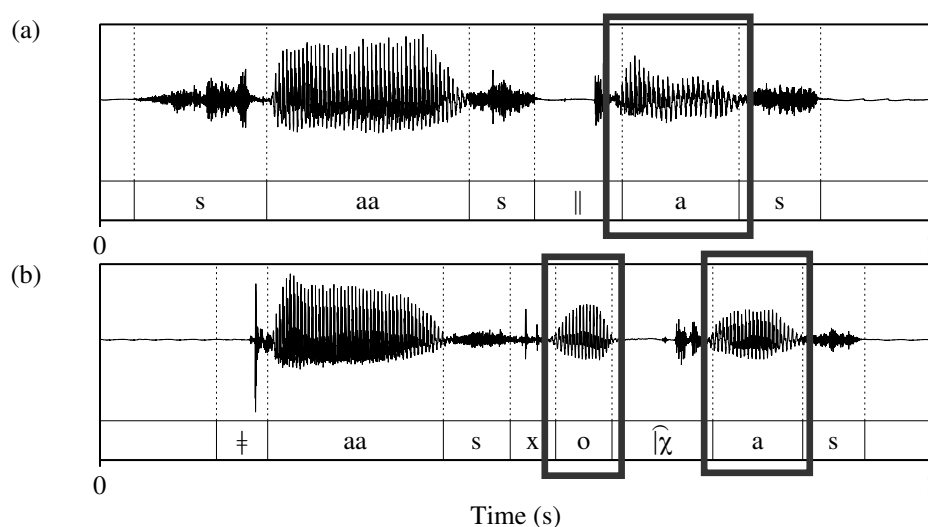


Figure 6.3 Waveforms showing the duration and intensity of nouns and postpositions: (a) [sâas ||âs] ‘toward the San’, and (b) [ɬâas xóχâs] ‘along the field’. Extracted from initial topic position of structurally and prosodically comparable sentences. (Speaker F2).

Haacke and Eiseb (2002) list *xō/khā* under the head word [xóo] ‘cheek’, which may well be its diachronic source, but the durations of these syllables clearly indicate that the vowels are synchronically monomoraic. Auditorily, the syllables do not give the impression of forming a prosodic unit the way, for instance, [táβa] does. Rather, they sound like successive monomoraic particles. This, together with the otherwise exceptionless generalization that clicks cannot occur in foot-medial position, suggests that these two syllables do not form a foot.

Given these vowel duration patterns, what prosodic status should we assign to postpositions? First of all, the fact that postpositions can be monomoraic shows that they do not *obligatorily* map to prosodic words. Nor does word order suggest a prosodic word analysis, because postpositions always follow their objects, which invariably have prosodic word status. If we make the simplifying assumption that monomoraic postpositions cannot be prosodic words, there are two logical possibilities. The first is postpositions are never prosodic words, and that they are simply syllables or feet that get parsed into higher-level prosodic structure. This possibility is represented for mono- and bimoraic postpositions in (13)(a). Phonological phrase boundaries are indicated with “>”, prosodic word boundaries with “[]” and foot boundaries with “)”. The second possibility is that monomoraic postpositions are sub-minimal and prohibited from acquiring prosodic word status, but that bimoraic postpositions are free to do so. This would be equivalent to the analysis of Serbian motivated by Zec (2005) and the analysis of Hungarian motivated by Trommer (2008). This possibility is represented in (13)(b).

(13) Possible prosodic structures for postpositions

- a. < [sàas] ||â >, <[(⁰|árás)] (táβa)>
- b. < [sàas] ||â >, < [(⁰|árás)] [(táβa)] >

Unfortunately, there is no clear-cut phonological evidence in Khoekhoe to help us decide between these possibilities. We can, however, observe that the representation in (13)(b) is equivalent to that of two successive prosodic words, for instance an adjective and a noun. There is a very strong tendency for sequences of a noun and a postposition to give an auditory impression that is distinct from that of an adjective and a noun. Specifically, the adjective-noun sequence sounds like two elements of equal more or less prominence, while the postposition tends to sound

weaker prosodically than its object. This is illustrated by the duration and intensity patterns of the waveforms in Figure 6.4.

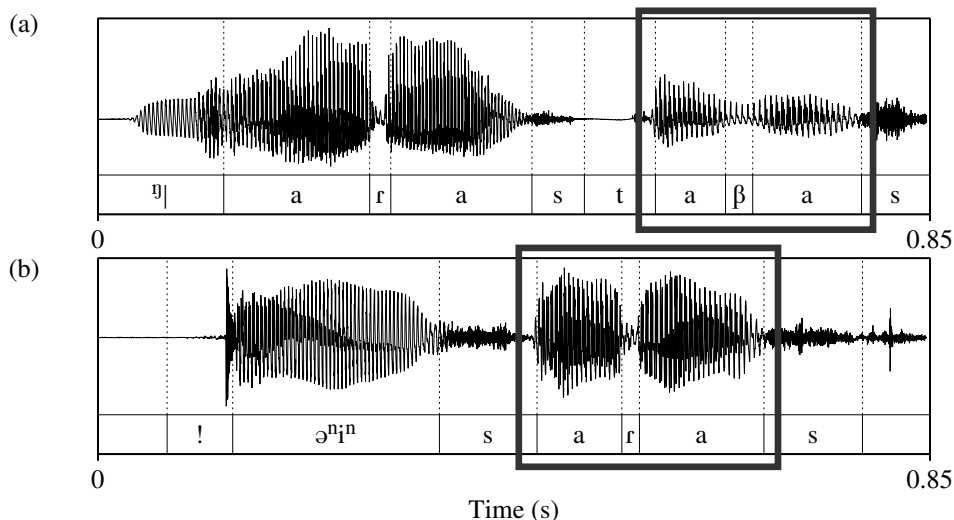


Figure 6.4 Waveforms showing the duration and intensity of: (a) [ʰ]árás táβas] ‘under the umbrella thorn’ and (b) [!ə̃ᵐᵐ sāràs] ‘good clothes’. Extracted from initial topic position of structurally and prosodically comparable sentences. (Speaker F2).

Here we see that the postposition is noticeably weaker in intensity and shorter in duration than the root that precedes it, but this is not the case with the adjective-noun sequence. It does not seem appropriate to regard these two examples as prosodically equivalent, so I tentatively assign Khoekhoe postpositions the structure in (13)(a). This means that the postpositions in Table 6.1 have prosodic representations shown in (14).

- (14) Prosodic status of postpositions
- a. Monomoraic: $x a_{\sigma} / x u_{\sigma} / \widehat{\chi} a_{\sigma} / \| a_{\sigma}$
 - b. Bimoraic: $(?uu)_{Ft} / (!ao)_{Ft} / (k^h\text{ami})_{Ft} / (ta\beta a)_{Ft}$
 - c. Exceptional: $x o_{\sigma} \widehat{\chi} a_{\sigma} / (\overset{!}{?}aro) ma_{\sigma}$

But if postpositions are not prosodic words, why is it that roughly half of them begin with a click? We saw in Chapter 4 that clicks are one of the defining features of

roots, which always occupy prosodic-word initial position. I argue that this can be accounted for if we recognize that roots and postpositions both initiate grammatical words in a way that particles do not, and that the constraints in Chapter 4 specifically targets word-initial position. This analysis is corroborated by the observation that postpositions exhibit variable patterns cross-linguistically, patterning with content words in some languages (e.g., German Hall 1999a) and with function words in others (e.g., English, Selkirk 1995).

6.2.2 Complementizers

The second prosodically mixed category we will consider is the complementizers. I define “complementizer” broadly as any morpheme that occurs at the end of an embedded clause (Hagman 1977:121). Embedded clauses vary in terms of which elements they contain (e.g., subjects, tense markers), but all have a predicate and all lack second-position sentential particles like *ge* (see Chapter 7). Only relative clauses lack an overt complementizer. Complementizers are a prosodically heterogeneous class that includes suffixes and particles, as well as heavy monosyllables and polysyllabic forms. They are listed in Table 6.2. Note that these examples are given in orthography because I do not have enough information to transcribe the lengths of all vowels accurately. Orthography is, however, sufficient to demonstrate the range of variation.

Table 6.2 Khoekhoe complementizers (Hagman 1977:121-138)

Light monosyllable		Heavy monosyllable		Polysyllabic	
<i>-s/-i</i>	nominalizer	<i>-lâ</i>	participial ⁴⁷	<i>xape</i>	‘although’
<i>-pa</i>	locative	<i>tsî</i>	‘as’	<i>hîa</i>	‘while’
<i>-se</i>	participial	<i>khais</i>	‘that’	<i>xuige</i>	‘since’
<i>-ka</i>	‘so that’			<i>amaga</i>	‘since’
<i>ti</i>	quotative			<i>xui-ao</i>	‘since’
<i>ga</i>	‘instead of’				
<i>o</i>	‘when’				

The light monosyllables include the PGN markers *-s* and *-i*, which serve as nominalizers, the adverbial suffixes *-pa* and *-se*, and the particles *ti*, *ka* and *o*. In my data, these are all clearly monomoraic, and they are represented as such in the orthography. There are also words that seem to conform to root phonotactics (*khais*, *xape* and possibly *lâ*), and words that look like suffixed or compounded roots (*xuige*, *amaga*, *xui-ao*). The most exceptional in phonotactic terms is *hîa*. In my recordings, this seems to be bisyllabic, and only the first vowel is nasalized, but the [iⁿ] is quite short and there is no glottalization between the vowels (i.e., [hiⁿ.a]). In any case, it violates the phonotactic constraints that hold on roots, much like the adverbs discussed in section 6.1.1. Overall, we find far more flexibility in the set of morphemes that mark embedded clauses than any other category, including postpositions. While there is no *a priori* reason these words must all be of the same prosodic type, the range of variation is striking. As with the postpositions, it is clear that minimality constraints cannot apply to the category as a whole, and I assume that they should be analyzed in terms comparable to the postpositions. Together, postpositions and complementizers

⁴⁷ Hagman analyzes this as a “root”, but Haacke and Eiseb (2002) list it as a suffix. Both sources assume that the nasal vowel is long. Unfortunately, I have no examples in my corpus.

constitute an intermediate category that is less root-like than function words with prosodic word status, but more root-like than clitics.

6.3 Morphologically complex forms

We saw in Chapters 3 and 4 that the behavior of suffixed roots shows that they are obligatorily coextensive with the head (and only) foot of the prosodic word they initiate. In this section, we turn to the behavior of morphologically complex function words that are not subject to this restriction. Words of this type begin with morphemes that surface with long vowels when they occur in isolation, but short vowels in morphologically complex forms, suggesting that they are not subject to ANCHOR-R(Root;Foot), even though they do initiate prosodic words. I first discuss the duration patterns in demonstrative adverbs (section 6.3.1), and then turn to the data on pronouns (section 6.3.2).

6.3.1 Quantity in demonstrative adverbs

As discussed above, Khoekhoe has a relatively small set of morphologically simple adverbs, which typically look like roots. But there is also a somewhat larger class of morphologically complex adverbs, which are formed by combining a demonstrative and one of four suffixes (Hagman 1977:98), and vowel durations in the demonstrative morpheme varies with the suffix. When the suffix is monomoraic, the demonstrative vowel is short, but when the suffix is bimoraic, the demonstrative vowel is long. This pattern, along with the proposed prosodic bracketings, is illustrated for the demonstrative /nee/ ‘this’ in (15) and the spectrograms in Figure 6.5, in which the demonstrative duration is compared to that in [pee-pa] ‘bus’. Morpheme boundaries are indicated with a hyphen.

- (15) a. [nee] ‘this’
 b. [ne-pa] ‘here (i.e., this place)’
 c. [ne-ti] ‘in this way’
 d. [ne-tse] ‘today (i.e., this day)’
 e. [nee-^{h̃}i^{ñ}] ‘this direction’

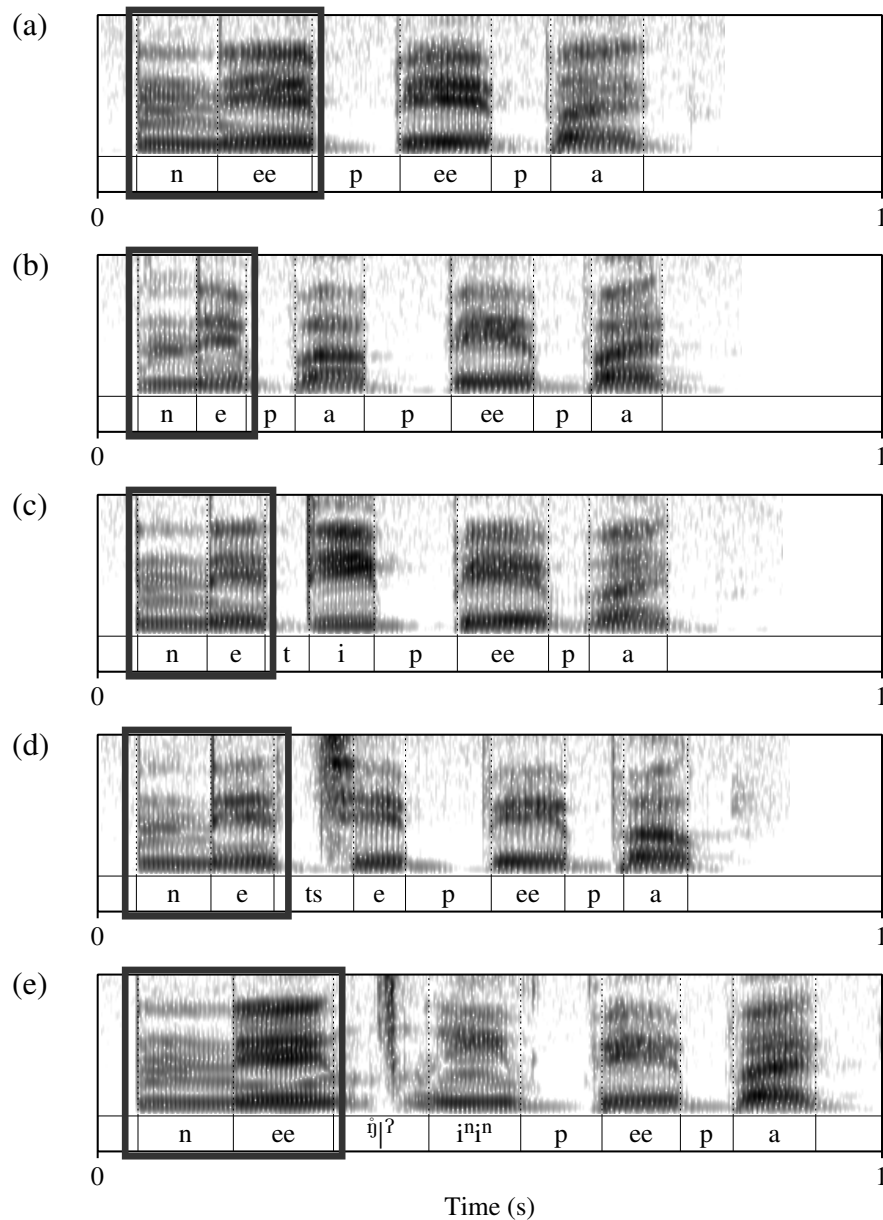


Figure 6.5 Spectrograms showing the durations of demonstratives and the reference noun [pee-pa] ‘bus’ for: (a) [nee] ‘this’, (b) [ne-pa] ‘here’, (c) [ne-ti] ‘in this way’, (d) [ne-tse] ‘today’ and (e) [nee-^{h̃}i^{ñ}] ‘this direction’. Extracted from sentences of the form *Namas ge nēpa bēba gere mû*. ‘The Nama saw the bus here.’ (Speaker M3).

The duration of [e] in the bare demonstrative in (15)(a) and in the adverb in (15)(e) is greater than the duration of [e] with the other suffixes. This pattern stands in opposition to what we find with roots like [pee-pa] ‘bus’, which retains its long vowel, even in its suffixed form. This kind of shortening is not limited to adverbials with [nee], as illustrated by the adverbs in (16) and the spectrograms in Figure 6.6, where again, the vowel in the first syllable of the adverb is significantly shorter than that in the reference noun. This pattern in fact obtains across the range of possible demonstrative/suffix combinations, as illustrated in Figure 6.7..

- | | | | |
|------|----|-------------------------|---------|
| (16) | a. | [ne-pa] | ‘here’ |
| | b. | [^{ɔ̃} a-pa] | ‘there’ |
| | c. | [ma ⁿ -pa] | ‘where’ |
| | d. | [^χ a-pa] | ‘again’ |

The boxplots in Figure 6.7 show the relationship between the duration of the vowel in the demonstrative and the duration of a bimoraic vowel in the frame sentence. Across speakers and combinations, the bare demonstratives (D) have durations that are comparable to the reference noun, as reflected by the mean ratio of approximately 1.0.⁴⁸ The ratios in demonstratives with [^{ɔ̃}||iⁿiⁿ] ‘manner’ are comparable, but those with the other suffixes are all well below 1.0, reflecting phonologically shortened vowels. These observations are corroborated by the intuitions of a linguistically-trained native speaker (Levi Namaseb, p.c.), though they are not reflected in the official orthography.

⁴⁸ The auditory impression of the extreme outliers with the bare demonstratives is one of contrastive focus, which seems to have been an inadvertent consequence of the recording context. Auditorily, this also seems to be an issue for the demonstrative adverbs. But significantly, we see an effect *in spite* of the focus, which increased the duration of the adverbs’ first syllables, making them durationally more syllable to the unfocused roots.

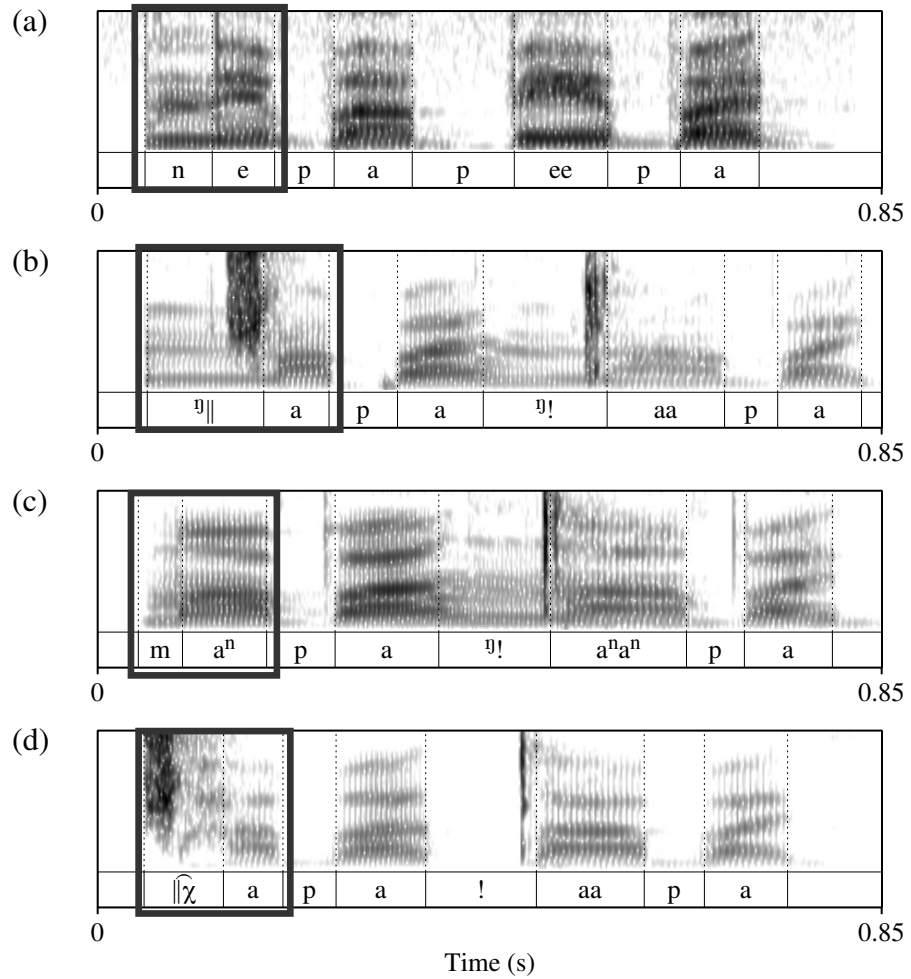


Figure 6.6 Spectrograms showing the durations of: (a) [ne-pa] ‘here’ and [pee-pa] ‘bus’, (b) [ʔ||a-pa] ‘there’ and [ʔ!aⁿaⁿ-pa] ‘light’, (c) [maⁿ-pa] ‘where’ and [ʔ!aⁿaⁿ-pa] ‘light’ and (d) [||χa-pa] ‘again’ and [!aa-pa] ‘servant’. Extracted from sentences of the form *Namas ge nēpa bēba gere mû*. ‘The Nama saw the bus here.’ (Speaker M3).

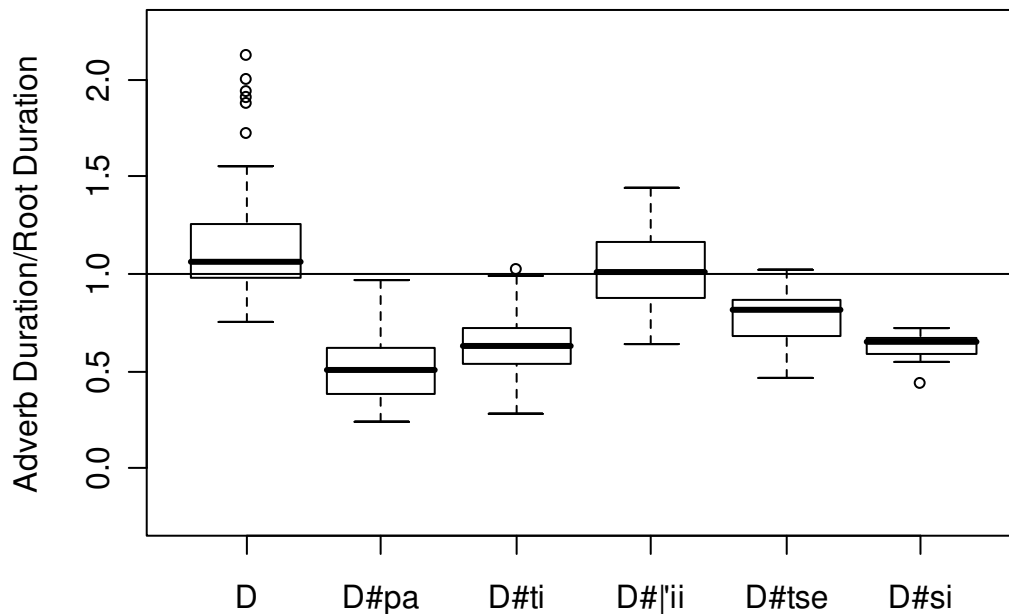


Figure 6.7 Ratio of the duration of the first vowel in a demonstrative or demonstrative adverb to the duration of a long vowel in the frame sentence. Extracted from sentences of the form *Namas ge nēpa bēba gere mû*. ‘The Nama saw the bus here.’ (n=20, Speakers F2, F3, F4, M2, M3).

The constraints that control the duration of the base vowel are shown in (17), which is repeated from Chapter 3. Recall that the outcome is the same, regardless of the vowel length we assume for the input. Note that I assume that $[\overset{\delta}{i}i^n]$, which patterns phonotactically like the roots, obligatorily initiates a prosodic word. Though both demonstratives and demonstrative adverbs map to prosodic words, demonstrative morphemes are not subject to ANCHOR-R(Root;Foot), and since the initial morpheme in demonstrative adverbs is not obligatorily heavy, minimality can be satisfied by the morphological word.

(17)

/nee/	ANCHOR-L (Rt;PW)	FT-BIN	PARSE- σ	MAX
a. [(ne)]		*!		*
☞ b. [(nee)]				
/nee + pa/	ANCHOR-L (Rt;PW)	FT-BIN	PARSE- σ	MAX
☞ a. [(nepa)]				*
b. [(ne) pa]		*!	*	*
c. [(nee) pa]			*!	
/nee + $\hat{h}i^n i^n$ /	ANCHOR-L (Rt;PW)	FT-BIN	PARSE- σ	MAX
a. [(ne $\hat{h}i^n$)]	*!			**
b. [(nee) $\hat{h}i^n i^n$]	*!		*	
☞ c. [(nee)] [$\hat{h}i^n i^n$]				

We now turn to the patterns in pronouns.

6.3.2 Quantity in pronouns

Khoekhoe pronouns are always morphologically complex and typically bisyllabic. They consist of a base that is determined by the person of the referent, and the appropriate PGN marker, as illustrated in (18).⁴⁹

(18)	[ti-ta] ‘I’	[si-k ^h om] ‘we (M.D.EX)’	[si-se] ‘we (F.PL.EX)’
	[sa-ts] ‘you (S.M)’	[sa-k ^h om] ‘we (M.D.IN)’	[sa-ro] ‘you (F.D)’
	[$\hat{h}i^n$ -p] ‘he’	[$\hat{h}i^n$ -ku] ‘they (M.PL)’	[$\hat{h}i^n$ -ra] ‘they (F.D)’

⁴⁹ Note that Beckman and others cites a claim by Swadesh (1971:130) that Khoekhoe (Hottentot) lacks clicks in pronouns. If we include the full forms of pronouns, and not just PGN markers, this claim is empirically incorrect.

The PGN markers were discussed in Chapter 4, so this section will focus on the behavior of the base. In their pronominal forms, base morphemes are generally monomoraic, but the morphemes /ti/ ‘1st person, singular’ and /sa/ ‘2nd person’ also have unbound forms that function as possessive adjectives, and the possessive adjective versions are optionally bimoraic.⁵⁰ The durational differences between the vowel /i/ in a root, a full possessive adjective and a pronoun are illustrated in Figure 6.8.

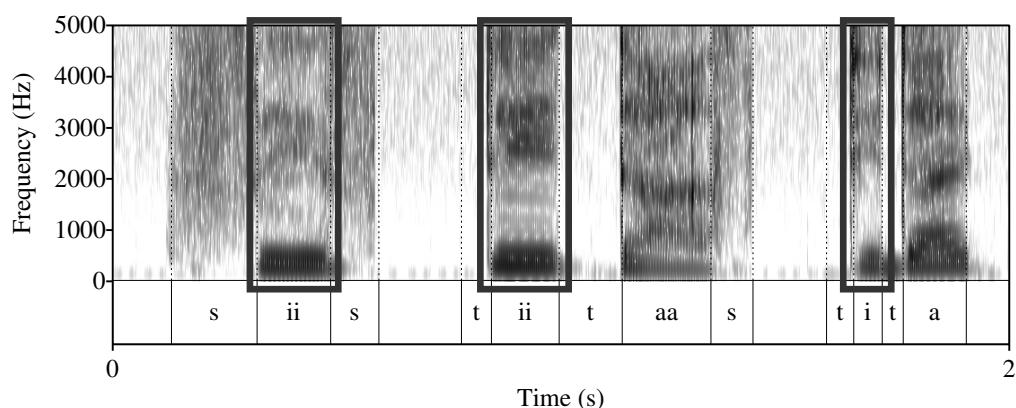


Figure 6.8 Spectrogram showing duration differences among: (a) the root [sii-s] ‘fart’, (b) the noun phrase [tii taa-s] ‘my victory’ and (c) the pronoun [ti-ta] ‘I’. Extracted from frame sentences of the form *Sīs xa ta ra ʔâi*. ‘I am thinking about the fart.’ and *Tita ge ra ʔama*. ‘I am showing off.’ (Speaker F2).

Here we see that the vowel in [tii] ‘my’ (center) is of a duration comparable to that in the root [siis] (left). That, together with its syntactic distribution suggest it should be analyzed as a prosodic word. The vowel in [tita], on the other hand, is

⁵⁰ Both duration and tone on these morphemes seem to vary, but I do not have enough examples in my corpus to suggest what factors may be conditioning the variation. The bare forms are represented in the orthography with a short vowel, but in at least some contexts, they surface with a long vowel. I assume that the forms with long vowels are prosodic words, while the forms with short vowels are free proclitics. Moreover, I have recordings of short forms in a sandhi context, in which case they take a falling, rather than a high level melody. To my knowledge, these are the only clitics that alternate.

clearly very different. Here the morpheme /ti/ has a short vowel, and the word as a whole has a medial consonant and a vowel sequence that is strictly prohibited in roots.

Interestingly, the durational alternation seen with the morpheme /ti/ above is also found with the third-person base, which contains a nasal vowel. The difference between a root with the 3.F.D PGN marker [-ra] and the corresponding pronoun is illustrated by the spectrogram in Figure 6.9.

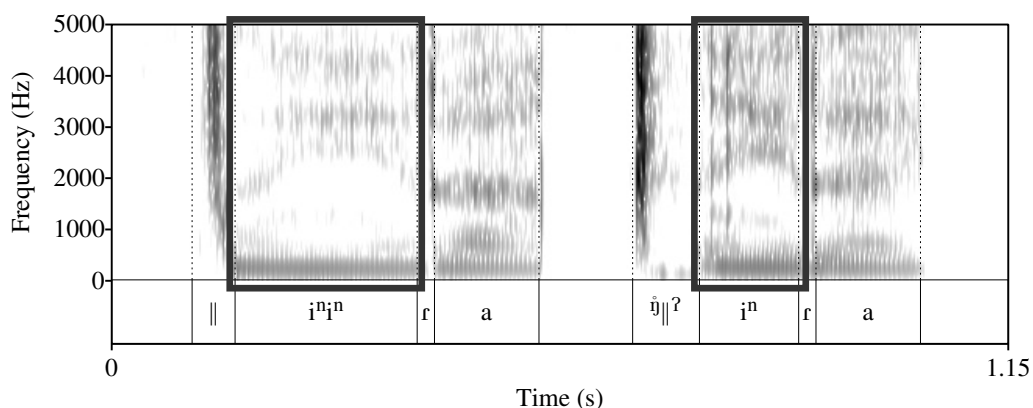


Figure 6.9 Spectrogram showing duration differences between: (a) the inflected root $[[i^n i^n -ra]$ ‘warts (F.D)’ and (b) the pronoun $[\hat{ʔ} i^n -ra]$ ‘they (F.D). Extracted from sentences of the form $/G\hat{i}s\ xa\ ta\ ra\ \hat{\neq}ai.$ ‘I am thinking about the wart.’ and $||\hat{t}ra\ ge\ ra\ \neq ama.$ ‘They (F.D) are showing off.’ (Speaker F2).

Here we see a near-minimal pair with a root plus a PGN marker, $[[i^n i^n -ra]$ ‘warts’, in which the root constitutes a foot, and a pronoun $[\hat{ʔ} i^n -ra]$, where each morpheme is simply a light syllable.

Though the shortening of the base vowel is quite robust with syllabic PGN markers, my data suggest variation when it comes to the single-segment markers, as illustrated by the duration data for first-person pronouns in Figure 6.10.

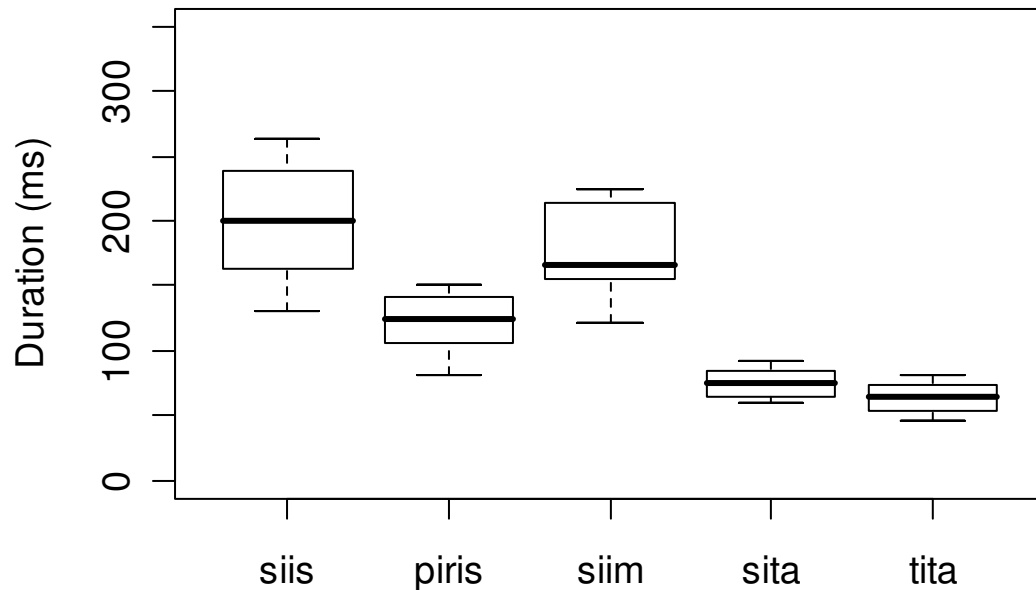


Figure 6.10 Durations of the vowels in: (a) [sii-s] ‘fart’, (b) [piri-s] ‘goat’, (c) [sii-m] ‘we’, (d) [si-ta] ‘we’ and (e) [ti-ta] ‘I’. Extracted from sentences of the form *Sîs xa ta ra #âi*. ‘I am thinking about the fart.’ and *Tita ge ra #ama*. ‘I am showing off.’ (Speakers F2, F3, F4, n=12).

This plot compares the durations of [i] in CVV and CVCV roots with [i] in the pronouns [siim] ‘we (C.D)’, [sita] ‘we (C.P)’ and [tita] ‘I’. We see that the vowel is quite short in [sita] and [tita], but that it is longer in [siim] (the orthographic representations for all three pronouns have short vowels). We might, then, think that PGN nasals are non-moraic and that the long [i] was required to fulfill the minimality constraint on prosodic words. But turning to the second person, we see a slightly different pattern, as shown in Figure 6.11.

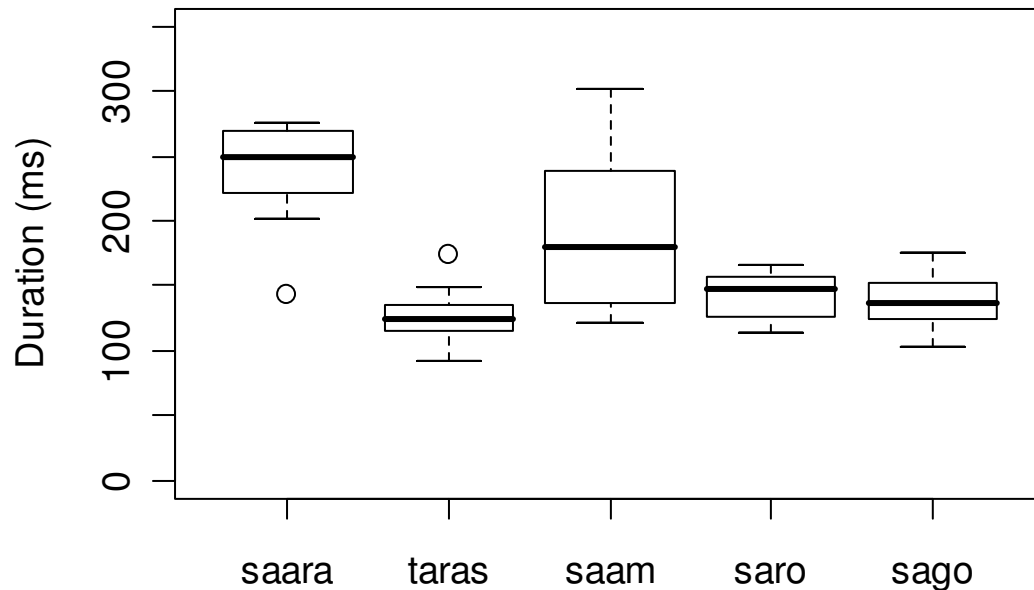


Figure 6.11 Durations of the vowels in: (a) [sàa-râ] ‘San (F.D)’, (b) [tárá-s] ‘woman’, (c) [saa-m] ‘we (F.D.EXCL)’⁵¹, (d) [sa-ro] ‘you (F.D)’ and (e) [sa-ko] ‘you (M.P)’. Extracted from sentences of the form *Taras ge ra ~~ama~~*. ‘The woman is showing off.’ (Speakers F2, F3, F4, n=12).

Here we see that the base vowel in pronouns with syllabic PGN markers is short, but curiously, the distribution of vowel durations with [saam] ‘we (F.D.EXCL)’ covers the range from the short to the long vowels. Closer examination reveals that this is due to inter-speaker variation: One speaker tended to use a long vowel, while the other two used a short vowel. There is a similar issue with the third person, as in Figure 6.12.

⁵¹ Khoekhoe has both exclusive and inclusive pronouns. The inclusive pronouns use the second person base with the first person PGN marker of the appropriate gender and number (Hagman 1977). For convenience, I will simply call these “second person pronouns”.

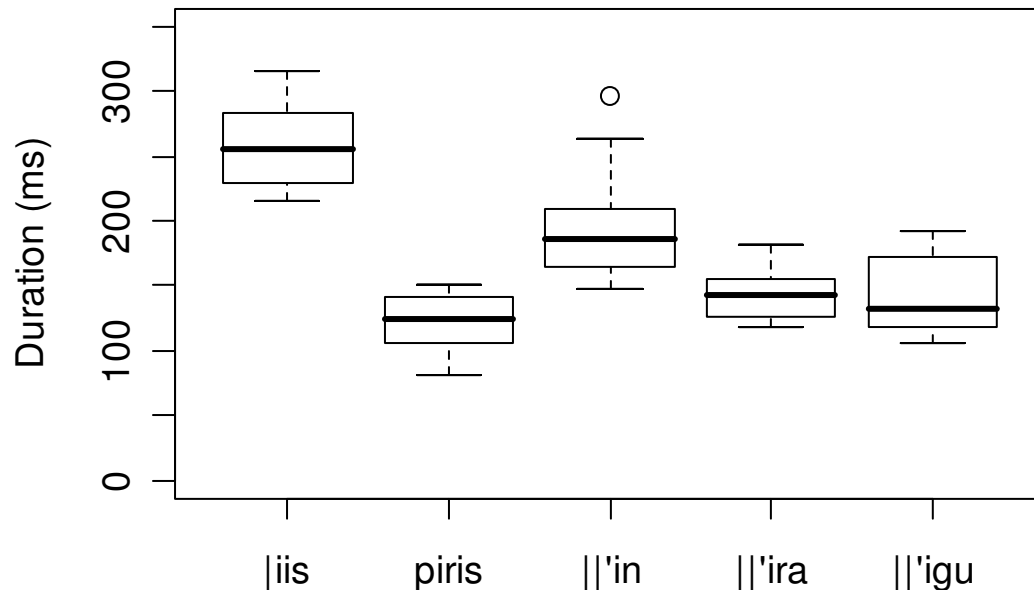


Figure 6.12 Durations of the vowels in: (a) [iⁿiⁿ-s] ‘wart’, (b) [piri-s] ‘goat’, (c) [ʔⁿʔⁿ-n] ‘they (C.PL)’, (d) [ʔⁿʔⁿ-ra] ‘they (F.D)’ and (e) [ʔⁿʔⁿ-ku] ‘they (M.PL)’. Extracted from frame sentences of the form /*Gîs xa ta ra #âi*. ‘I am thinking about the wart.’ and /*Îra ge ra #ama*. ‘They (F.D) are showing off.’ (Speakers F2, F3, F4, n=12)

Again, the syllabic PGN markers occur with a short base vowel, while the vowel durations in forms with [-n] varies, and again this is due in part to inter-speaker variation. In any case, the present data set cannot resolve the question of the status of monosyllabic pronouns, so it will have to remain a matter for future research. The key point is that the base vowels in the bisyllabic pronouns shorten consistently, indicating that the base itself does not have the same status as a root. That is, it is not targeted by ANCHOR-R(Root;Foot).

6.4 Summary

In this chapter, I have motivated a view of the content/function word divide that does not treat function words as a homogeneous class. Rather than a sharp division, we find a clustering of properties that requires us to distinguish among constraints that target prosodic words (e.g., minimality) and those that target

grammatical words (e.g., click distribution). We will see in Chapter 7 that we also need to recognize those constraints that target only roots.

CHAPTER 7: POST-LEXICAL TONE AND PHRASAL ALIGNMENT

7.0 Introduction

As shown in Chapter 5, Khoekhoe patterns with the majority of African languages in using tone to mark lexical contrasts, but it differs from both its Khoesan and its Bantu neighbors in that the tone melodies associated with roots alternate categorically in different syntactically-conditioned environments. In this respect, Khoekhoe resembles languages found in eastern Asia, most famously Xiamen (Chen 1987). In both languages, a word's default melody is replaced in certain contexts, and the relationships between associated "citation" and "sandhi" melodies cannot be captured in strictly phonological terms, though generalizations can be made about the citation and sandhi inventories (see Chapter 5 for discussion). Indeed, this alternation looks more like distributional allomorphy than "sandhi" as it is usually understood (Tsay and Myers 1996, see also Yip 2004 on tonal allomorphs in Zahao). The forms of Khoekhoe tonal allomorphs were discussed in Chapter 5; this chapter will focus on their distribution.

In Xiamen, it has been argued that the distribution of citation melodies is best captured with reference to a domain that corresponds to the phonological phrase. The right edges of these domains align with the right edges of certain maximal projections, and citation forms occur only at the right edges of domains (Chen 1987, 2000, Lin 1994). Crucially, these analyses assume that tone alternations result from a rule or constraint that operates within a *phonological*—not syntactic—domain. That is, the choice of tonal allomorph is taken to be a matter for the phonological component of the grammar. Moreover, the equation of this tonal domain with the phonological phrase indicates that the domain is presumed to be part of the Prosodic Hierarchy

(Selkirk 1978/81, Nespors and Vogel 1986). This approach is not without its problems, even for Xiamen, but this chapter will show that it can be adapted for the Khoekhoe data with relatively few qualifications.

I will also show that Khoekhoe differs from Xiamen in several important respects. We saw in Chapter 5 that the relationship between citation and sandhi melodies is very different from the “tone circles” found in Southern Min languages. This underscores the fact that the constraints driving alternation are formally independent of the associations between citation and sandhi inventories. Second, citation melodies in Khoekhoe are found at the beginning of the phonological phrase, not the end, a pattern that is unattested in east Asian languages with tone sandhi of this type. Finally, Khoekhoe differs from Southern Min languages in that the majority of function words fail to undergo sandhi, even when they bear “root-like” tone melodies. Taken together, these patterns have important implications for theories of tone sandhi (e.g., Chen 2000, Zhang 2007), which have focused almost exclusively on the areally and genealogically related languages of China, and for theories of phonological phrasing (e.g., Selkirk 1986, 2000, Nespors and Vogel 1986, Truckenbrodt 1995, 1999).

This chapter will be structured as follows. Section 7.1 offers an overview of Khoekhoe tonal alternations, while section 7.2 provides a brief summary of the analyses that have been proposed for Xiamen. I then present data for Khoekhoe nouns and adjectives (7.3), verbs (7.4) and other parts of speech (7.5). The implications of these patterns are discussed in section 7.6.

7.1 Overview of Khoekhoe tone sandhi

We saw in Chapter 5 that Khoekhoe roots (i.e., nouns, verbs and adjectives) belong to one of six tone classes, but that the melody associated with a particular root

in a particular utterance depends on both its category affiliation and its morpho-syntactic context. That is, nouns, verbs and adjectives can surface with melodies that are markedly different from their citation forms. The citation and sandhi inventories are summarized in (30).

(1)

Citation	Sandhi
SL-L	SL-L
SL	L-SL
H	
L	L
H-SH	
SH	H

Sandhi positions are characterized by four rather than six contrasts, with mergers between citation SL and H, as well as between citation L and H-SH. Two categories (SL-L and L) have identical citation and sandhi forms, two level tones (SL and H) become falling, and one level tone (SH) is lowered. The distribution of citation and sandhi forms is the same for all six categories. Because of the very obvious difference between citation H-SH and its sandhi counterpart L, examples in this chapter will generally involve words from this category, but the same pattern obtains with words of other categories, even in cases where “alternation” is not apparent (e.g., L→L).

Previous work on both Khoekhoe (Haacke 1999a) and Xiamen (Chen 1987, 2000, Lin 1994) has referred to this type of paradigmatic alternation as “sandhi”, but two examples will suffice to show why these alternations cannot be analyzed as (external) sandhi in its strictest sense. First of all, the trigger for substitution is independent of a melody’s identity. Khoekhoe nouns generally occur in citation form,

but when they are preceded by a modifier, the modifier takes citation form and the noun takes sandhi form. In true cases of tone sandhi, like Ewe tone raising (Clements 1978), which can be analyzed as register assimilation (Odden 1995), or the well-known dissimilatory pattern with Mandarin tone three (e.g., Shih 1997), it is the *identity* of the adjacent tones that triggers the change. Alternation in Khoekhoe (and Xiamen) is independent of the tone category of either the modifier or the noun, as illustrated by the examples in (2) and (3), and the pitch tracks in Figure 7.1 and Figure 7.2. Here and throughout, morphemes in citation form are bolded, while those in sandhi form are underlined.

- | | | | |
|-----|----|----------------------------|------------------|
| (2) | a. | [námáʃ] | ‘Nama (F.S)’ |
| | b. | [nèè] <u>nàmas</u> | ‘this Nama’ |
| | c. | [nàù] <u>nàmas</u> | ‘that Nama’ |
| | d. | [hàra] <u>nàmas</u> | ‘the other Nama’ |
| | e. | [ʔáá] <u>nàmas</u> | ‘that Nama’ |
| | f. | [áí] <u>nàmas</u> | ‘the bad Nama’ |
| | g. | [sáa] <u>nàmas</u> | ‘your Nama’ |

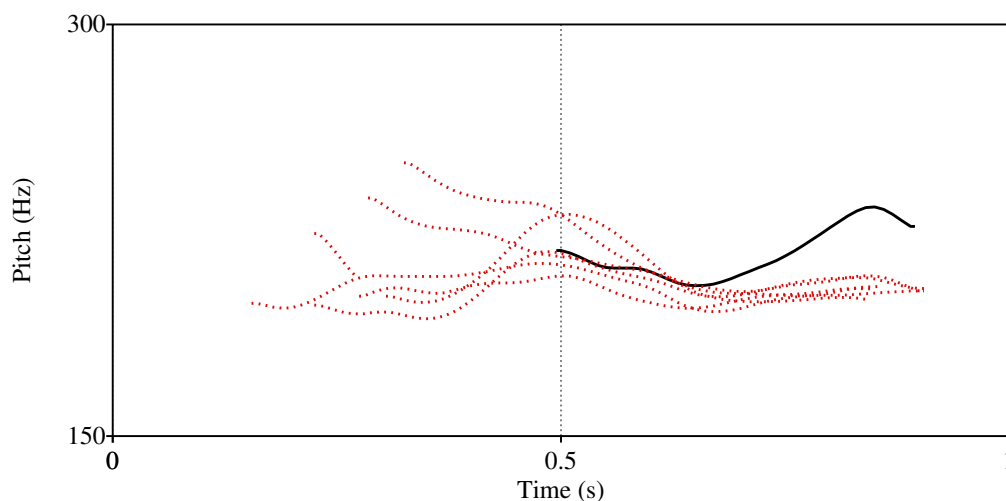


Figure 7.1 F0 traces of citation ([námáʃ], solid line) and sandhi ([nàmas], dashed lines) forms of ‘Nama’ and its modifiers for the examples in (2). The onset of the [n] in ‘Nama’ is aligned at 0.5 s. (Speaker F2).

Here the high-rising citation melody on the bare noun in (2)(a) is characterized by a distinct rise in F0, while the fundamental frequency on the modified noun tokens corresponding to (2)(b-g) is consistently lower and level. Moreover, the contours for the sandhi forms in (2)(b-g) are identical, regardless of the tone or syntactic category (demonstrative or adjective) of the modifier. The examples in (3) and Figure 7.2 show that the same pattern obtains on a root with citation SH tone.

- | | | | |
|-----|----|--|-------------------|
| (3) | a. | [^ʰ !áras] | ‘nara melon’ |
| | b. | [nèè ^ʰ !áras] | ‘this nara melon’ |
| | c. | [nàù ^ʰ !áras] | ‘that nara’ |
| | d. | [^h àra ^ʰ !áras] | ‘the other nara’ |
| | e. | [^ʰ !áá ^ʰ !áras] | ‘that nara’ |
| | f. | [!ái ^ʰ !áras] | ‘the bad nara’ |
| | g. | [sáa ^ʰ !áras] | ‘your nara melon’ |

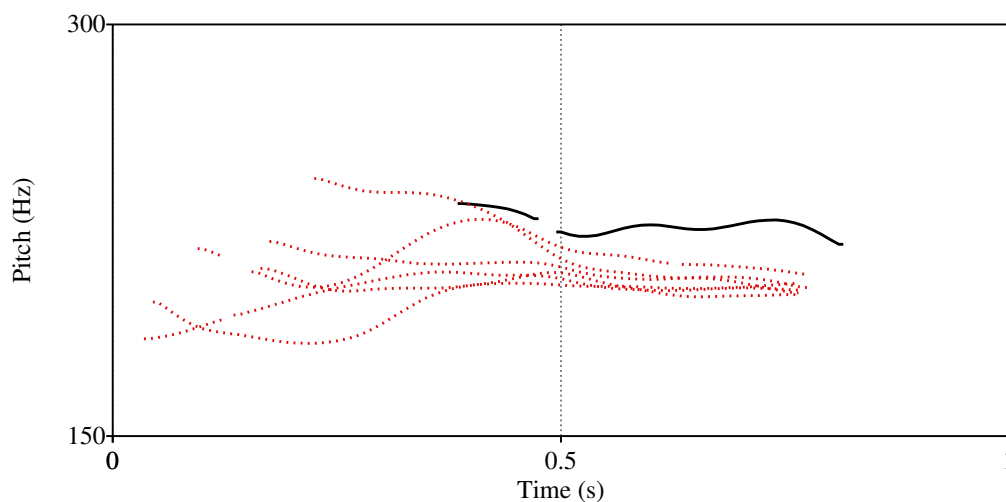


Figure 7.2 F0 traces of citation ([^ʰ!áras], solid line) and sandhi ([^ʰ!áras], dashed lines) forms of ‘nara melon’ and its modifiers for the examples in (3). The onset of the first [a] in ‘nara melon’ is aligned at 0.5 s. (Speaker F2).

Again, all six modifiers have the same effect on the noun’s melody, with minor differences that can be attributed to different pitch ranges for domains with different

starting points. This is, in fact, the pattern with all 36 possible modifier-noun combinations of the six tone classes. Moreover, we will see below that nouns with two or more modifiers have citation melodies on the first element and sandhi melodies on the rest, indicating that the distribution of sandhi forms depends only on position within the phrase and not on tonal identity. This is not a case of elements interacting at a juncture, as in the classical definition of sandhi, but rather the alignment of elements within a domain.

The difficulty in treating Khoekhoe tone patterns as “sandhi” becomes even more apparent when we look at the tone distribution patterns on verbs. In a typical declarative sentence with SOV word order, unmodified nouns take citation form and the verb takes sandhi form. There is, however, a minimally different alternative construction, and here the verb takes citation form instead, as illustrated by the sentences in (4) and the F0 traces in Figure 7.3. The syntactic differences between these sentences will be discussed in section 7.4.1. Again, citation forms are bolded, while sandhi forms are underlined. Words that do not alternate are in plain typeface. For the remainder of this chapter, examples will be given in orthography rather than transcription, except where phonetic detail is relevant to the discussion (see Chapter 2 for discussion of the orthography). Note that the macron (e.g., *ō*) and circumflex (e.g., *â*) indicate length and nasality, respectively; tone is not marked in the orthography.

- (4) a. Tita ge go **nō**. ‘I measured.’⁵²
 I DEC PST measure
- b. ||Ari ta go **nō**. ‘Yesterday I measured.’
 yest. I PST measure

⁵² The following abbreviations are used for particles: DEC=declarative, PST=past tense, FUT=future tense, IMP=imperfective aspect, PRF=perfective aspect, COP=copula, OBL=oblique, POS=possessive, QUOT=quotative, ADV=adverbial. See Hagman (1977) for more information.

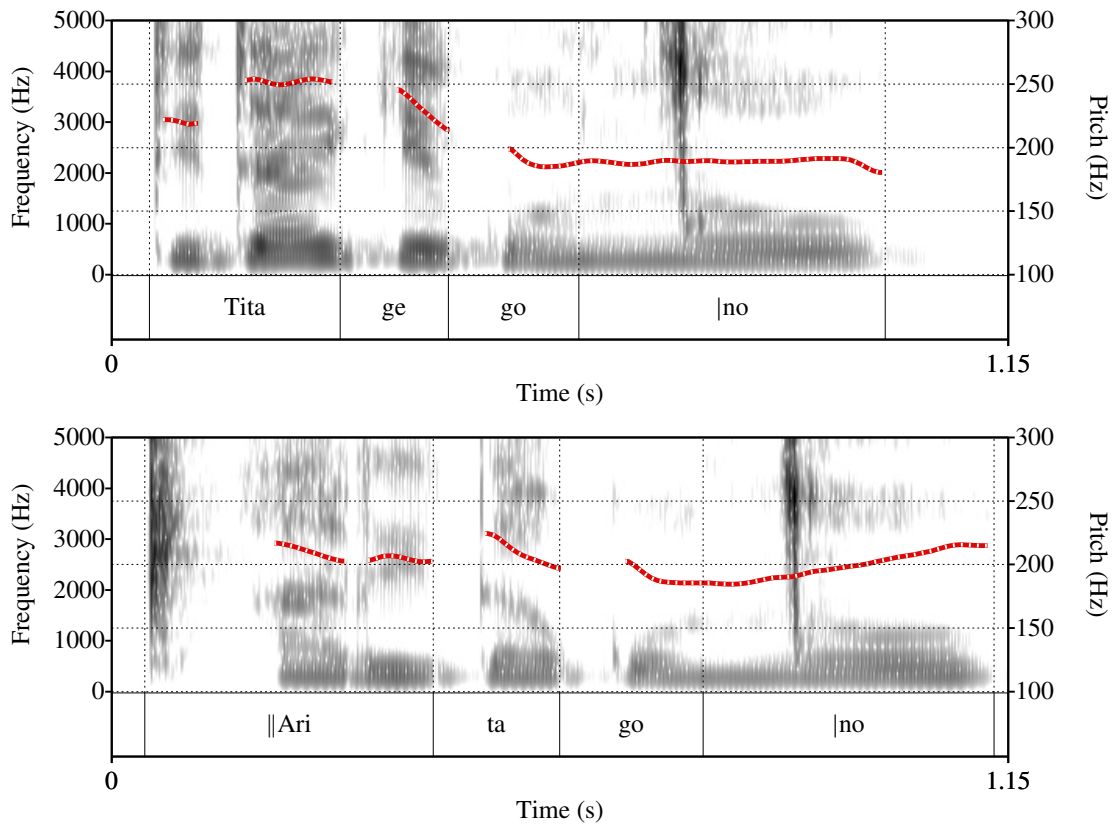


Figure 7.3 Spectrograms and F0 traces for the sentences in (4)(a, top) and (4)(b, bottom), showing a verb with a H-SH citation melody. (Speaker F2).

Here we see that the verb (*ḥō* ‘measure’) in the first sentence takes the sandhi melody (L), while the verb in the second sentence takes the citation form (H-SH). The same pattern obtains for a root with SH tone, as shown in (5) and Figure 7.4.

- (5) a. Tita ge go mî. 'I spoke.'
 I DEC PST speak
- b. ||Ari ta go mî. 'Yesterday I spoke.'
 yest. I PST speak

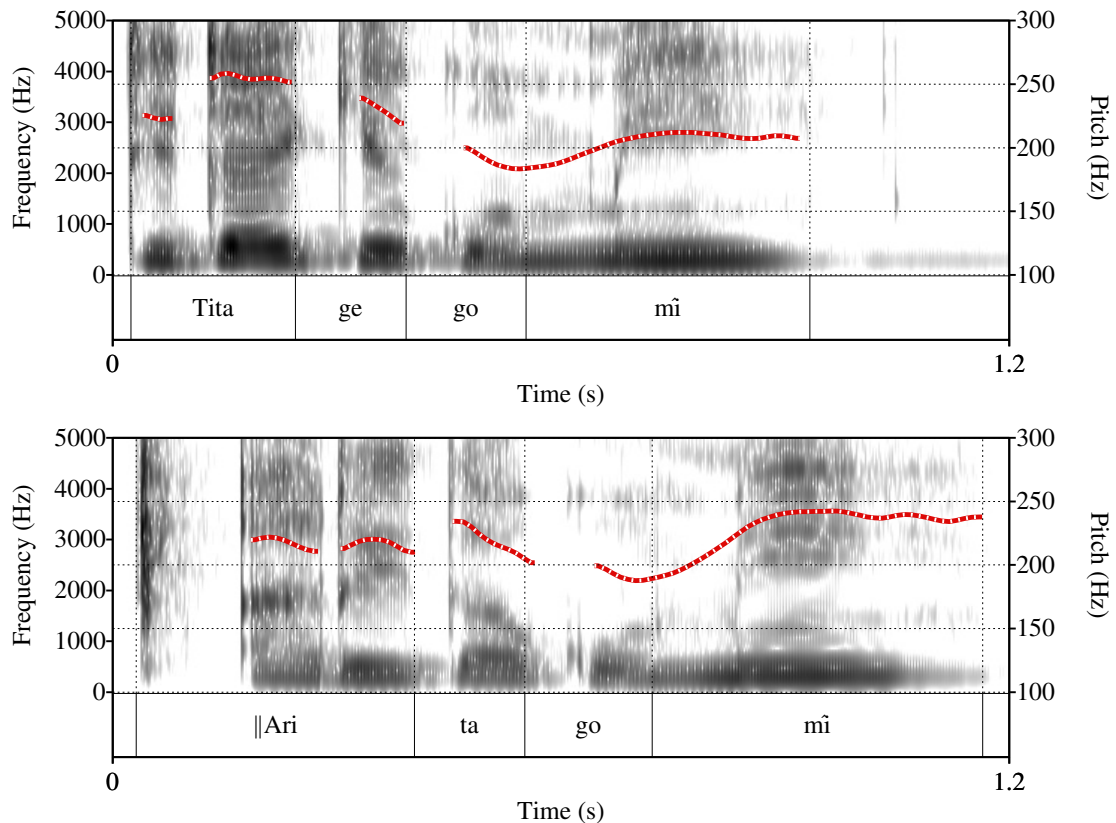


Figure 7.4 Spectrograms and F0 traces for the sentences in (5)(a)(top) and (5)(b)(bottom), showing a verb with a SH citation melody. (Speaker F2).

Again, we see that the verb in the first sentence takes its sandhi form (H), while the verb in the second sentence takes its citation form (SH). I will show below that the tonal difference between the sentences in (4)-(5)(a) on the one hand, and (4)-(5)(b) on the other correlates with the use of the declarative particle *ge*. For now, however, these examples demonstrate that the tone melody (i.e., citation or sandhi) that surfaces on a verb cannot result from true sandhi. First, the sentences in (4)-(5) contain only one root, and therefore only one root melody, thereby precluding an analysis where sandhi is triggered by the melody on another root. Second, the

immediate phonological environment of the verb is the same in both cases—it is only the syntactic conditions that differ. While the distribution of melodies in modified noun phrases could perhaps be seen as a type of external sandhi that is independent of tonal identity, these examples show that such an argument is untenable for verbs. This pattern is one of the most important respects in which Khoekhoe differs from Xiamen.

Strictly speaking, then, this is not external sandhi. The word has, however, come to serve as a cover term for a wide variety of tonal alternations in Chinese languages. Yip (2002:180), for instance, notes that, “...in Chinese tradition [sandhi] is used for all systematic tone changes, even when they take place word-internally across morpheme boundaries,” and Zhang (2007:259) defines tone sandhi as, “...tonal alternations conditioned by adjacent tones or by the prosodic or morphosyntactic position in which the tone occurs.” Since “sandhi” is such a well established term and since the vast majority of work on this type of alternation has been undertaken in the Chinese tradition, I retain it here, though Yip’s (2004) terms for alternating forms in Zahao, namely “primary” and “secondary”, are probably more appropriate.

Before moving on, one further tonal alternation needs to be discussed. It is known as flip-flop.⁵³ Like the sandhi alternations, this phenomenon was first identified by Haacke (1999a), who observed that it is largely confined to verbal compounds and reduplicated forms, though it can also be triggered by certain suffixes. In short, flip-flop is a process whereby the tonal melody of a root switches to that of a different category (e.g., SH → H-SH). Flip-flop comes in two forms, which I call “weak” and “strong”.⁵⁴ With weak flip-flop, only three of the six categories take their flipped forms, which results in neutralization to just three tonal contrasts (i.e., SL-L, H, H-

⁵³ By the definitions in Yip (2002) and Zhang (2007), this is also a type of “sandhi”. The term “flip-flop” originated with Wang (1967).

⁵⁴ Haacke (1999a) calls these “unidirectional” and “bidirectional”.

SH), but in strong flip-flop, all six categories switch, preventing neutralization. A schematic of the relationships among the different categories is shown in (55).

“Weak”	Citation	“Strong”
SL-L	SL-L	SL
	SL	SL-L
H	L	H
	H	L
H-SH	SH	H-SH
	H-SH	SH

In a “weak” flip-flop environment, roots in the SH and H-SH categories will both surface with H-SH melodies, but in a “strong” environment, SH will surface as H-SH and H-SH will surface as SH. Weak environments are far more common than strong environments, which are essentially confined to causative reduplication (Haacke 1999a:133-35). No tone has a flip-flop form that is the same as its sandhi form, and roots can surface with the sandhi forms of their flipped melodies. That is, a word in the SH category can surface with an L melody in a context where it is subject to both flip-flop and sandhi. Flip-flop is crucially different from sandhi in that it applies to the *first* morpheme. That is, it is “right-dominant” rather than “left-dominant” because the rightmost element is unaffected. Flip-flop also differs from sandhi in that it is morphologically conditioned; some morphemes trigger flip-flop and others do not. Sandhi, on the other hand, applies to a wide range of constructions and is conditioned by prosodic position.

Sentences illustrating the use of weak flip-flop with the perfective aspect are given in (6), with corresponding F0 traces in Figure 7.5. Flipped forms are indicated

with italics. The syntax of these sentences and the reason the verbs take citation rather than sandhi melodies will be discussed below in section 7.4.

- (6) a. **Namas** ge **||naina xoa** ra. ‘The Nama is picking berries.’
 Nama DEC berry pick IMP
 b. **Namas** ge **||naina xoa** hâ. ‘The Nama has picked berries.’
 Nama DEC berry pick PRF

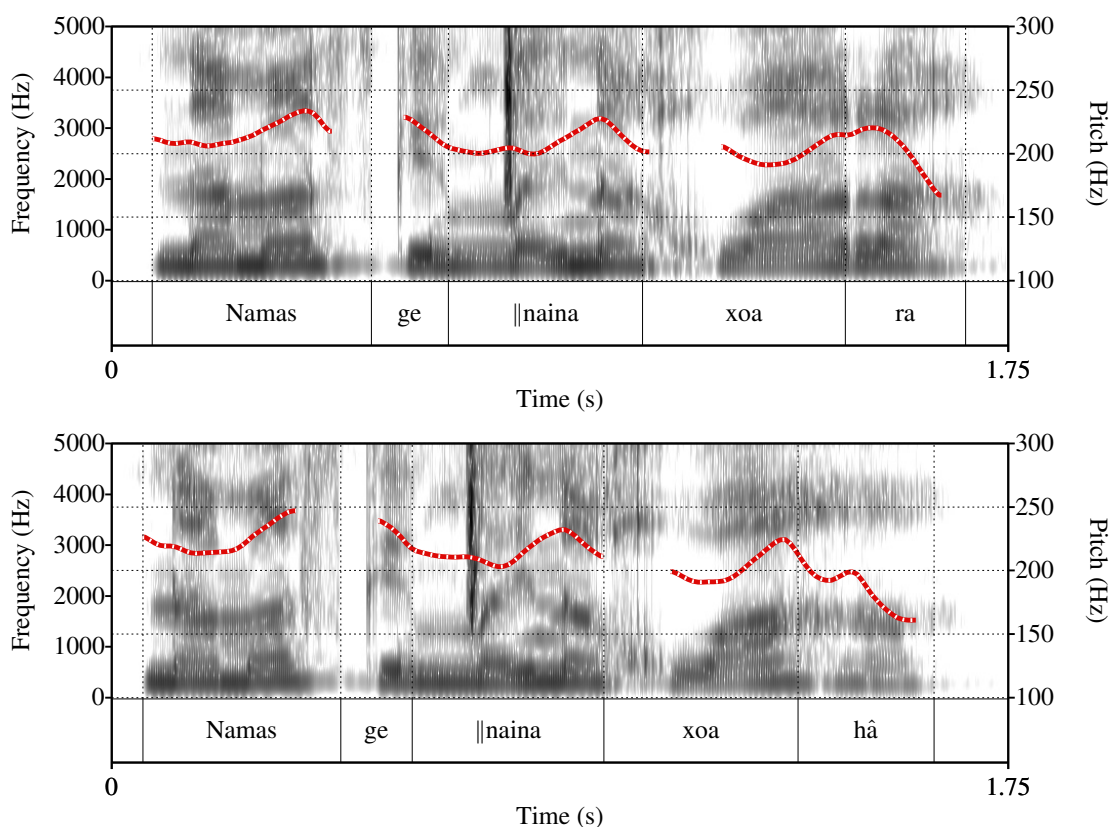


Figure 7.5 Spectrograms and F0 traces for the sentences in (6), showing weak flip-flop on a verb with a H-SH citation melody. (Speaker F2).

Here we see that the melody on the verb *xoa* is H-SH in both perfective and imperfective sentences, confirming that this is not an environment for strong flip-flop. The difference between the flipped and non-flipped tone is, however, apparent with a SH root, as in (7) and Figure 7.6.

- (7) a. **Sa** !gâs ge **mai-e pā** ra. ‘The Nama is cooking mealie.’
 your sister DEC mealie cook IMP
- b. **Sa** !gâs ge **mai-e pā** hâ. ‘The Nama has cooked mealie.’
 your sister DEC mealie cook PRF

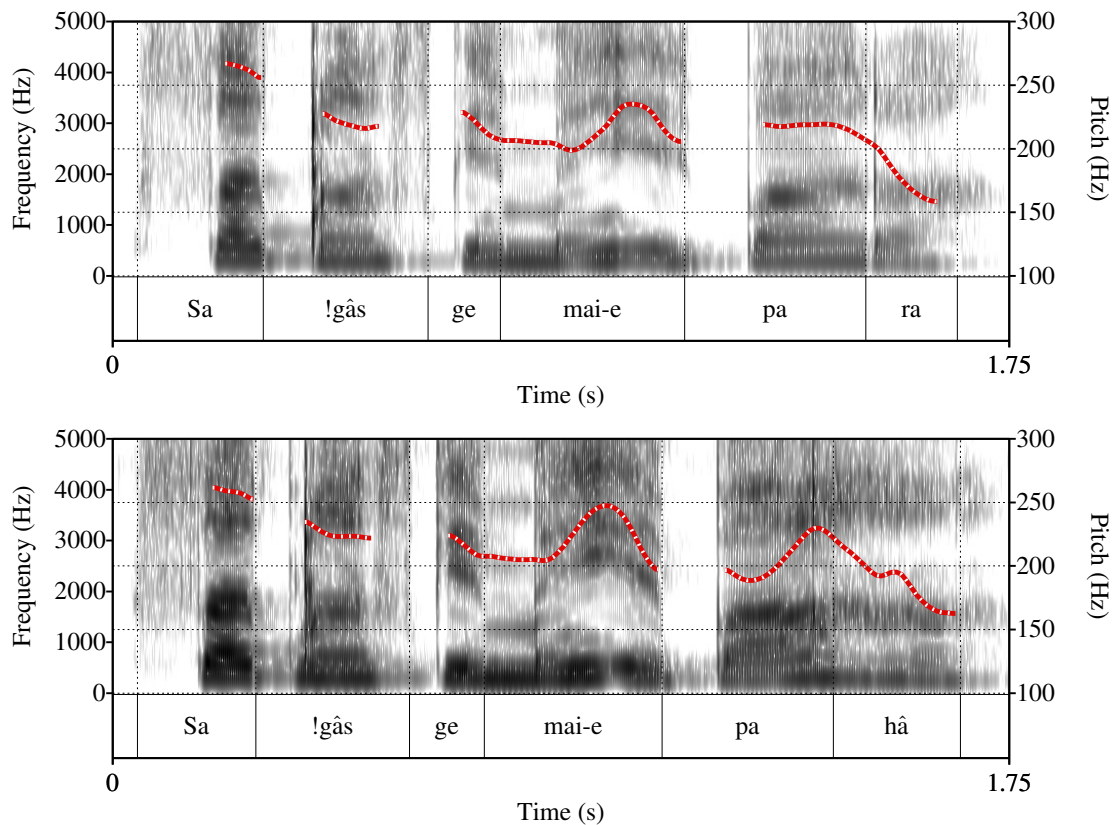


Figure 7.6 Spectrograms and F0 traces for the sentences in (7), showing weak flip-flop on a verb with a SH citation melody. (Speaker F2)

Here we see that *pā* takes its citation (SH) form in the imperfective, but its flipped (H-SH) form in the perfective. This is an idiosyncrasy of present perfective constructions (see section 7.4.2), but it is orthogonal to the sandhi process discussed above.

Though sandhi and flip-flop both involve paradigmatic substitution, they are qualitatively different processes. Flip-flop is triggered by the morpho-syntax and is preserved even when the target and trigger are separated, for example by raising of

one element in a verbal “compound” to initial position (see section 7.4.3). Sandhi, on the other hand, reflects a root’s position within a domain. That is, it reflects the root’s alignment, or lack of alignment, with a prosodic boundary. And each is fundamentally different from the phonological processes of assimilation and dissimilation that are more appropriately labeled “sandhi”.

From a typological perspective, Khoekhoe is interesting because sandhi and flip-flop constitute independent left- and right- dominant sandhi systems (Yue-Hashimoto 1987, Chen 2000). Zhang (2007) notes an asymmetry in the sandhi systems of Chinese languages, namely that left-dominant systems generally make use of melody extension, where the leftmost tone melody spreads rightward through a domain, and that right-dominant systems are more likely to have melody substitution, in which the final syllable keeps its citation form, but non-final melodies are replaced, often with default tones. Khoekhoe’s primary sandhi system is an exception to this generalization, as schematized in (8), where the typologically preferred systems are boxed in bold.

(8)

	Melody extension	Melody substitution
Left-dominant	Shanghai	Khoekhoe
Right-dominant	(Unattested)	Xiamen

Though Zhang cites Dongkou, a Xiang dialect spoken in Hunan Province, as a left-dominant system where the second syllable of disyllabic words takes a default melody, the type of sandhi found in Khoekhoe does not seem to have a direct parallel in the Chinese languages Zhang surveyed. Interestingly, however, Khoekhoe does conform to Zhang’s prediction that a language with both left- and right-dominant sandhi and melody substitution in the left-dominant system must also have melody substitution in the right-dominant system.

Zhang (2007) argues that the typological asymmetry in (8) reflects the influence of universal markedness constraints on contour tones. The most important of these for the present discussion preferentially licenses contours in final positions, where durations tend to be the greatest. This constraint is motivated in part by the survey in Zhang (2002), which found no language where contour tones were preferred domain-initially. Zhang captures this with the intrinsic ranking of $*\text{CONTOUR}_i\text{-NONFINAL} \gg * \text{CONTOUR}_i\text{-FINAL}$, which requires that a particular contour melody i be preferred in domain-final position.⁵⁵ The distribution of Khoekhoe contours seems at first to contradict this generalization, because the H-SH melody is restricted to initial position, and though sandhi positions do license a falling melody not found domain-initially, this cannot be attributed to the greater duration of final syllables, because the melody is found domain-internally as well as finally, and because falls also occur on clitics, which are always monomoraic. This does not, however, obviate the need for constraints of the type Zhang motivates. First of all, we saw in Chapter 4 that Khoekhoe consistently licenses marked structures at the left edges of prosodic domains, so the restriction H-SH melodies is not actually inconsistent with Zhang's generalization about the markedness of non-final contours. More importantly, I argued in Chapter 5 that melodies in the sandhi inventory reflect constraints on the distribution of SH and SL tones. That is, the prohibition on non-initial H-SH is not about contours at all, but about pitch range. Zhang's constraint ranking may well be universal, but it does not seem to be active in Khoekhoe.

We now turn to the theoretical apparatus necessary to account for Khoekhoe melody distribution.

⁵⁵ These constraints amount to positional markedness constraints relativized to both weak and strong positions. Under the framework assumed here, the ranking would be $*\text{CONTOUR}_i/\text{FINAL} \gg \text{IDENT}[\text{Contour}_i] \gg * \text{CONTOUR}_i$.

7.2 Theoretical considerations

While there is no *a priori* reason that melody alternation in Khoekhoe must be analyzed in the same terms as in Xiamen, the substitution patterns are so similar in these two languages, despite being so unusual cross-linguistically, that a unified analysis is highly desirable. This section will, therefore, digress slightly from the discussion of Khoekhoe to review and, where necessary, modify proposals put forth for Xiamen and other Southern Min dialects. This lays the groundwork for the analysis of Khoekhoe presented in sections 7.3, 7.4 and 7.5.

7.2.1 Distribution of citation forms

Like Khoekhoe roots, Xiamen syllables belong to tone categories that are associated with distinct citation and sandhi melodies, and the melody that surfaces in a particular utterance is determined by context. I assume that the relationships between citation (M^A_C, M^B_C, M^C_C , etc.) and sandhi (M^A_S, M^B_S, M^C_S , etc.) melodies are specified in the lexicon, and that sandhi melodies replace their citation counterparts in the appropriate environment. Such replacement constitutes a violation of constraints on tonal identity. This section summarizes the theoretical machinery necessary to account for the distribution of citation and sandhi forms within a tonal domain; the distribution of the domains themselves will be taken up in the next section.

The most obvious way that Xiamen differs from Khoekhoe is the edge with which the citation melody is aligned. In Xiamen, it is the final syllable of a tone domain that takes a citation melody, while all other syllables surface with sandhi form. This distribution has been expressed in slightly different terms in previous work, as illustrated in (9) and (10). Note that Chen's T is my M_C , while his T' is my M_S .

(9) *Xiamen tone distribution as sandhi (Chen 1987:113)*

$T \rightarrow T' / \text{--- } T$ within a tone group

(10) *Xiamen tone distribution as alignment (Chen 2000:438)*

(... T ... T) p-phrase

↓

T'

The formulation in (9) is an expression of true tone sandhi in that an underlying citation tone is changed to a sandhi tone, and this change is triggered by the presence of another tone in the same domain. As discussed above, such a rule is problematic in both Xiamen and Khoekhoe. While the application of true sandhi (e.g., Mandarin tone 3 or Ewe tone raising) may be blocked by prosodic boundaries, a proper sandhi rule cannot be devoid of phonological content. The formulation in (10), on the other hand, is an expression of alignment rather than of sandhi, though Chen (2000) does not emphasize the distinction (but see Yip 2002). Here the juxtaposition of two tones is irrelevant; tone realization is conditioned by adjacency to a phrase boundary and not the presence of another tone *per se*. I argue that this should be expressed formally in terms of positional faithfulness.

In the remainder of this section, I will show that positional faithfulness constraints directly parallel to those used in Chapters 3 and 4 allows us to account for the distribution of citation and sandhi melodies. We saw in Chapter 5 that citation inventories are more marked than their sandhi counterparts (see also Yip 2002, 2004). In both Xiamen and Khoekhoe, for instance, sandhi inventories are smaller and have fewer rising tones, suggesting the harmonic scale $M_S \succ M_C$ and the constraint $*M_C$ that penalizes citation forms. This constraint is formalized in (11).

syllables take sandhi melodies because of a constraint that requires each syllable be specified for tone. I assume this is SPECIFY(M) (formulated as in Yip 2002).

(16) *Constraints for citation resistant syllables*

* σ^R -M_C: “Resistant” syllables cannot associate with citation melodies.

SPECIFY(M): Each TBU must be associated with a melody.

Crucially, IDENT[M]/FINAL still requires that the final specified melody in the domain take citation form, regardless of whether or not it is associated with the final syllable. The interaction of the relevant constraints is illustrated in (17).

(17) *Taiwanese citation resistant syllables in final position*

/ t'eʔ k'i ^R lai ^R /	* σ^R -M _C	IDENT[M]/ FINAL	SPECIFY(M)	*M _C
a. (t'eʔ k'i ^R lai ^R)	*!			*
b. (t'eʔ k'i ^R lai ^R)		*!		*
c. (t'eʔ k'i ^R lai ^R)			**	*
d. (t'eʔ k'i ^R lai ^R)		*!	**	*

Candidate (a) satisfies IDENT[M]/FINAL, but at the expense of the higher-ranked prohibition on resistant syllables with citation melodies. It is, therefore, eliminated. Candidate (b), on the other hand assigns sandhi melodies to the resistant syllables, which prevents it from satisfying IDENT[M]/FINAL. The crucial difference between candidates (c) and (d) is that the final specified melody in (c) is a citation form, while the final syllable in (d) is not, and this violates IDENT[M]/FINAL. If, however, the citation resistant syllables occur in non-final position, they are free to take sandhi form, as shown in (18).

(18) *Taiwanese citation resistant syllables in non-final position*

/ t'eʔ k'i ^R lai ^R tsia /	*σ ^R -M _C	IDENT[M]/ FINAL	SPECIFY(M)	*M _C
a. (t'eʔ k'i ^R lai ^R tsia)			*!***	*
☞ b. (t'eʔ k'i ^R lai ^R tsia)				*
c. (t'eʔ k'i ^R lai ^R tsia)			*!*	*

Candidate (a) is comparable to the winning candidate in (17), except that the final syllable in this case is not lexically-specified as citation resistant. It is eliminated for the unnecessary violation of SPECIFY(M). Similarly, candidate (c) is eliminated because the resistant syllables do not come between the citation melody and the right edge of the phrase and so do not need to be unspecified. The winning candidate, (b), has a right-aligned citation melody and all syllables are specified for tone. We will see below that this same mechanism is necessary to account for the behavior of Khoekhoe verbs in certain morpho-syntactic contexts.

The patterns described above show that the distribution of citation and sandhi melodies in this type of language serves to signal the edge of some higher-level entity. In this respect, constraints on the distribution of citation melodies parallel the Khoekhoe segment distribution facts discussed in Chapters 3 and 4. While the distribution of obstruents and clicks in Khoekhoe serves to mark the left edge of the prosodic word, we will see that the distribution of citation melodies marks the left edge of a phrase-level constituent. The question of what, exactly, these domains are being aligned with is taken up in the next section.

7.2.2 Alignment of PhP

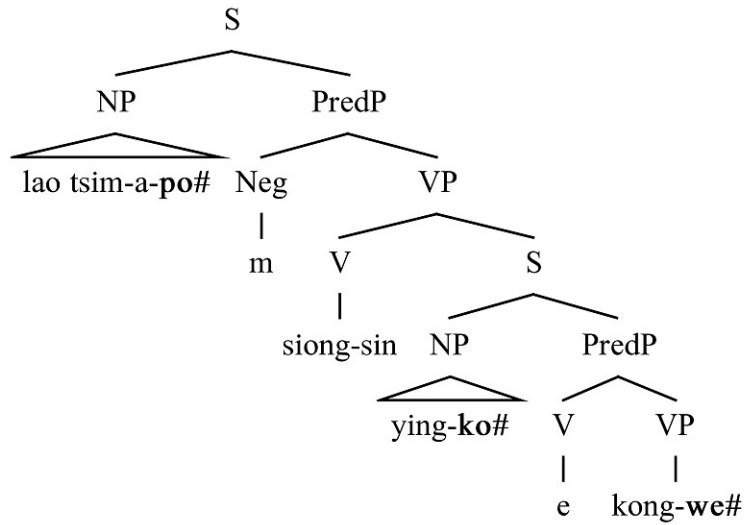
Now that we have seen how tones are distributed within a domain, we come to the question of how domains themselves are distributed. Citation melodies in Xiamen are found on the right edges of certain syntactic constituents, suggesting that their

distribution is syntactically-conditioned. But a large body of work over the past several decades has motivated the idea that phonological rules should not have direct access to syntactic structure (e.g., Selkirk 1986, Nespor and Vogel 1986, Inkelas and Zec 1990). Support for this idea comes from the observation that a theory of direct reference is too powerful and would allow for phonological rules that are not attested. Instead, prosodic structure is assumed to mediate between phonological rules or constraints and the fully-articulated syntactic structure. The phonological phrase, as the level between the prosodic word and the intonational phrase, is taken as the appropriate level for representing syntactically-derived domains (Selkirk 1986, 2000, Nespor and Vogel 1986, Truckenbrodt 1995, 1999 and references therein). Despite problems that will be discussed in section 7.2.3, I will assume that the phonological phrase is, indeed, the correct mechanism for describing tonal domains in both Khoekhoe and Xiamen.

The distribution of tonal domains in Xiamen is illustrated by the sentence in (19), in which citation forms are bolded and sandhi forms are underlined. The syntactic structure assumed by Chen (1987, 2000) and Lin (1994) is shown in (20), where citation melodies are indicated with bold and boundaries with “#”.

- (19) (lao tism-a-po)_{PPh} (m siong-sin ying-ko)_{PPh} (e kong-we)_{PPh}
 old lady not believe parrot can talk
 ‘The old lady doesn’t believe the parrot can talk.’ (Chen 1987:114)

(20)



As this example shows, citation melodies are found on the right edges of XPs, here the NPs *lao tsim-a-po* ‘old lady’ and *ying-ko* ‘parrot’, and the utterance-final VP *kong-we* ‘talk’. Thus, the edges of phonological phrases coincide with the edges of syntactic structures, but crucially, tonal domains are not isomorphic with XPs. The middle phrase, *m siong-sin ying-ko* ‘not believe the parrot’ is not a syntactic constituent. In Xiamen, it is only the right edges of syntactic structures that matter.

The first attempt to account for the Xiamen data in explicitly prosodic terms was Chen (1987). His analysis was modified somewhat by Lin (1994), who drew on Hale and Selkirk’s (1987) treatment of Papago (now called Tohono O’odham), specifically the idea of lexical government. Lin shows that tone boundaries are found at the right edge of all Xiamen XPs, except those that are lexically governed (i.e., contained within NP, VP or AP but not an intervening functional projection). This can be formalized as in (21).

(21) Xiamen p-phrase: (Right, X^{\max}), X^{\max} not lexically governed (Chen 2000:459)

Like the distribution of tones within a domain, the distribution of domains themselves is determined by alignment, in this case the alignment of phonological phrases and syntactic XPs. In practical terms, phrase boundaries are found at the right edges of DPs, IPs, predicate APs and adjuncts to functional projections.

The distribution of citation and sandhi melodies in Xiamen nouns and verbs is fairly straightforward, as demonstrated by the sentence in (20). Because verbs are always governed by a functional projection, VPs are always non-lexically governed and so always followed by a tone boundary. But because VPs are head-initial, the verb surfaces with citation form only when it is not followed by a complement or VP-internal adjunct, as illustrated by the difference between *siong-sin* ‘believe’ and *kong-we* ‘talk’. There are no exceptions to this generalization in Xiamen. Similarly, the pattern in nouns is straightforward once we recognize the distinction between NPs and DPs noted by Lin (1994). This is illustrated in (22) by two examples from Chen (1987) that have been modified to show which constituents are NPs and which are DPs.

(22) *Melody distribution in Xiamen DPs*

- a. [[[bi-kok]_{NP1} ki-tsia]_{NP2}]_{DP}
 U.S. journalist
 ‘American journalist’
- b. [hit pun [siao-suat]_{NP}]_{DP} [tsiɔq lai k’uah]_{VP}
 that CL novel borrow to read
 ‘borrow that novel to read’

In (22)(a), *bi-kok* ‘U.S.’ is an NP adjunct to *ki-tsia* ‘journalist’ and lexically governed by N₂. It is not, therefore, followed by a phrase boundary. But under the now-standard assumption that “full NPs” are actually DPs (Abney 1987), NP₂ must be governed by a phonetically null D, making it non-lexically governed. It is, therefore

followed by a phonological phrase boundary and the final syllable takes citation tone. Similarly, the NP in (22)(b) is non-lexically governed by the classifier (=Q) *pun*, and so terminates with a citation melody. Crucially, NPs terminate with citation form *only* when they are governed by D or another functional projection (see Chen 1987, 2000, Lin 1994 for additional examples).⁵⁷

One strength of Lin's proposal is that it also captures the apparently contradictory behavior of adjectives and adverbs in different syntactic positions. Adjuncts to functional categories are followed by phrase boundaries, but adjuncts to lexical categories (N, V and A) are not. This is made particularly clear by the behavior of pre-nominal adjectives, illustrated by the examples in (23).

(23) *Pre-nominal adjectives in Xiamen (Chen 2000:465)*

- a. [[pin-tuah]_{AP} gin-a]_{NP}
 lazy boy
 'lazy boy'
- b. [[[pin-tuah]_{AP} e]_{CP} gin-a]_{NP}⁵⁸
 lazy COMP boy
 'lazy boy'
- c. [[[ts'ong-bing]_{AP} [k'un-lat]_{AP} e]_{CP} gin-a]_{NP}
 smart hard-working COMP boy
 'smart and hard-working boy'

⁵⁷ One exception to this generalization seems to be example (84) in Chen (2000):

[[[[hit [liap [mua-a]_{NP}]_{QP}]_{DP} tua]_{AP} e]_{CP} sio-piã]_{DP}
 that CL sesame seed big COMP bun
 'buns as big as that sesame seed'

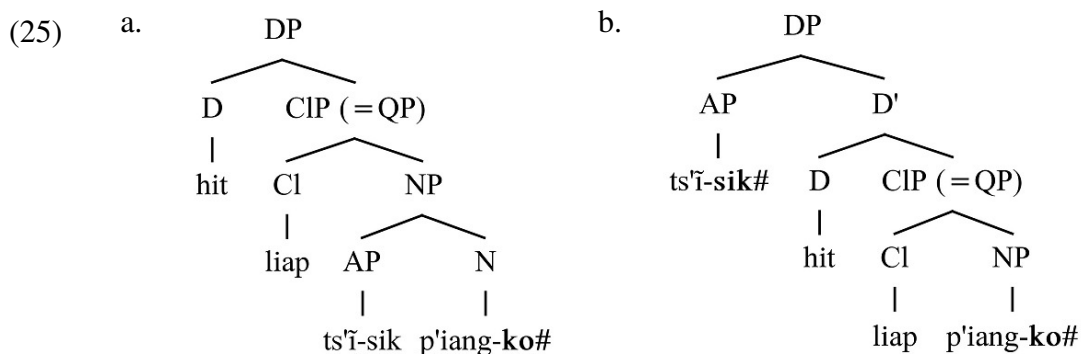
The NP *mua-a* 'sesame seed' is non-lexically governed by the classifier, but not followed by a phrase boundary. This is a problem for both Lin's analysis, and for the alternative approach discussed below.

⁵⁸ Soh (2001) proposes a structure in which *e* takes *gin-a* as its complement and *pin-tuah* is an AP adjunct. See Truckenbrodt (2002) for additional discussion.

In (23)(a), AP adjoins to NP, making it lexically governed. It, therefore, terminates in a sandhi tone. In (23)(b), on the other hand, AP is governed by the complementizer *e*, which means it is non-lexically governed. It takes a citation tone. Similarly, each of the coordinate APs in (23)(c) terminates with a citation tone, because each is non-lexically governed. The distinction between lexically- and non-lexically governed APs is made even more apparent by the examples in (24), the presumed structures of which are shown in (25).

(24) *Raised adjectives in Xiamen (Chen 2000:462)*

- a. m-t'ang tsiaq [hit liap [ts'ĩ-sik]_{AP} p'iang-ko]_{DP}
 don't eat that CL green apple
 'Don't eat that green apple.'
- b. m-t'ang tsiaq [[ts'ĩ-sik]_{AP} hit liap p'iang-ko]_{DP}

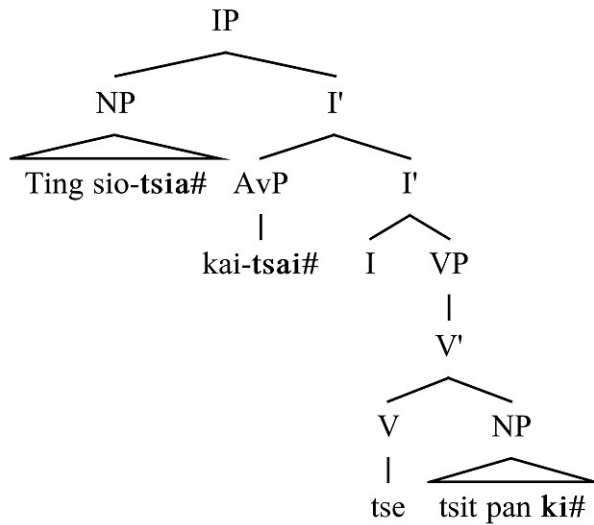


When the AP *ts'ĩ-sik* 'green' is adjoined to the noun in (24)(a), it is lexically-governed and, therefore, it takes sandhi tone. In (24)(b), however, it is adjoined to the DP and is non-lexically governed. In this case, it takes citation form. A similar pattern is found with adverbs, some of which are analyzed on syntactic grounds as adjuncts to VP, while others are adjuncts to IP. The sentences in (26) and the structures in (27) and (28) illustrate the difference

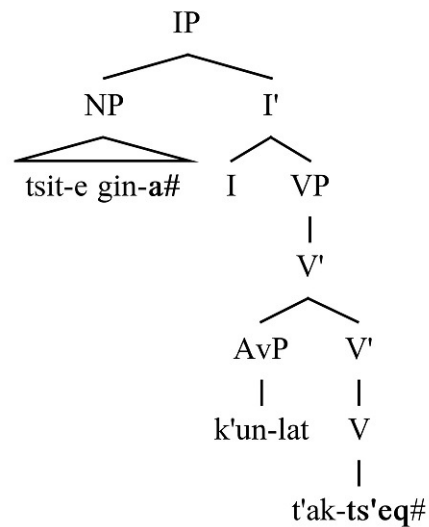
(26) *Xiamen adverbs* (Chen 2000:459-60)

- a. [Ting sio-tsia]_{DP} [kai-tsai]_{AvP} [tse [tsit pan ki]_{DP}]_{VP}
 Miss Ting fortunately take this CL flight
 ‘Fortunately, Miss Ting took this flight.’
- b. [tsit-e gin-a]_{DP} [[k'un-lat]_{AvP} t'ak-ts'eq]_{VP}
 this child diligent study
 ‘This child studies hard.’

(27)



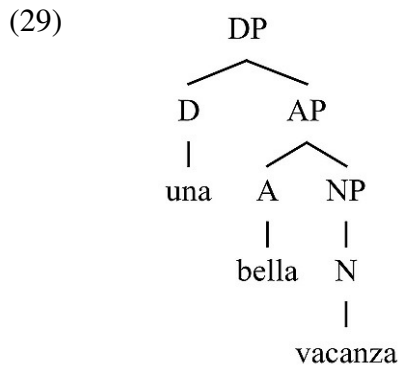
(28)



Here, the sentential adverb in (26)(a) is adjoined to the functional projection above VP and non-lexically governed, so it takes citation form, while the VP-internal adverb in (26)(b) does not. Lin's approach to the alignment of Xiamen phonological phrases, therefore, succinctly accounts for the distribution of citation and sandhi forms.

The role of lexical government in the syntax-prosody mapping has, however, been called into question. Truckenbrodt (1995, 1999) reanalyzes Hale and Selkirk's (1987) Tohono O'odham data and argues lexical government is unnecessary. Rather, he shows that the results fall out naturally from the interaction of ALIGN and a constraint he calls WRAP-XP, which requires XPs to be contained in a single phonological phrase. Such interactions also provide a uniform account for phrasing phenomena in a number of languages—phenomena that lexical government cannot explain—effectively removing the original motivation for applying lexical government to Xiamen.

Unfortunately, Truckenbrodt's approach does not, on the surface, account for as much of the Xiamen data as Lin's. Though the results for NPs and VPs are the same under the two analyses, the behavior of adnominal adjectives and some adverbs are not so easily explained. Truckenbrodt acknowledges this and appeals to analyses by Clements (1978) and Selkirk and Tateishi (1991), who propose that the problematic adjuncts may, in fact, be syntactic heads rather than syntactic phrases. That is, the difference between adjectives and adverbs that are followed by a phrase boundary and those that are not reflects different syntactic structures. Following Abney, Truckenbrodt (1995:63) suggests a possible alternative structure for the Italian phrase *una bella vacanza* 'a nice vacation', reproduced in (29).



This structure resolves the problem by making the adjective *bella* a head that takes the NP *vacanza* as its complement. We would not, therefore, expect a phrase boundary between an adjective and noun in a language with right alignment. Because this structure makes the correct predictions for Xiamen and because it is no worse than the alternative for Khoekhoe, I will adopt it in the discussion of Khoekhoe below. A similar reanalysis would be necessary to account for the behavior of Xiamen adverbs,⁵⁹ but because adverbs do not alternate in Khoekhoe, I will not pursue the question here.

One important component of Truckenbrodt's analysis is the idea, drawn from Selkirk (1995), that alignment relates prosodic categories to lexical categories, but not to functional categories. He formulates this as in (30).

(30) *Lexical Category Condition* (Truckenbrodt 1999:226)

Constraints relating syntactic and prosodic categories apply to lexical syntactic elements and their projections, but not to functional elements and their projections, or to empty syntactic elements and their projections.

⁵⁹ In footnote 5, Truckenbrodt (1999:222) points out that, "A class of adjuncts (certain adnominal adjectives and VP adverbs) is exceptional relative to this algorithm.... What is common to these cases is that the adjuncts in question do not introduce prosodic boundaries at their edges, as would be expected if there were full XPs." In fact, under Truckenbrodt's definitions, whether it is the VP-adverbs or the sentential adverbs that are exceptional depends on whether adverbs count as "lexical".

This recognition of the disparate ways content and function words behave is very much in keeping with the analysis presented in this dissertation, which lends Truckenbrodt's approach considerable appeal. When we express prosodic phrasing with lexical government, we effectively argue that tone boundaries are conditioned by functional projections. It may happen that these boundaries also coincide with lexical XPs, but only because those XPs are non-lexically governed. The LCC, on the other hand, explicitly ties phrasing to lexical items in much the way that constraints on minimality and segment distribution target Khoekhoe roots, but not Khoekhoe function words. That is, the LCC assigns a privileged status to lexical projections. So despite the fact that Truckenbrodt's analysis cannot, in its current form, account for all aspects of the Khoekhoe data presented below, it is more in keeping with the spirit of this dissertation than the lexical government approach advocated by Lin. For this reason, I will limit the remainder of my discussion to the predictions made by Truckenbrodt's proposal.

Turning to the formulation of actual constraints under the LCC, the distribution of phonological phrases must be governed by an alignment constraint like that in (31).

- (31) *ALIGN-R(LexP;PhP)*: Align the right edge of each lexical XP with the right edge of a PhP.

As Truckenbrodt observes, this requirement succinctly accounts for an apparent contradiction in Xiamen that was first noted by Chen (1987), namely that non-final pronouns take sandhi form, even when they occur in the same positions as DPs that terminate with citation melodies. Examples of such sentences are shown in (32). In each case, the entire phrase parses to a single PhP, but in a sentence with a DP that contained an NP, that DP would be followed by a PhP boundary, as well.

- (32) *Xiamen pronouns (Chen 1987)*
- a. [Yi/lang]_{DP} [sia k'a kin]_{VP}
 he/someone write more fast
 ‘He/someone writes faster.’
- b. [sang [gua/lang]_{DP} [nng pun ts'eq]_{DP}]_{VP}
 give I/someone two CL book
 ‘give me/someone two books’

Because the alignment constraint in (31) targets only lexical—not functional—categories, the absence of a phrase boundary after a non-final pronoun is exactly what we would expect.⁶⁰ That is, ALIGN-R(LexP;PhP) targets NPs within DPs, not DPs themselves. Note, however, that Lin’s analysis makes the same prediction as long as we assume that pronouns are DPs that lack NP complements.⁶¹

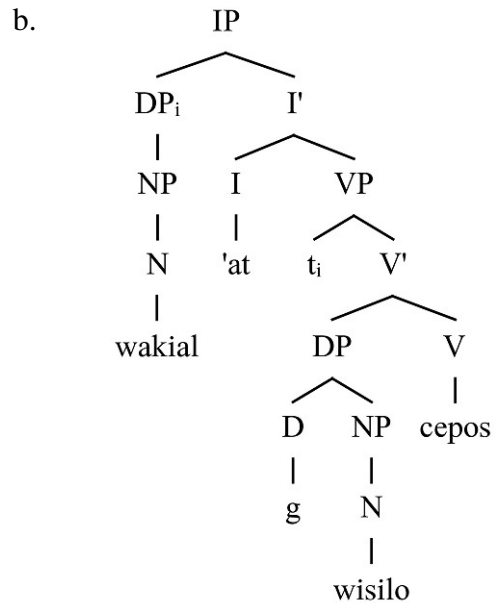
Before moving on, it is important to note that any examination of the syntax-prosody mapping depends crucially on our assumptions about syntactic structures. Truckenbrodt, for instance, follows Hale and Selkirk in assuming that the default SOV word order in Tohono O’odham reflects the structure in (33).

⁶⁰ Phrase boundaries in final position can be attributed either to VP, or else to a requirement on exhaustive parsing. Pronouns in Taiwanese take neutral tone in such environments—citation melodies surface only under contrastive focus (Du 1988).

⁶¹ An additional challenge for both proposals comes from Kelantan Hokkien (Lee 2005), a Southern Min dialect that differs from Xiamen and Taiwanese in that verbs, predicate prepositions and predicate adjectives take citation rather than sandhi form, and that phrase boundaries seem to align with traces of extracted heads. Lee maintains that arguments and predicates have special status, and that the grammar can target them specifically. Though this attempt at a theory-neutral analysis is appealing, it depends crucially on a derivational framework that is incompatible with the approach taken here, and the details are not relevant for the Khoekhoe data, so I will not pursue it.

(33) *Tohono O'odham declarative (Hale and Selkirk 1987)*

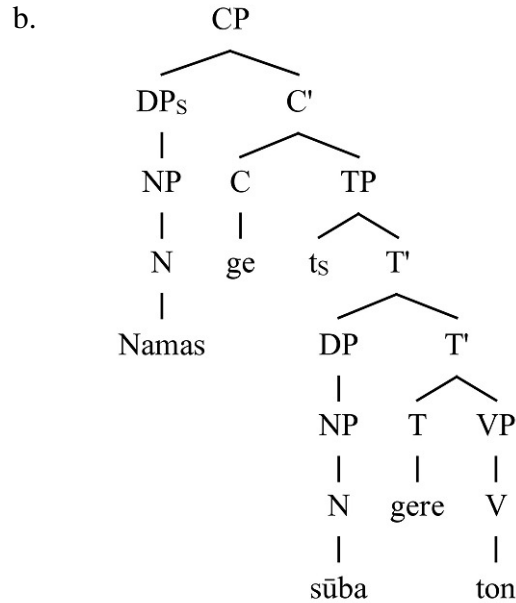
- a. (wakial)_{PhP} ('at g wisilo cepos)_{PhP}
 cowboy AUX DET calf branded
 'The cowboy branded the calf.'



In contrast, the Minimalist analysis that has been proposed for Khoekhoe declaratives (Washburn 2001) takes a very different approach. A greatly simplified version of Washburn's proposed structure, from which most traces and several functional projections have been removed, is illustrated with an example in (34).

(34) *Khoekhoe declarative*

- a. **Namas** ge **sūba** gere **ton**
 Nama DEC pot PST-IMP carry
 ‘The Nama was carrying the pot.’



The crucial difference between the trees in (33)(b) and (34)(b) is the position of the object with respect to VP. In Washburn’s analysis, *sūba* ‘pot’ has been raised from the complement of V (not shown) to an adjunct position above T.⁶² At first glance, it seems that the structure in (33) might be a better match for the surface

⁶² Syntactic arguments in favor of this structure are beyond the scope of this dissertation, but I observe that object clitics, unlike object pronouns or subject clitics, always follow the verb. This is illustrated by equivalent sentences like:

- | | |
|---|--|
| <p>a. <i>līgu</i> ge ge <i>mûpi</i>
 they DEC PST see-him
 ‘They (M.PL) saw him’ (Hagman 1977:80)</p> | <p>b. <i>līgu</i> ge <i>līpa</i> ge <i>mû</i>.
 they DEC him PST see</p> |
|---|--|

I show in Chapters 4 and 6 that distributional differences of this type correlate with prosodic word status. In any case, these distributional patterns are consistent with Washburn’s structure if we assume that clitics cannot serve as adjuncts.

sandhi behavior in Khoekhoe, but I argue that patterns in embedded clauses suggest otherwise (see section 7.4.1). For the sake of expositional clarity, I adopt the structures in (29) and (34) for Khoekhoe APs and VPs, respectively, but I will not explore the consequences of such assumptions for analyses of Tohono O’odham or Xiamen. In the remainder of this chapter, I endeavor to lay out the Khoekhoe facts as clearly as possible, and to draw parallels to other languages discussed in the literature, but an analysis that fits all the data for all the languages mentioned above is beyond the scope of this dissertation.

7.2.3 Strict layering and speech rate

Before moving on to the patterns found in Khoekhoe, it is important to qualify the claims about the syntax-prosody mapping made in the previous section. As strong as the evidence is for the alignment of tonal domains and syntactic XPs, there is a real problem with identifying Xiamen tonal domains as phonological phrases. Though Chen (2000:438) proposes that tonal alternation in Xiamen “...functions like some sort of phonological punctuation: the appearance of the unchanged base tone serves to signal the end of a major syntactic constituent...”, he also acknowledges that this “punctuation” does not always align with higher-level intonational domains. The phonological phrases defined in (19), for instance, can be broken up by intonational phrases, as shown in Figure 7.7.

7.3 Nouns and adjectives

In this section, I lay out the tone sandhi patterns found with Khoekhoe DP-internal nouns and adjectives. Predicate nominals and adjectives pattern with stative verbs and so will be discussed in the next section. As in Xiamen, DPs in Khoekhoe are domains for tone sandhi, but because citation melodies are left- rather than right-aligned, they fall on modifiers rather than NPs. This turns out to be a challenge for Truckenbrodt’s analysis, but we will see that it works for the majority of cases if we make certain simplifying assumptions about the syntax-prosody mapping.

With very few exceptions, unmodified nouns in Khoekhoe appear in citation form, while nouns preceded by one or more modifiers take sandhi form. Similarly, in strings of modifiers, only the leftmost element takes citation form; all others have sandhi melodies, as illustrated by the sentences in (35) and the pitch tracks in Figure 7.8. Recall that words in citation form are bolded and words in sandhi form are underlined, while PGNs and other non-alternating morphemes are neither bolded nor underlined.

- (35) a. [súú-ku] ‘pots (M.PL)’
 pot-PGN
- b. [ʰ!áβá sùu-ku] ‘red pots’
 red pot-PGN
- c. [ʰ!áni ʰ!àβa sùu-ku] ‘six red pots’
 six red pot-PGN
- d. [ʰ!áá ʰ!àni ʰ!àβa sùu-ku] ‘those six red pots’
 those six red pot-PGN
- e. [hòà ʰ!àa ʰ!àni ʰ!àβa sùu-ku] ‘all those six red pots’
 all those six red pot-PGN

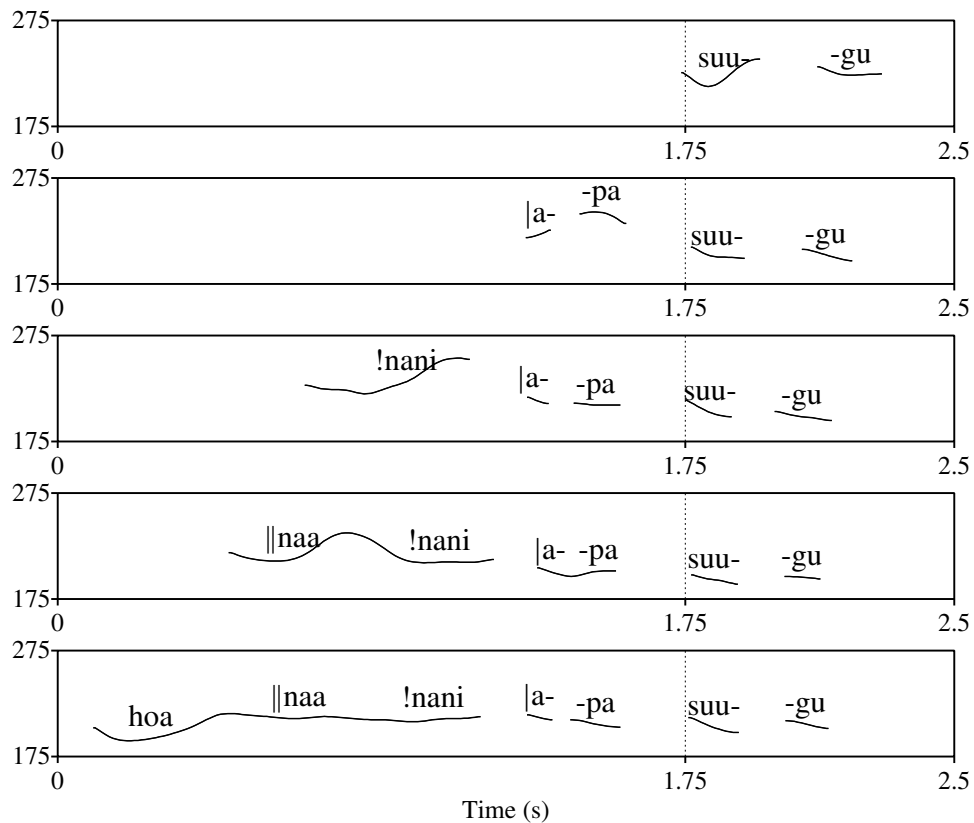


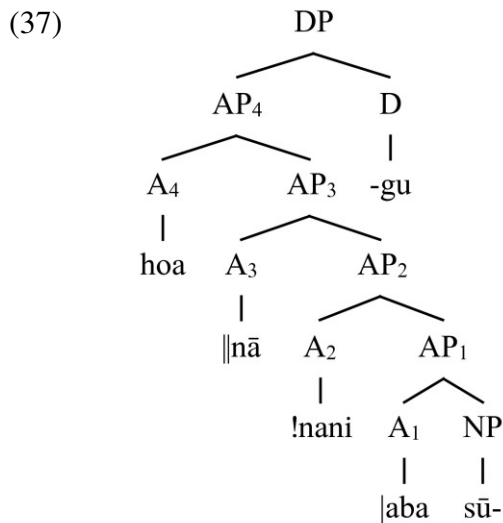
Figure 7.8 F0 traces for the examples in (35). (Speaker F2).

These traces show that the noun *sūgu* ‘pots’ takes a high-rising melody when unmodified, and a low-level melody when preceded by any number of modifiers, and that each modifier occurs in citation form (i.e., H-SH, except *hoa*, which is SL-L) only when it is the first element in the domain. This is the mirror image of Xiamen, where the final element takes citation form. But when we try to adapt Truckenbrodt’s analysis of Xiamen by simply reversing the direction of alignment, we see that it fails to predict the observed pattern. This is illustrated with a sentence-medial DP in (36).⁶³

⁶³ This example ignores the phrasing of the verb, which will be discussed below.

- (36) a. (**Namas** ge) (**hoa** ||nā !nani |aba sūgu) go mû.
 Nama DECL all those six red pot-PGN PAST see
 ‘The Nama saw all those six red pots.’
- b. *(**Namas** ge hoa ||nā !nani) (|aba) (sūgu) go mû.

If *hoa*, *||nā* and *!nani* were, in fact, function words for the purposes of ALIGN-L(LexP;PhP), while *|aba* and *sūgu* were lexical items, we would expect a pattern in (36)(b). This is not the case. How do we reconcile the apparent contradiction? I propose that the phrasing in (36)(a) reflects the fact that pre-nominal modifiers “count” as adjectives, and so as lexical heads, for the purposes of phrase alignment, and that the PGN clitic is really D. If this is the case, the medial DP in (36) should have the structure in (37).



With this structure, Truckenbrodt’s proposal predicts the correct results if we introduce the constraints listed in (38).

(38) WRAP-XP: Each lexical XP is contained in a phonological phrase.
(Truckenbrodt 1995, 1999)

NONRECURSIVITY: Any two phonological phrases that are not disjoint in extension are identical in extension. (Selkirk 1995, Truckenbrodt 1995, 1999)⁶⁴

The idea behind WRAP-XP is that it is preferable for lexical XPs to phrase as a unit, while NONRECURSIVITY prevents embedded phrases. When these constraints outrank ALIGN-L(LexP;PhP), DPs phrase as a unit, as shown in (39).

(39)

/hoa nā aba sūgu/	WRAP-XP	NONREC	ALIGN-L (LexP;PhP)
a. (hoa) (nā) (aba) (sū-gu)	*!***		
b. (hoa (nā (aba (sū-gu)))))		*!***	
☞ c. (hoa nā aba sū-gu)			***

In candidate (a), the left edge of each lexical XP is aligned with a phrase boundary, in violation of WRAP-XP. It is, therefore, eliminated. Similarly, candidate (b) is eliminated because of the prohibition on recursive structures. The only way to satisfy both WRAP-XP and NONRECURSIVITY is to violate ALIGN-L (LexP;PhP), as in candidate (c).

On what grounds can we justify the analysis of pre-nominal modifiers as “adjectives”? First, such words pattern phonotactically with the roots. They satisfy the constraints on minimality and segment distribution, and they are the only function words that can take sandhi form; adverbs, pronouns, postpositions and verbal auxiliaries all have invariant melodies. Moreover, the syntax of PGN markers makes

⁶⁴ Truckenbrodt argues that this constraint should be evaluated gradiently, but because it makes no difference to the present discussion, and because this would be inconsistent with the rest of my analysis, I simply assign one violation for each phrase contained in another phrase.

them good candidates for D—all DPs carry them, including pronouns, but predicate nominals do not (see also Washburn 2001). I will, therefore, assume that the structure in (37) is appropriate, at least for the purposes of the syntax-prosody mapping.

Before we turn to constructions larger than the DP, it should be noted that the left-dominant sandhi pattern is also found word-internally. For the most part, compounds are beyond the scope of this dissertation, but it is worth noting that the vast majority of nominal compounds pattern with the subordinating verbal compounds discussed in section 7.4.3. That is, the initial element takes citation form and all others take sandhi form, as illustrated by the examples in (40).

- (40) a. [ʔ||üib] ‘fat’ + [ʔ||áós] ‘stain’ → [ʔ||üi-ʔ||àos] ‘fat stain’
 b. [kúríb] ‘year’ + [kámb] ‘specific time’ → [kúrí-kámab] ‘season’
 c. [kúrí-kámab] ‘season’ + [ʔ||óab] ‘wind’ → [kúrí-káma-ʔ||òäb] ‘seasonal wind’

In each case here, the root on the left retains its citation melody, while the root on the right takes its sandhi form. This is perfectly in keeping with the observation that citation melodies are found on the left edges of lexical projections.

The fact that phonological phrases align with the left edges of lexical XPs and not a larger constituent is illustrated by the sandhi patterns in appositive constructions (Hagman 1977:45, Haacke 1999a:180). Each component of the appositive takes a PGN marker, suggesting that it is its own DP, and each constitutes a separate domain for tone assignment. Examples of appositives modeled on those cited by Hagman (1977) are listed in (41) and (42).

- (41) a. [Sise]_{DP} [tarase]_{DP}
 we woman
 ‘we (F.PL), the women’
- b. [Ti kûib]_{DP} [‡khari kûib]_{DP} [‡kham kûib]_{DP}
 my brother small brother young brother
 ‘my brother, the small brother, the young brother’
- (42) a. [Sige]_{DP} [!nanige]_{DP}
 we six
 ‘We (M.PL), the six’
- d. [Ti kûib]_{DP} [‡kharib]_{DP} [‡khami]_{DP}
 my brother small young
 ‘My brother, the small one, the young one’

In each case, the leftmost element in the lexical projection takes citation form, even when it is preceded by another DP, despite the fact that the entire appositive construction behaves as a constituent for purposes of movement and case marking. All non-subject arguments take oblique PGN markers (see Chapter 4). In sentences with appositives in oblique positions, only the final element takes the oblique PGN, as illustrated in (43). All other DPs take subject PGN markers. Recall that the 3.F.S subject PGN marker is [-s], while the oblique version is [-sa].

- (43) a. Tita ge ||ari [sa sores]_{DP} [Namasa]_{DP} go mû.
 I DEC yest. your friend-PGN Nama-PGN PST see
 ‘Yesterday I saw your friend the Nama.’
- b. *Tita ge ||ari [sa soresa]_{DP} [Namasa]_{DP} go mû.

The appositive object in this example takes only one oblique marker, despite the fact that there are two distinct tone sandhi domains. The observed tone patterns fall out naturally from the constraint ranking shown above, as demonstrated in (44).

(44)

/ti kûib †khari kûib/	WRAP-XP	NONREC	ALIGN-L (LexP;PhP)
a. (Ti) (kûib) (†khari) (kûib)	*!*		
☞ b. (Ti kûib) (†khari kûib)			**
c. ((Ti kûib) (†khari kûib))		*!*	**
d. (Ti kûib †khari) (kûib)	*!		**
e. (Ti kûib †khari kûib)			***!

Candidate (a) satisfies ALIGN-L(LexP;PhP), but violates the higher-ranked WRAP-XP, while candidate (c) is eliminated for a gratuitous violation of NONRECURSIVITY. Candidate (d), on the other hand, wraps one, but not both of the lexical constituents, and candidate (e) violates ALIGN-L(LexP;PhP) more than is necessary to satisfy higher-ranked constraints. The same basic pattern also obtains with the coordinated noun phrases in (45).

- (45) a. [|Gaes]_{DP1} tsî [|gûs]_{DP2} tsî-ra ge **daob** xō|khā goro !gû.
 gemsb. and spring. and-PGN DEC road along PST-IMP walk
 ‘The gemsbok and the springbok are walking along the road.’
- b. Tita ge [Daman]_{DP1} tsî [Naman]_{DP2} tsî-na go mû.
 I DEC Damaras and Namas and-PGN PST see
 ‘I saw the Namas and the Damaras.’

As with the appositives, each noun here takes citation form, as we would expect if the NP, not the larger coordinated structure, is the domain for phrase alignment. The phrasing of the monomoraic particle *tsî* ‘and’, however, is an issue. Even though ALIGN-L(LexP;PhP) requires lexically-headed XPs to align with phonological phrases, it does not prevent phrases aligned with other types of morphemes. That is, it cannot prevent a phrasing like (/gaes) (tsî) (/gûs) (tsî-ra). Truckenbrodt precludes such possibilities with the low-ranked *STRUC constraint

*PhP, which prevents phonological phrases not required by constraints ranked above it, but we saw in Chapter 4 that constraints of this type are unnecessary and undesirable (Gouskova 2003). Instead, observed patterns should be shown to fall out from independently-motivated constraints. In (44)(c), for example, a candidate with excess structure was eliminated for needlessly violating NONRECURSIVITY. But what constraint will do the same for phrases aligned with words like *tsî*?

As shown in Chapter 4, one of the crucial differences between roots and particles is that particles are prohibited in clause-initial positions. I argue that this is because phonological phrases must begin with prosodic words. This analysis is corroborated by the observation that the clause-initial conjunction [tsî^{n̄}] ‘and’ (as opposed to the coordinating particle [tsî^{n̄}] ‘and’, which is orthographically identical) has a long vowel and a high-rising melody (see Chapter 6 for details). That is, the conjunction is a prosodic word, but the coordinating particle is not. This restriction is part of a general pattern of left prominence that includes word-initial augmentation and the association of tones with the left mora in a root. Formally, I capture this with the alignment constraint in (46), the effect of which is demonstrated in (47).

(46) ALIGN-L(PhP;PrWd): Align the left edge of each phonological phrase with the left edge of a prosodic word.

(47)

/ gaes tsî gûs tsî/	ALIGN-L (LexP;PhP)	ALIGN-L (PhP;PW)
a. (gaes) (tsî) (gûs) (tsî-ra)		*!*
☞ b. (gaes tsî) (gûs tsî-ra)		

Both candidates here meet the requirement that NPs should align with PhPs, but candidate (a) has two additional phrases. It is eliminated because the particle

version of *ts̃* is not a prosodic word. The winning candidate in (b), however, has well-formed phrases that are consistent with the observed tone pattern.

Another interesting pattern is found with possessive constructions. In addition to the possessive adjectives *tī* ‘my’ and *sā* ‘your’, there is a particle *di*, which functions something like English ‘s’. Three possible variants are illustrated by the sentences in (48). The PGN markers are not glossed, but note that *-s* is the feminine singular marker and *-b* the masculine singular marker.

- (48) a. [[**Namab**]_{DP1} di xams]_{DP2}
 Nama POS lion
 ‘The (male) Nama’s (female) lion.’
- b. [**xams**]_{DP1} [[**Namab**]_{DP2} dis]_{DP3}
 lion Nama POS
- c. [[**Namab**]_{DP1} xams]_{DP2}
 Nama lion

The structure in (48)(a) seems at first to be directly parallel to the English translation, where the possessive particle *di* functions like English ‘s’. We will, however, see that its distribution is somewhat different. Nonetheless, *Namab* in (48)(a) is initial in its domain, and so takes citation form, while *xams* is non-initial and so takes sandhi form. The example in (48)(b), on the other hand, is an appositives, where each noun is leftmost in its own DP and so each takes citation form. Finally, in (48)(c), the DP *Namab* functions like an adjunct to the NP *xam*, which triggers a sandhi melody. Although both nouns in (48)(c) end with PGN markers, they are *different* markers, indicating that this is not an appositive construction.

Looking more closely at the structure in (48)(a), we find the particle *di* can precede a noun modified by an adjective, numeral, demonstrative or universal, but not

a possessive. That is, *di*, *ti* and *sa* are in complementary distribution, presumably for semantic reasons. Examples of such constructions are provided in (49).

- (49) a. **Namab** di l*nani* xamgu ‘The Nama’s six lions (F.PL)’
 Nama POS six lion-PGN
 b. **Namab** di l*nā* xamgu ‘Those lions of the Nama’s’
 c. **l*Nā*** **Namab** di l*nā* xamgu ‘Those lions of that Nama’s’
 e. **Namab** di h*oa* xamgu ‘All the lions of the Nama’s’
 g. **Hoa** **Naman** di xamgu ‘All the Namas’ lions’

The example in (49)(a) is again directly parallel to the English gloss, but in (49)(b-g) we find that the Khoekhoe and the English constructions pattern differently with respect to the modifiers they allow. I take this as evidence that *di* is not, in fact, a determiner like English ‘s. Rather, I assume that the phrase *Namab di* serves as a PP-like adjunct. If this is the case, and *Namab di* adjoins to the NP or AP containing *xam*, we get the observed pattern, as demonstrated in (50).

(50)

/Namab di xams/	WRAP-XP	NONREC	ALIGN-L (LexP;PhP)
a. (Namab di) (xams)	*!		
b. (Namab) (di <u>xams</u>)	*!		*
☞ c. (Namab di <u>xams</u>)			*

Candidates (50)(a-b) are both eliminated for failing to wrap the entire constituent, leaving candidate (50)(c) as the winner.

Thus far, then, we can make the generalization that an NP and its adjective or adjunct modifiers constitute a domain for the alignment of citation melodies, because WRAP-XP and NONRECURSIVITY both outrank ALIGN-L(LexP;PhP). Unfortunately,

this tidy picture is complicated by the behavior of relative clauses. Relative clauses immediately precede the noun, but any universal, demonstrative, possessive or numeral will precede the relative clause. The influence of WRAP-XP in the above examples would suggest that the relative clause should be included in the same phonological phrase as the rest of the DP. This is not, however, the case, as illustrated by the sentences in (51).

- (51) a. [Taradi]_{DP} ge |narab tawa ra sâ.
 women DEC umb.th. under IMP rest
 ‘The women are resting under the umbrella thorn.’
- b. [[|Ari go |naina xoa] taradi]_{DP} ge |narab tawa ra sâ.⁶⁵
 yest. PST berries pick women
 ‘The women who picked berries yesterday are resting under the umbrella thorn.’
- c. [|Nā [|ari go |naina xoa] taradi]_{DP} ge |narab tawa ra sâ.
 those yest. PST berries pick women
 ‘Those women who picked berries yesterday are resting under the umbrella thorn.’

Here, we see that the noun *taradi* ‘women’ is in citation form when it is DP-initial, but in sandhi form when it is preceded by a relative clause. This is what we would expect from the previous examples. But *within* the relative clause, we find that the object DP and verb take citation forms, indicating two additional phonological phrases. Moreover, the example in (51)(c) shows that a preceding demonstrative has no effect on the roots within the clause. Such clause-internal NPs and VPs are,

⁶⁵ Note that the location of the tense particle in this example is somewhat unexpected, because it seems to be patterning like a second position particle rather than a verbal particle. This example reflects the speech of Speaker M1, who conceded that the alternative *|ari |naina go xoa taradi* was acceptable, but had a strong preference for this construction. Unfortunately, I have no data on the preferences of other speakers. In my data set, Speaker M1 expressed this preference only for relative clauses.

therefore, different from the APs discussed above, and their behavior cannot be generated with the same constraint ranking, as illustrated in (52).

(52)

/ nā [ari go naina xoa] _{CP} taradi/	WRAP- XP	NONREC	ALIGN-L (LexP;PhP)
a. (nā) (ari go) (naina) (xoa) (taradi)	*!*		
b. (nā) (ari go) (naina) (xoa taradi)	*!*		
c. (nā ari go) (naina) (xoa taradi)	*!*		
⊗ d. (nā ari go naina xoa taradi)			**
e. (nā ari go (naina) (xoa taradi))		*!*	

Candidates (a-c) are all eliminated because they fail to wrap the entire XP, and candidate (e) is eliminated because of recursive phrasing. The ranking motivated by pre-nominal modifiers predicts the phrasing in (d), which is incorrect. No ranking of these constraints can generate both the pattern for the adjectives and the pattern for the relative clauses. The picture is further complicated by clauses that lack objects and adverbs, as in (53).

- (53) a. [Xoa go] taradi ge |narab tawa ra sâ.
 pick PST women DEC umb.th. under IMP rest
 ‘The women who picked berries are resting under the umbrella thorn.’
- b. ||Nā [xoa/xoa go] taradi ge |narab tawa ra sâ.
 those pick PST women DEC umb.th. under IMP rest
 ‘Those women who picked berries are resting under the umbrella thorn.’

The unmodified verb-initial constituent in (53)(a) takes citation form, but when preceded by a demonstrative, as in (53)(b), there is variability in the type of tone melody it surfaces with (see section 7.4.1 for discussion of verb-tense marker

inversion). Haacke's (1999a:180) examples of comparable constructions show the verb in sandhi form in cases like (b), and one of my consultants uses sandhi form as well, but the other does not.⁶⁶ In any case, the constraints used above for NPs and APs are not sufficient. It seems likely that these data will ultimately prove amenable to an account that appeals to the notion of phase-based spell-out (see e.g., Selkirk and Kratzer 2007 and references therein), but I will not attempt to reconcile the issue here.

Before moving on to the patterns in verbs and other parts of speech, we need to consider one special case, namely the effect of fronted constituents on nouns in sentence-initial position.

7.3.1 Special case: Fronting

Regardless of their position in a sentence, unmodified nouns in Khoekhoe nearly always take citation form, as demonstrated by the sentences in (54). The focus here will be on the nouns; other parts of speech will be discussed below.

- (54) a. **Namas** ge **sūba** gere ton.
 Nama DEC pot PST-IMP carry
 'The Nama was carrying the pot.'
- b. **Taras** ge **Namaba** **sūba** ge ||amaba.
 woman DEC Nama pot PST buy-for
 'The woman bought the Nama a pot.'
- c. **Darob** ge **Namas** |kha ra !gû.
 child DEC Nama with IMP walk
 'The boy is walking with the Nama.'
- d. **Darob** ge **Namasa** xū ra !gû.
 child DEC Nama away IMP walk
 'The boy is walking away from the Nama.'

⁶⁶ Both use citation melodies in constructions like (51)(c).

These examples show that subject (54)(a-d), direct object (54)(a-b), indirect object (54)(b) and postpositional object⁶⁷ (54)(c-d) nouns all take citation form in their default positions. Khoekhoe has relatively flexible word order, but nouns always retain citation form if they are permuted to different positions in the sentence. The most common types of movement are the topicalization of non-subjects, and the extraposition of elements to a position after the verb, as in (55).

- (55) a. **Sūbas** ge **Namasa** gere ton.
 pot DEC Nama-PGN-OBL PST-IMP carry
 ‘The Nama was carrying the pot.’
- b. **Namas** |khab ge **daroba** gere !gû.
 Nama with DEC child-PGN-OBL PST-IMP walk
 ‘The boy was walking with the Nama.’
- c. **Namas** ge gere ton, **sūba**.
 Nama DEC PST-IMP carry pot
 ‘The Nama was carrying—the pot.’
- d. **Darob** ge gere !gû, **Namas** |kha.
 child DEC PST-IMP walk Nama with
 ‘The boy was walking—with the Nama.’

In sentences (55)(a-b), the object and postpositional phrase have been raised to initial position, while the subjects have been “deposed” to a position immediately after *ge*. This has no effect on tone melodies. Similarly, in sentences (55)(c-d), the object and postpositional phrase have been moved to a post-verbal position, again without any effect on tone distribution, though the auditory impression suggests a separate intonational phrase. In fact, there is only one instance in which unmodified nouns in permuted sentences do not retain their citation melody. Hagman (1977:111) and

⁶⁷ Some postpositions require an oblique PGN marker on their objects, but most do not. See Hagman (1977) for discussion.

Haacke (2006) describe an uncommon, but acceptable, construction where the verb and tense marker, and optionally objects and adverbs, are moved to a pre-subject position. That is, the subject remains in “first” position, indicating that this is not topicalization *per se*. In such cases, the subject takes sandhi rather than citation form. The range of possible structures is illustrated in (56).

- (56) ‘*The Nama picked berries yesterday.*’
- a. **Namas** ge ||ari ||**naina** go xoa.
Nama DEC yest. berry PST pick
 - b. [**Xoa** go] Namas ge ||ari ||**naina**.
 - c. [||**naina** go **xoa**] Namas ge ||ari.
 - d. [||ari go **xoa**] Namas ge ||**naina**.
 - e. [||ari go ||**naina** **xoa**] Namas ge.
 - f. *||naina Namas ge ||ari go xoa.
 - g. *||ari Namas ge ||naina go xoa.
 - h. *Xoa Namas ge ||ari ||naina go.

Focusing for the moment on the subject *Namas*, we see that it takes sandhi rather than citation form when the verbal constituent precedes it. This constituent must include the verb and tense marker, and can optionally include any other non-subject arguments or adjuncts. This fronted constituent is not, however, a relative clause, because the verb’s object can remain in the matrix clause, and because the fronted element precedes rather than follows the demonstrative //nā ‘that’, as in (57).

- (57) ‘*That Nama picked berries.*’
- a. ||**Nā** Namas ge ||**naina** go xoa.
that Nama DEC berries PST pick
 - b. **Xoa** go ||nā Namas ge ||**naina**.
 - c. *||Nā xoa go Namas ge ||naina.

This is the opposite of the pattern we saw in the relative clauses above. It does not, therefore, seem that the fronted element forms a constituent with the noun, even though it does have an effect on the tone. One possibility is that this is a pseudo-cleft construction along the lines of “what the Nama picked is berries”. Interestingly, the effect on the subject is localized to the first element of an appositive construction.

- (58) *‘Your friend the Nama picked berries.’*
- a. **Sa** sores **Namas** ge **||naina** go xoa.
your friend Nama DEC berries PST pick
 - b. **Xoa** go sa sores **Namas** ge **||naina**.

Furthermore, this type of construction is only possible with lexically-specified subjects—that is, it is *not* possible with pronouns, as illustrated in (59).

- (59) *‘I picked berries.’*
- a. Tita ge **||naina** go xoa.
I DEC berry PST pick
 - b. *Xoa go tita ge **||naina**.

This is interesting because it is the only possible context where a pronoun could occur in a sandhi environment, and it is prohibited in exactly that position.

The only other situation in which a “first position” subject is not utterance-initial is when the sentence begins with a conjunction. In such sentences, citation form is retained on lexical subjects, and pronouns are also possible.

- (60) a. Tsî **Namas** ge **||naina** goro xoa.
 and Nama DEC berries PST-IMP pick
 ‘And the Nama was picking berries.’
- b. Tsî tita ge **||naina** goro xoa.
 and I DEC berries PST-IMP pick
 ‘And I was picking berries.’

It is not, therefore, the case that the subject must be utterance-initial in order to take citation tone, but rather that cleft constructions have a special effect on tone. It is unclear how we should analyze the syntax of these constructions, but one possibility is that the fronted material is a headless relative clause, and that the lexical subject is moved to the position of the relativizer, even though it is an independent DP.⁶⁸ I will leave fuller discussion of the syntax-prosody mapping in these constructions until their syntax is better understood. We now turn to the tone distribution patterns observed in verbs.

7.4 Verbs

The previous section demonstrated that tone distribution in nouns and adjectives can, with very few exceptions, be described concisely in terms of position within a phonological phrase that is aligned with the left edge of an NP or AP. This section will show that the behavior of verbs is more complex, but that it can also be expressed in terms of alignment as long as we recognize an independent, grammaticalized uses of sandhi as a means of signaling the difference between matrix and embedded clauses. We look first at the behavior of embedded clauses (section 7.4.1), then turn to the effect of word order verb tone in matrix clauses (section 7.4.2), and finally, we consider the patterns found with complex verbs (section 7.4.3).

⁶⁸ I am grateful to Chris Collins for this suggestion.

7.4.1 Matrix and embedded clauses

At first glance, it seems that the default for Khoekhoe verbs is to take a sandhi melody. Under Haacke's (1999a) analysis, this falls out from the fact that the verb is preceded by the tense and/or imperfective aspect marker, which Haacke analyzes as the first element in the verb phrase. One problem with this analysis is that word order in embedded clauses is identical to that in matrix clauses, but embedded verbs consistently take citation melodies. Haacke addresses this by arguing that verbs in embedded clauses are marked with a "citation retention" diacritic that overrides the sandhi melody triggered by the VP structure. The function of this marker is to link the embedded clause to the main clause. I argue the opposite, namely that citation melodies on embedded verbs results from the regular alignment of phrase boundaries with lexical projections, and that standard declarative sentences are, in fact, the diacritically-marked exception rather than the rule.

Syntactically, the defining characteristic of a standard declarative clause in Khoekhoe seems to be the presence of a second-position particle like the simple declarative marker *ge*. For the sake of this discussion, I will assume this is the head of a CP. Such second-position sentence markers occur with three of the most common matrix clause types, and word order patterns suggest that the fourth is structurally equivalent. These four categories are the simple declarative, marked with *ge*, the emphatic declarative, marked with *kom...o*, the simple interrogative, not marked with a particle, and the emphatic interrogative, marked with *kha* (Hagman 1977). Both the simple interrogative and the emphatic interrogative also require an oblique PGN marker on the subject. Verbs in all four types of matrix clause take sandhi form, as illustrated by the sentences in (61).

(61) *Standard matrix clauses*

- a. **Sais** ge **!narasa** gere ||ama.
sister DEC nara PST-IMP buy
'The older sister was buying the nara melon.'
- b. **Sais** kom **!narasa** gere ||ama o.
sister DEC nara PST-IMP buy EMP
'Surely, the older sister was buying the nara melon.'
- c. **Saisa** **!narasa** gere ||ama?
sister-OBL nara PST-IMP buy
'Was the older sister buying the nara melon?'
- d. **Saisa** kha **!narasa** gere ||ama?
sister-OBL INT nara PST-IMP buy
'Was the older sister buying the nara melon?'

Embedded clauses, on the other hand, vary somewhat in terms of the elements they contain, but all lack a second-position particle⁶⁹ and all have citation melodies on their verbs. We saw above, for instance, that verbs in relative clauses take citation melodies, regardless of clause-internal word order or the presence of a pre-clause modifier. This is illustrated by the sentences in (62). Constraints on word order in embedded clauses will be discussed below. For convenience, the embedded clauses in these examples are set off with “[”.

⁶⁹ Some embedded clauses do have a second-position subject PGN marker, as do matrix clauses with deposited or absent subjects, but these have no effect on tone distribution.

(62) *Relative clauses*

- a. [**Xoa** ta go] ||naina ge a ||khoaxa.
pick I PST berries DEC COP delicious
'The berries I picked are delicious.'
- b. [||Ari ta go **xoa**] ||naina ge a ||khoaxa.
yest. I PST pick berries DEC COP delicious
'The berries I picked yesterday are delicious.'
- c. [**Sa** !gâs ge **xoa**] ‡khanis ge a kaise !gâi.
your sister PST write book DEC COP very good
'The book that your sister wrote is very good.'
- d. ||**Nâ** [||ari go ||**naina xoa**] taradi ge |**narab** tawa ra sâ.
those yest. PST berries pick women DEC umb.th. under IMP rest
'Those women who picked berries yesterday are resting under the umbrella thorn.'

In each case, the embedded verb takes citation form, regardless of clause-internal word order. There is no reason to think that the structural relationship between the verb and tense marker in embedded clauses like those in (62)(b-c) is any different from that in a matrix clause.⁷⁰ The only difference is the clause type and the absence of a second-position particle.

This same pattern is also found in adverbial clauses, which are embedded clauses that end with either a suffix or a subordinating conjunction (Hagman 1977:126-135). Examples are provided in (63). In (63)(b-d), the adverbial is topicalized and followed by a PGN marker that refers to the subject of the matrix clause.

⁷⁰ As mentioned above, the word order in the relative clause in (d) reflects the preference of speaker M1.

(63) *Adverbial clauses*

- a. **Namas** ge [**daoba** ra **napu-se**] ra nae.
Nama DEC road IMP sweep-ADV IMP sing
'The Nama is singing while sweeping the road.' (based on Haacke:204)
- b. [**Namas** āsarana ra **!ā-pa**]-ts ge **hâ** tide.
Nama laundry IMP hang-ADV-you DEC stay not
'You cannot stay where the Nama is hanging laundry.' (based on Haacke:204)
- c. [**Mai-e** ta ra **xon**] hîa-s ge **sa !gâsa daoba** gere napu.
mealie I IMP grind while-PGN DEC your sister road PST-IMP sweep
'While I was grinding the mealie, your sister was sweeping the road.'
- d. [**Naras** tawa-khom ra **sâ**] hîa-khom ge **!ū** ra gûba goro mû.
umb.th under-we IMP rest while-we DEC graze IMP spring. PST-IMP see
'While we were resting under the umbrella thorn, we saw the grazing springbok.'

As in relative clauses, both nouns and verbs in adverbial clauses take citation form, even though the verbs are preceded by tense markers. The same pattern obtains with nominalizations (64), indirect discourse clauses 0, and quotative clauses (65).

(64) *Nominalization*

- a. [Tita nâti ra **!âi**]-s !aroma-b ge goro aixa.
I that-way IMP think-PGN because-he DEC PST-IMP angry
'He was angry because of my thinking that way.'
Indirect discourse 'that'-clauses
- a. **Aob** ge ra gom [**naina** ta ge **xoa**] khaisa.
man DEC IMP believe berries I PST pick that-CASE
'The man believes that I picked berries.'
- b. [**Sa !gâs** **!khanisa** nî **xoa**] khais ge a ama.
your sister book FUT write that DEC COP true
'It is true that your sister will write a book.'

(65) *Quotative clauses*

- a. **Aob** ge go mî [**||naina** ta ge **xoa**] ti.
man DEC PST say berries I PST pick QUOT
'The man said that I picked berries.'
- b. **Aob** ge go mî [**sa** !gâs †**khanisa** nî **xoa**] ti.
man DEC PST say your sister book FUT write QUOT
'The man said that your sister will write a book.'

In each case, the verb in the embedded clause takes citation form, even when preceded by a tense particle. Any account of Khoekhoe tone distribution must address this fundamental difference between matrix and embedded clauses. But given the complementary distribution of matrix and embedded clauses, how do we determine what is the exception and what is the rule?

I argue that a special form of matrix clause, not mentioned by Hagman (1977) or Haacke (1999a), suggests that citation melodies on verbs are, in fact, the rule and not a linking mechanism, as Haacke proposed. Examples of this type were volunteered by my primary consultant in our discussion of word order variation, and other consultants subsequently produced them consistently and without hesitation. Moreover, Witzlack-Makarevic (2006) reports that constructions of this type are common in Richtersveld Nama, a South African dialect of Khoekhoe. For my primary consultant, these "special matrix clauses" are dispreferred with a lexically specified subject, but I do not know whether this is a widespread preference in Namibian Khoekhoe. The defining features of special matrix clauses are the absence of the second-position sentential particle and a citation melody on the verb, just like in embedded clauses. Examples of minimally different standard and special matrix clauses are given in (66).

(66) *Standard and special matrix clauses*

- a. Tita ge ra nom. 'I am smiling.'
I DEC IMP smile
- b. |**Nom** ta ra.
smile I IMP
- c. Tita ge **mai-e** ra xon. 'I am grinding mealie.'
I DEC mealie IMP grind
- d. **Mai-e** ta ra **xon**.
mealie I IMP grind
- e. |**Naras** tawakhom ge nî sâ. 'We will rest under the umbrella thorn.'
umb.th. under-PGN DEC FUT rest
- f. |**Naras** tawakhom nî **sâ**.
umb.th.under-PGN FUT rest

In each case, the verb in a clause with *ge* takes sandhi form, while the verb in the “special” matrix clause takes citation form. This strongly suggests that it is clause type, and not the location of the tense marker, that triggers sandhi on the verb. But how does this explanation fit with the analysis motivated above for nouns and adjectives? Thus far, I have followed Chen (1987, 2000), Lin (1994) and Truckenbrodt (1999) in treating Khoekhoe tone sandhi as a matter for the phonology, but the distinction between matrix and embedded clauses is clearly matter for the syntax. The precise nature of the syntactic difference between these clause types remains to be established, but I argue it can be captured with the same mechanism I proposed for Taiwanese “citation resistant” morphemes in section 7.2.1. That is, the syntax marks verbs in standard matrix clauses as citation resistant, and the association of citation melodies with such verbs is blocked by a high-ranked constraint like that in (67).

- (67) *V^R-M_C: “Resistant” verbs cannot associate with citation melodies

Under this analysis, sandhi melodies on matrix verbs indicate violations of IDENT[M]/RT_{1Ph} not ALIGN-L(LexP;PhP). If we assume the syntactic structure in (34), ALIGN-L(LexP;PhP) will produce the phrasings in (68), and the constraints on citation tone alignment will produce the patterns in (69) and (70). Khoekhoe differs from Taiwanese in that roots never surface without tonal specification, so I assume SPECIFY(T) is undominated and do not consider unspecified candidates.

(68) *Phonological phrasing in standard and special matrix clauses*

- a. (Namas ge)_{PhP} (mai-e ra)_{PhP} (xon)_{PhP} ‘The Nama is grinding mealie.’
 Nama DEC mealie IMP grind
- b. (Mai-e ta ra)_{PhP} (xon)_{PhP} ‘I am grinding mealie.’
 mealie I IMP grind

(69) *Standard matrix clauses*

/ Namas ge mai-e ra xon ^R /	*V ^R -M _C	IDENT[M]/ RT _{1Ph}	*M _C
☞ a. (Namas ge) (mai-e ra) (<u>xon</u> ^R)		*	**
b. (Namas ge) (mai-e ra) (xon ^R)	*!		***

(70) *Special matrix clauses*

/ mai-e ta ra xon/	*V ^R -M _C	IDENT[M]/ RT _{1Ph}	*M _C
a. (mai-e ta ra) (<u>xon</u>)		*!	*
☞ b. (mai-e ta ra) (xon)			**

One advantage of this approach is that phonological phrasing is the same in the two types of matrix clause. This is consistent with the auditory impression given by minimally different sentences, as well as the impression that tense and aspect particles tend to phrase leftward, regardless of their syntactic constituency. Whatever the

mapping between syntactically-derived phrasing and auditory phrasing might be, it is preferable for sentences that sound similar to be analyzed in comparable terms.

An additional reason to prefer the phrasing in (68) is the observation that clitics seem to resist domain-initial positions (see Chapter 4 and section 7.3). As the examples in (71) show, word order in embedded clauses is verb-first when the clause contains only the verb and clitics, but tense-first when the clause also contains another prosodic word (i.e., DP, PP or Adv). I argued above that clause-initial positions are always phrase-initial positions, and that phrases must begin with a prosodic word. The phrasing in (68) allows us to retain this generalization.

- (71) a. [**Xoa** go] taradi ge |**narab** tawa ra sâ.
pick PST woman DEC umb. thorn under IMP rest
‘The women who picked are resting under the umb. thorn.’
- b. *[Go xoa] taradi ge |narab tawa ra sâ.
- c. [**Xoa** ta ge] |khanis ge a kaise |gâi.
pick I PST book DEC COP very good
‘The book that I wrote is very good.’
- d. [**Sa** |gâs ge **xoa**] |khanis ge a kaise |gâi.
your sister PST write book DEC COP very good
‘The book that your sister wrote is very good.’

Significantly, such distinctions between matrix and embedded clauses are not unheard of cross-linguistically: verbs in Classical Japanese relative clauses inflect differently than verbs in matrix clauses (Vovin 2003), verbs in Zahao take lexically-specified allomorphs in subordinate clauses (Yip 2004), and embedded verbs in Bora are productively marked with a high tone (Weber and Thiesen 2001). The crucial difference between Khoekhoe and these other languages is that Khoekhoe also uses the same alternation to mark the boundaries of syntactically-derived phonological phrases.

We now turn to word order variants in matrix clauses.

7.4.2 Verb raising in matrix clauses

Though the default in matrix clauses is for verbs to take sandhi form, there are cases in which word order is permuted and the verb instead surfaces with a citation melody. In this section, I argue that matrix verbs can only be marked “citation resistant” in their default positions; verbs in inverted and topicalized constructions take citation form because they have been raised to a higher structural position. I suspect this will eventually prove to be a type of focus marking. I also show that constructions with the past stative, the present perfective and the past perfective must be regarded as exceptions to the generalization that matrix verbs take sandhi melodies.

Tense in Khoekhoe is indicated with one of four particles: *ge* ‘remote past’, *go* ‘recent past’, *nî* ‘future’ and *ga* ‘indefinite’ (see Hagman 1977 for discussion). The present tense is unmarked in active verbs, though stative verbs have a present-tense copula (*a*) that occupies the same position as the tense markers. The default position for tense particles is immediately before the verb, though they behave phonologically like enclitics rather than proclitics. Active verbs can also take one of three aspects. The punctual aspect is unmarked, the imperfective is marked with the particle *ra*, which cliticizes to and sometimes harmonizes with the tense marker (e.g., *go + ra = goro*), and the perfective aspect is marked with the post-verbal auxiliary *hâ* and, in the past tense, the past copula *ī*.

In matrix clauses with default word order, the verb appears in final position and takes sandhi form, as illustrated for the recent past tense in the punctual and imperfective aspects by the sentences in (72).

- (72) a. **Namas** ge **||naina** go xoa. ‘The Nama picked berries.’
 Nama DEC berries PST pick
- b. **Namas** ge **||naina** goro xoa. ‘The Nama was picking berries.’
 Nama DEC berries PST-IMP pick

It is, however, possible to reverse the order of the verb and the tense marker, and in such cases, the verb takes its citation melody, as shown in (73).

- (73) a. **Namas** ge **||naina** **xoa** go. ‘The Nama picked berries.’
 Nama DEC berries pick PST
- b. **Namas** ge **||naina** **xoa** goro. ‘The Nama was picking berries.’
 Nama DEC berries pick PAST-IMP

The verb also takes a citation melody when raised to sentence-initial position, as in (74).

- (74) a. **Xoas** ge **Namasa** **||naina** go
 pick DEC Nama berries PST
 ‘The Nama picked berries.’
- b. **Xoas** ge **Namasa** **||naina** goro
 pick DEC Nama berries PST-IMP
 ‘The Nama was picking berries.’

Both tense inversion and initialization involve extraction of the verb from its default position and raising to a position above the tense particle, and in both cases the raised verb takes citation form. I argue that such verbs are not marked by the syntax as “citation resistant” and so surface with the melody required by ALIGN-L(LexP;PhP) and IDENT[M]/RT_{1Ph}.

This fairly straightforward picture is complicated by the perfective aspect. The perfective is exceptional in that verbs take citation rather than sandhi form, except in

the future tense. The relevant patterns are illustrated in (75). The verbs in these examples are italicized because this is also a flip-flop environment.

(75) *Perfective aspect*

- a. **Namas** ge **||naina** *xóó* hàⁿàⁿ.
 Nama DEC berries pick PRF
 ‘The Nama has picked berries.’
- b. **Namas** ge **||naina** go *xóó* hàⁿàⁿ í⁷¹
 Nama DEC berries PST pick PRF COP
 ‘The Nama had picked berries.’
- c. **Namas** ge **||naina** nî *xòq* háⁿaⁿ íi
 Nama DEC berries FUT pick PRF COP
 ‘The Nama will have picked berries.’
- d. **Namas** ge **||naina** nî *xòq* háⁿaⁿ háⁿaⁿ⁷²
 Nama DEC berries FUT pick CONTINUE
 ‘The Nama will continue picking berries.’

These sentences show that the past and present tenses, which both use the auxiliary *hàⁿàⁿ*, require the verb to take its citation high-rising melody, but that the future tenses, in which the auxiliary has a different tone, require verbs with sandhi forms. The past and future auxiliaries *hàⁿàⁿ* and *háⁿaⁿ* also differ prosodically: *hàⁿàⁿ* is prosodically less prominent than the verb, as in a subordinated compound, while *háⁿaⁿ* behaves prosodically like a coordinated compound, with equal prominence on the verb and the auxiliary. It is not clear why the aspectual morphology should be different in these cases (perhaps the future tenses are not truly in the perfective aspect), but these are clearly different morphemes, so it is not unreasonable that they should behave

⁷¹ The recent and remote past tenses pattern together, but I use examples with recent past to prevent confusion with the declarative particle *ge*.

⁷² Hagman’s (1977:66-67) description of the future perfective mentions only the reduplicated auxiliary *hâhâ*, but my consultant reported the differences between (c) and (d). This gloss for *hâhâ* is the same as that listed in Haacke and Eiseb (2002).

differently. In the framework I propose, we capture this by saying that verbs in matrix clauses with the past or present perfective are simply not marked citation resistant.

Comparable differences are also found with the past tenses of stative verbs and predicate nominals and adjectives (Hagman 1977:84-88). These are illustrated in (76), (77) and (78).

(76) *Stative verbs*

- | | | |
|----|--|----------------------------|
| a. | Namas ge a <u>khài</u> .
Nama DEC COP absent | ‘The Nama is absent.’ |
| b. | Namas ge go <u>khái</u> ’ íí. | ‘The Nama was absent.’ |
| c. | Namas ge nî <u>khài</u> . | ‘The Nama will be absent.’ |

(77) *Predicate nominals*

- | | | |
|----|--|-----------------------------------|
| a. | Nāb ge a <u>nàra</u> .
that DEC COP umb.thorn | ‘That is an umbrella thorn.’ |
| b. | Nāb ge go nara ’ íí.
that DEC PST umb.th. COP | ‘That was an umbrella thorn.’ |
| c. | Nāb ge nî <u>nara</u> ’ íí.
that DEC FUT umb.th. COP | ‘That will be an umbrella thorn.’ |

(78) *Predicate adjectives*

- | | | |
|----|--|-----------------------------|
| a. | Namas ge a <u>uru</u> .
Nama DEC COP healthy | ‘The Nama is healthy.’ |
| b. | Namas ge go uru ’ íí. | ‘The Nama was healthy.’ |
| c. | Namas ge nî <u>uru</u> . | ‘The Nama will be unlucky.’ |

Here, the past tense retains citation form, while the present and future tenses do not, and again these differences correlate with different melody on the copula. This seems to be an idiosyncratic property of past tense constructions. The fact that verbs in an embedded clause never take “exceptional sandhi” is further evidence that citation melodies are the rule rather than the exception. I show in the next section that the

behavior of compounds provides additional evidence that it is only *in situ* verbs that are marked.

7.4.3 Compound verbs

The examples in section 7.3 show that citation melodies in compound nouns and multi-root DPs occur on the leftmost element, and that non-initial elements take sandhi melodies. The same basic pattern obtains in compounds that involve a verb and another part of speech, as illustrated by the examples in (79).

(79) *Mixed verb compounds (Haacke 1999a:110-111)*

- a. [ʰ!hùùb] ‘earth’ + [!áo] ‘to cut’ → [ʰ!hùù!àò] ‘to plough’
- b. [ʔáo] ‘to throw’ + [!áʰaʰp] ‘rear’ → [ʔáo!áʰaʰ] ‘to throw again’
- c. [ʰ!hòrà] ‘crippled’ + [!óe] ‘to lie’ → [ʰ!hòrà!óe] ‘to bec. quadriplegic’

But compounds with two verbs are more complex. These fall into two distinct categories, which I call coordinating and subordinating.⁷³ In coordinating compounds, both roots retain their citation melodies, but in subordinating compounds the first root takes citation form and the second root takes sandhi. This difference also seems to correlate with prosodic status; the two elements in coordinating compounds give the auditory impression of being prosodically equivalent, while the first element in a subordinating compound seems to be more prominent. This distinction is illustrated by the minimal pair in (80) and the waveform in Figure 7.9.

- (80) a. Subordinating: [ʰóí-ʔùnù] ‘to rename’
- b. Coordinating: [ʰóí-ʔúnu] ‘to call to change’

⁷³ Haacke (1999a) discusses the coordinating compounds as cases of “citation retention”.

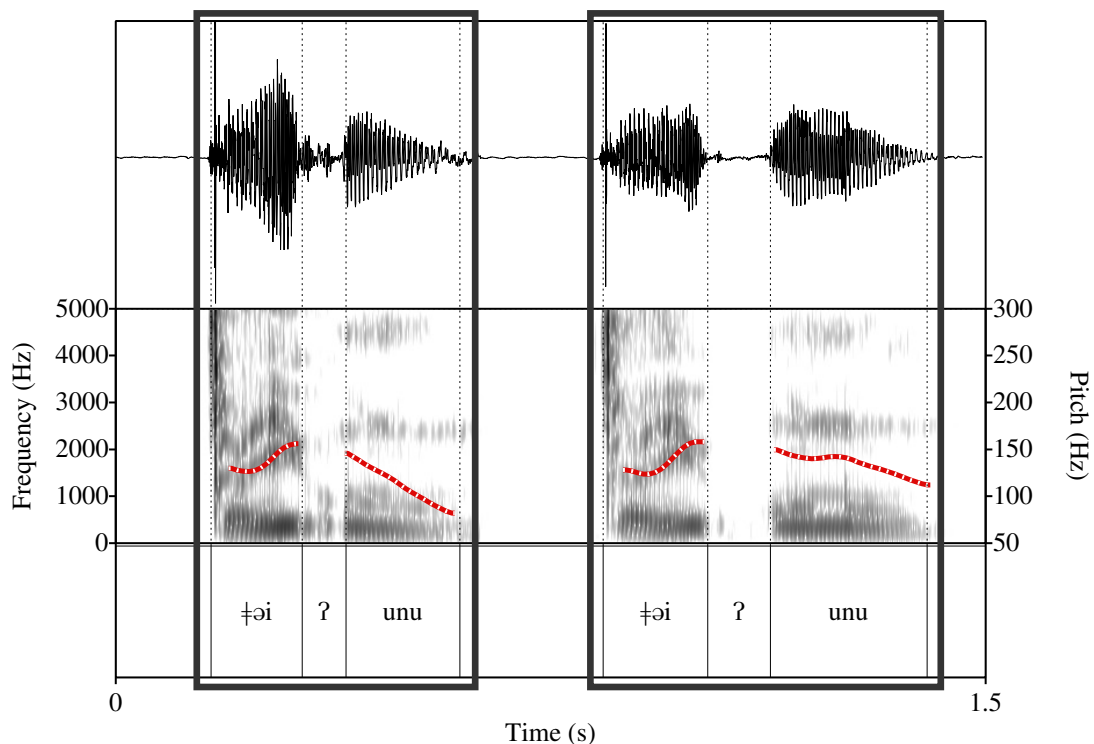


Figure 7.9 Waveform, spectrogram and F0 traces of minimally different subordinating (left) and coordinating (right) compounds with [ʔəí] ‘to call’ and [ʔunu] ‘to change’. Words recorded in isolation. (Speaker M1, recording courtesy T. Deoskar).

The figure shows that the duration of each morpheme is somewhat greater in the coordinating than the subordinating case. I do not have enough tokens of minimally different cases to provide quantitative results, but the pattern is fairly robust. In addition, there is a much greater tendency towards lenition of the glottal stop in subordinating than coordinating constructions (Deoskar 2003). Taken together the tone patterns and phonetic details support distinct prosodic analyses for these compounds. Given that the analysis thus far has taken citation melodies to align with phonological phrases, it is reasonable to conclude that each root in a coordinating compound constitutes its own phrase. But what about the subordinating case? If we assume that roots always map to prosodic words, there are two possible analyses. These are shown in (81).

- (81) a. *Option 1:* < [[†óí] [ʔùnù]] >
 b. *Option 2:* < [†óí] [ʔùnù] >

Both analyses map each root to its own prosodic word, but in (81)(a) the whole compound is contained in a recursive prosodic word, with the first element as its head. In (81)(b), on the other hand, the two prosodic words are contained in a single phonological phrase. We have relatively little evidence to help us choose between these options, but we can observe that the representation in (81)(b) is equivalent to that motivated for strings of roots in modified DPs, which do not give the same auditory impression as compounds. I therefore assume that coordinating and subordinating compounds map to the structures in (82).

- (82) a. Coordinating compounds: < [†óí] > < [ʔúnu] >
 b. Subordinating compounds: < [[†óí] [ʔùnù]] >

Interestingly, however, tense inversion can apply to both types of “compound” in a way that separates the two elements, as shown for the subordinating compound in (83).

- (83) *Subordinating compounds and tense inversion*
 a. Tita ge |gôaba go †gai-unu. ‘I renamed the child.’
 I DEC child PST call change
 b. Tita ge |gôaba †gai go unu.⁷⁴
 c. Tita ge |gôaba †gai-unu go.

Here the first verb takes sandhi form when it follows *go*, but citation form when it precedes it, just like the matrix verbs discussed in section 7.4.2. But when we

⁷⁴ One consultant (F2) expressed discomfort with this construction and produced it with a different tonal pattern, so data in this section reflects the production of speakers M1 and M3.

look at comparable constructions with coordinating compounds, we find support for the idea that it is only *in situ* verbs that get marked citation resistant, as illustrated by the resultative construction in (84).

(84) *Coordinating compounds and tense inversion*

- a. Tita ge |aoba go #*nau*-!gam. 'I hit-killed the snake.'
 I DEC snake PST hit kill
- b. Tita ge |aoba #*nau* go !gam.
- c. Tita ge |aoba #*nau*-!gam go.

In (84)(a), the first verb takes sandhi form, as is typical of a matrix verb, but the second element retains its citation melody, as is typical of coordinating compounds. If, however, the first verb precedes the tense marker, as in (84)(b), the second verb takes sandhi form, as we would expect if sandhi can only be required on *in situ* verbs. Prosodic phrasing for the subordinating and coordinating constructions is shown in (85) and (86), respectively.

(85) *Prosodic phrasing in subordinating compounds*

- a. (Tita ge) (|gôaba go) (#gai^R-unu) 'I renamed the child.'
 I DEC child PST call change
- b. (Tita ge) (|gôaba) (#gai go) (unu^R)
- c. (Tita ge) (|gôaba) (#gai-unu go)

(86) *Prosodic phrasing in coordinating compounds*

- a. (Tita ge) (|aoba go) (#*nau*^R) (!gam) 'I hit-killed the snake.'
 I DEC snake PST hit kill
- b. (Tita ge) (|aoba) (#*nau* go) (!gam^R)
- c. (Tita ge) (|aoba) (#*nau*) (!gam go)

Note also that the first element in each type of compound is subject to flip-flop, even when it is separated from its trigger (i.e., the second element) by the tense particle. This turns out to be a general pattern, as demonstrated by the examples in (87).

- (87) a. Tita ge **mai**-e go pā †û. 'I cooked-ate mealie.'
 I DEC mealie PST cook eat
 b. Tita ge **mai**-e *pā* go †û.
 c. *Pā* ta ge **mai**-e go †û.

Here, the first verb, *pā* 'cook', takes a flipped melody in all three constructions, regardless of its proximity to the trigger †û, suggesting that the substitution is the result of morpho-syntactic marking, rather than strict adjacency. But this picture is complicated by the observation that flip-flop fails to apply when the first element is suffixed, and as Haacke (1999a) reports, even morphologically vacuous "pseudo-suffixes" block flip-flop, as illustrated by the causative reduplication of numerals in (88). Recall from Chapter 5 that causative reduplication triggers strong flip-flop, so the melody on each base should change in this context.

- (88) a. [úí] 'one' → [úí'-ùí] 'to unify'
 b. [ʰ!ání] 'six' → [ʰ!áni-ʰ!àní] 'to make six'
 c. [χǝísá] 'eight' → [χǝísá-χǝìsà] 'to make eight'
 d. [kxǝèsè] 'nine' → [kxǝèsè-kxǝèsè] 'to make nine'

The picture is further complicated by the observation that flip-flop can apply to all non-final elements in a serial verb construction, as if it were the reverse of the sandhi pattern. This is shown in (89) and Figure 7.10. Note that //ama 'to buy' is in the H-SH citation category, *pā* is in the SH category and †û is also H-SH. This means that

H-SH is the flip-flop form of both *//ama* and *pā*, and L is the sandhi form of the flipped melody.

- (89) Tita ge **mai-e** go *//ama pā* †û. ‘I bought-cooked-ate mealie.’
 I DECL mealie PST buy cook eat

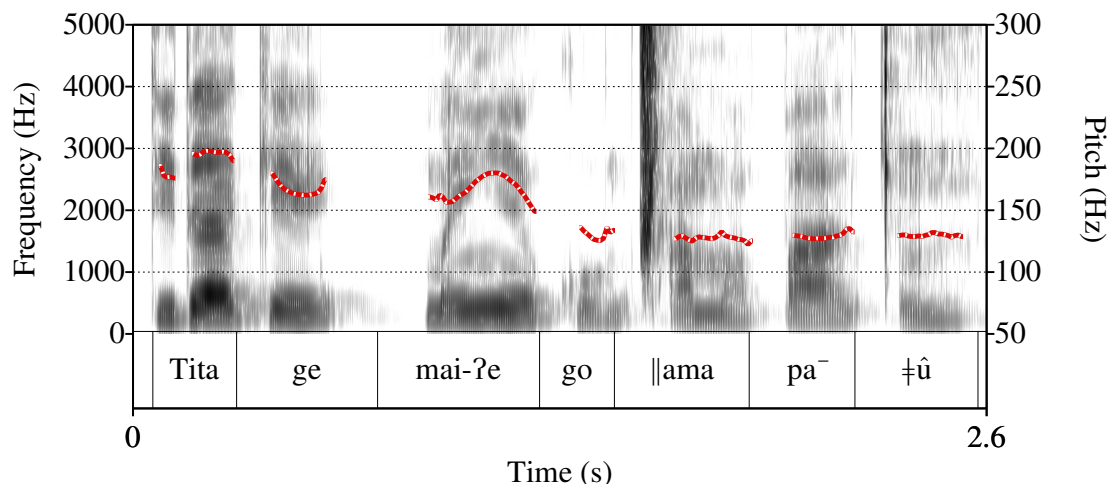


Figure 7.10 Spectrogram and F0 trace for the sentence in (89). (Speaker M3).

The crucial observation here is that *pā* must be subject to flip-flop, or else it would take the H sandhi form of SH, rather than L sandhi form of H-SH. This pattern most likely reflects some kind of recursive syntactic structure that marks all non-final elements for flip-flop, but I do not have enough data at this time to resolve the issue, so I leave the question for future research.

7.4.4 Verb summary

This section has shown that the tone sandhi behavior of verbs is parallel to that of nouns, but that the patterns are obscured by orthogonal processes in matrix clauses and the perfective aspect. If alignment constraints are, indeed, restricted to lexical categories, the patterns in Khoekhoe verbs are unsurprising, as long as we realize that the patterns in matrix clauses are the exception rather than the rule. The crucial insight

is that tense and aspect markers are functional heads that take a VP complement, and that alignment constraints target the VP rather than the functional projection.

Having established the basic patterns in content words, we now turn to the behavior of those function words that most resemble roots.

7.5 Function words

The previous two sections have shown that the distribution of citation and sandhi melodies in Khoekhoe nouns, verbs and adjectives can be captured with reference to prosodic domains derived from syntactic structures, just as has been argued for Xiamen. But Khoekhoe differs from Xiamen in that tone melodies on function words are invariant. The failure of clitics to alternate could perhaps be explained by arguing that melodies on such morphemes are different from those on roots, but many function words in connected speech take H-SH and SH melodies that are identical to those on citation forms. They are, in fact, quite common. One explanation is that such function words are also aligned with phonological phrases, thereby providing a counterexample to the LCC. I argue that this is not the case. Rather, Khoekhoe differs parametrically from southern Min dialects in that the markedness constraint, $*M_C$ targets only lexical heads.

As discussed in Chapter 6, the function words that most resemble roots phonotactically are nominal modifiers, simple adverbs, postpositions and verbal auxiliaries. The set of simple adverbs, for instance, includes one with SH tone [kóma] ‘supposedly’. This adverb always takes the SH melody in connected speech, but restrictions on the syntactic environments in which it occurs means that there is no principled way to determine whether it is preceded by a phrase boundary.

Postpositions, however, are somewhat more informative, because they are a prosodically heterogeneous class, in which some words pattern phonotactically with

the roots, while others more closely resemble particles. Crucially, postpositions with H-SH melodies always take citation form, despite the fact that they follow their objects. Example sentences are shown in (90).

- (90) a. **Xams** ge **xorasa** [úú] gere !gû.
 lion DEC water-hole along PST-IMP walk
 ‘The lion was walking along the water hole.’
- b. **Xams** ge **xorasa** [xúú] gere !gû.
 lion DEC water-hole from PST-IMP walk
 ‘The lion was walking away from the water hole.’
- c. **Xams** ge **xorasa** [ʰ!ʰóá] gere !gû.
 lion DEC water-hole toward PST-IMP walk
 ‘The lion was walking toward the water hole.’

In order to posit a phonological phrase boundary between postpositions and their objects, we would have to abandon not only the LCC, but also the requirement that ALIGN-L(XP;PhP) target maximal projections rather than heads. Moreover, the prosodic heterogeneity of this morpho-syntactic category precludes a principled basis for alignment. Though some postpositions do resemble roots, others do not. Some are sub-minimal, as shown in (91), suggesting that at least some postpositions cannot be prosodic words and that phrase boundaries would violate constraints on strict layering. Given this heterogeneity, the most straightforward explanation is that postpositions do not align with phrase boundaries.

- (91) a. **Namas** ge **taras** [χâ] gere !gû.
 Nama DEC woman with PST-IMP walk
 ‘The Nama was walking with the woman.’
- b. **Namas** ge **xoras** [||à] gere !gû.
 Nama DEC water-hole toward PST-IMP walk
 ‘The Nama was walking toward the water hole.’

Additional evidence that function words are invariant comes from verbal auxiliaries. These conform to the phonotactic requirements on roots, and the majority take either H-SH or SH melodies, as shown in (92).

- (92) [χáa] ‘be able to (do)’ [tsáⁿáⁿ] ‘try to (do)’
 [ʰí^ʰʰóa] ‘be unable to (do)’ [tóa] ‘finish (doing)’
 [ʰáó] ‘want to (do)’ [káí] ‘make/cause/allow to (do)’

But in contexts where matrix verbs would take a sandhi melody, auxiliaries still surface with citation forms, as shown in (93).

- (93) a. Tita ge **mai**-e go **pā** [ʰáó]. ‘I wanted to cook mealie.’
 I DEC mealie PST cook want
 b. Tita ge **mai**-e **pā** go [ʰáó].

Unlike the coordinated compounds in (84), the auxiliary in (93)(b) is unaffected when *pā* ‘cook’ is raised to a position above the tense marker. Nor does the auxiliary trigger flip-flop.

The high-rising melody also occurs with a type of productive reduplication that Haacke (1999a) dubs “verbs of pretence”. In such verbs, the first element takes its weak flip-flop melody, and the second element takes high-rising tone, as in (94)

- (94) a. [xóa], [xóáxóásèⁿ] ‘to write’, ‘to pretend to write’
 b. **Namas** ge go [xòaxóásèⁿ] ‘The Nama pretended to write.’
 Nama DEC PST pretend

Again, we find that the functional morpheme—the reduplicant—fails to take a sandhi melody. It is, of course, possible to posit a phonological phrase boundary in the middle of the reduplicated word, but this would suggest that verbs of pretense are

structurally equivalent to coordinating compounds. Reduplicated verbs do not, however, pattern syntactically like coordinating compounds; the base and reduplicant cannot, for instance, be separated by tense inversion or topicalization. Rather, reduplicants pattern with postpositions and auxiliaries in requiring a “citation” melody in an environment ALIGN-L(LexP;PhP) predicts should be phrase-medial.

Taken together, these examples indicate that the melodies associated with function words, even when identical to those on content words are not targeted by the relevant markedness constraint. As we saw in Chapter 4, a constraint that reduces the markedness of strong positions (roots) but not of weak positions (function words) needs to be captured in terms of a positional markedness. That is, the constraint is that in (95)

(95) *M_C/RT: Roots should not have a citation melody.

Because function words are not roots, they are not targeted by *M_C/RT and so do not alternate. This approach to the parametric difference between Khoekhoe and Southern Min languages is in keeping with the position taken by Selkirk (1995) and Beckman (1999) that constraints should be able to make reference to content words or all words, but not specifically to function words. The phrasings implied by this analysis are shown in (96) for the sentences in (90)(a), (93)(a) and (94)(b). As above, morphemes with citation melodies are shown in bold, morphemes with sandhi melodies are underlined, and morphemes with invariant melodies are in plain typeface.

- (96) a. (**Xams** ge) (**xorasa** ū gere) (!gû^R)
 b. (Tita ge) (**mai**-e go) (pā^R †ao)
 c. (**Namas** ge go) (xoā^R xoasen)

7.6 Conclusions

This chapter has shown that Khoekhoe tone sandhi, though complex, can be expressed in terms that have been motivated for other languages. Like Xiamen, the left-dominant sandhi system in Khoekhoe involves paradigmatic melody substitution that is governed by constraints on both the syntax-prosody mapping and the distribution of tone melodies within a prosodic domain. But Khoekhoe also differs from Xiamen in several important respects. First of all, Khoekhoe citation melodies are found in initial, rather than final, position. Khoekhoe also differs from Xiamen in that it requires a mechanism for syntactically-marked exceptionality to prosodically-conditioned melody distribution. Finally, function words in Khoekhoe fail to participate in the sandhi alternation at all, suggesting a parametric difference between Khoekhoe and the Southern Min languages.

CHAPTER 8: CONCLUSIONS

8.0 Khoekhoe prosody

The primary goal of this dissertation has been to demonstrate the importance of prosody for our understanding of Khoekhoe phonology. I began by showing that Khoekhoe morphemes are subject to strict phonotactic constraints on tone and segment distribution, and that these constraints define two distinct prosodic categories. Roots, on the one hand, are obligatorily coextensive with the head (and only) foot of the prosodic words they initiate. They are also required to begin with perceptually salient consonants, and to prohibit all but the most sonorous of consonants in non-initial positions. Furthermore, roots are associated with two distinct tone inventories, and the melody on a particular root in a particular utterance is determined by a host of morphological, syntactic and prosodic factors. Clitics, on the other hand, are characterized by onsets that are less salient than those in root-initial position, though they are still more prominent than those that occur root-medially. Clitics are also strictly monomoraic, and associated with an inventory of tone melodies that is smaller and less marked than that found on roots. Finally, roots and clitics differ in their syntactic distribution, with clitics prohibited in phrase-initial positions. I argue that this reflects a requirement that phonological phrases always begin with a prosodic word.

But despite the fact that the root/clitic distinction is quite robust, there are certain words that fail to fit comfortably in either category. Some words in closed grammatical classes pattern entirely like roots (e.g., numerals), some pattern mostly like roots (e.g., demonstratives, adverbs, auxiliaries), and some constitute prosodically heterogeneous categories (e.g., postpositions, complementizers). Such an imperfect

mapping between the syntax and prosody of “lexical” and “functional” heads is, in fact, quite common both within and across languages. In Khoekhoe, I account for this by arguing that constraints on segment distribution refer to grammatical words, constraints on quantity target prosodic words and constraints that govern tone sandhi target roots. Clitics are none of these things, but the intermediate status of other function words can be accounted for if some are prosodic words but not roots (e.g., demonstratives, auxiliaries), while others are grammatical words but not prosodic words (e.g., postpositions, some complementizers). Phonotactically, the division between “content” and “function” words is not, therefore, a strictly bipartite one, but rather a continuum with roots and clitics as its endpoints. The patterns are summarized in Table 8.1.

Table 8.1 Patterns found in roots, clitics and other function words.

	ROOTS	PROSODIC WORDS		GRAMMATICAL WORDS	
	Sandhi	Utterance-initial	Minimally bimoraic	Click onset	Root melody
Nouns	✓	✓	✓	✓	✓
Verbs	✓	✓	✓	✓	✓
Adjectives	✓	✓	✓	✓	✓
Demonstratives	✓	✓	✓	✓	✓
Numerals	✓	✓	✓	✓	✓
Possessives	✓	✓	(✓)	✗	✓
Adverbs	✗	✓	✓	✓	✓
Auxiliaries	✗	✗	✓	✓	✓
Pronouns	✗	✓	✓	✓	(✓)
Dem. Adverbs	✗	✓	✓	✗	(✓)
Conjunctions	✗	✓	✓	✗	✓
Postpositions	✗	✗	✗	✓	✓
Complementizers	✗	✗	✗	✓	✓
Particles	✗	✗	✗	✗	✗
Suffixes	✗	✗	✗	✗	✗

Formally, I account for these phonotactic distinctions with markedness and faithfulness constraints that are relativized to strong positions. Though positional markedness and positional faithfulness are distinct approaches to positional neutralization, they conspire in Khoekhoe to ensure that perceptually salient elements are restricted to the left edges of morpho-prosodic domains. The positional constraints motivated in this dissertation are summarized in Table 8.2.

Table 8.2 Khoekhoe positional constraints.

	RT_{1Ph}	σ_{1W}	RT	σ_{1M}
Positional faithfulness	IDENT[M] IDENT[SH]	IDENT[Complex]	IDENT[Rise]	IDENT[Manner]
Positional markedness	*FALL	*ONSA	*M _C	---

Constraints that target the first prosodic word in a phonological phrase serve to preserve citation melodies (IDENT[M]/RT_{1Ph}), to license the SH tone (IDENT[SH]/RT_{1Ph}) and to prohibit falling melodies (*FALL/RT_{1Ph}). Constraints relativized to the first syllable of the grammatical word (including postpositions and complementizers) license clicks (IDENT[Complex]/σ_{1W}) and prohibit approximants (*ONSA/σ_{1W}), while constraints on roots license rising melodies (IDENT[Rise]/RT) and trigger tone sandhi (*M_C/RT). Finally, the one constraint relativized to morpheme-initial position (IDENT[Manner]/σ_{1M}) preserves the manner specification of morpheme-initial obstruents that surface in intervocalic contexts. Together, these positional constraints serve to restrict perceptually salient elements to the left edges of morpho-prosodic constituents. This is the defining feature of Khoekhoe prosody.

Though Khoesan languages are best known for their complex segment inventories, I have shown that the Khoekhoe tone system is also worthy of note. The most striking aspect from a cross-linguistic perspective is its use of paradigmatic

melody substitution, a type of tone sandhi that is otherwise confined to the genetically and areally related languages of east Asia. Because Khoekhoe's syntactic and prosodic structures are very different from those found in Chinese languages, it offers a novel avenue for understanding this type of phenomenon. Though the precise morpho-syntactic triggers of flip-flop remain somewhat unclear, the sandhi process described in Chapter 7 seems largely comparable to those in Southern Min languages. The distribution of tonal domains can be accounted for with minor adaptations to mechanisms proposed in the literature, and I show that melody substitution can be captured with markedness and faithfulness constraints relativized to phrase-initial positions. That is, this type of melody substitution should be viewed in the same terms as positional neutralization, rather than sandhi as it is typically understood.

Having now surveyed the most striking aspects of Khoekhoe prosodic structure, we are in a position to consider Beach's somewhat despairing speculation that vowel durations in Khoekhoe might be "so capricious as to defy scientific investigation." Though I have not attempted to model the varied forces that determine vowel duration in natural speech, the distinctions motivated here clearly form the foundation of such a model. Patterns in segmental, tonal and syntactic distribution point to distinctions at several prosodic levels, and the phonetic realization of an utterance will reflect these, as well as semantic and pragmatic factors. Though Beach was right that vowel duration in Khoekhoe is highly variable, I have shown that the situation is not so hopeless as he originally imagined.

APPENDIX

Wordlist for syllable judgment task (in orthography)

CVV roots judged monosyllabic

dīs	‘deed’	gūn	‘sheep’	naon	‘ancestors’
sīs	‘fart’	xūs	‘thing’	aos	‘snake’
tsēs	‘day’	hais	‘tree’	goas	‘spoon’
tsēn	‘days’	hain	‘trees’	goan	‘spoons’
ēs	‘mongoose’	ais	‘cousin’	goas	‘mud’
Sās	‘San’	aes	‘firewood’	does	‘migration’
Sān	‘San’	aen	‘firewood’	!noes	‘hurry’
hās	‘horse’	aes	‘nation’	uis	‘in-law’
‡ōs	‘salt’	kaun	‘fat’	uin	‘in-laws’
‡ōn	‘salt’	kaus	‘piece of fat’	!nuis	‘snare’
xōs	‘cheek’	baus	‘metal container’		
gūs	‘sheep’	naos	‘ancestor’		

CVN roots judged monosyllabic

gams	‘two’	gans	‘piece of meat’	xons	‘grinding’
xams	‘lion’	koms	‘termite’	ons	‘name’
ans	‘living, staying’	tsoms	‘sink into sand’		

CVV roots judged bisyllabic

ae-i	‘firewood’	‡ō-i	‘salt’	Sā-i	‘San’
ui-i	‘in-laws’	gū-i	‘sheep’	tsē-i	‘day’
goa-i	‘spoons’	hai-i	‘trees’	kau-i	‘fat’
nao-i	‘ancestor’	aera	‘firewood’	uira	‘in-laws’
goara	‘spoons’	‡ōra	‘salt’	haira	‘trees’
naora	‘ancestors’	gūra	‘sheep’	kaura	‘fat’
Sāra	‘San’	tsēra	‘days’		

CVN roots judged bisyllabic

gan-i	'meat'	gann	'meat'	ganra	'pieces of meat'
kom-i	'termite'	komn	'termites'	komra	'termites'
xam-i	'lion'	xamn	'lions'	xamra	'lions'

CVCV roots judged bisyllabic

kinis	'knead'	piris	'goat'	seres	'slip'
pereb	'bread'	Namas	'Nama (f)'	saras	'clothing'
!goros	'ankle'	goros	'fingernail'	gurus	'wild animal'
urus	'forget appt.'	!nares	'give present'	gares	'slingshot'
garis	'obligation'	daros	'child'	amis	'ostrich'
nanus	'cloud'	garus	'bag'	garos	'bend'
gomas	'cow'	!gores	'zebra'	!Goras	'Baster'
nuris	'grandchild'	uris	'louse'	‡ores	'scoop w/ finger'
pirin	'goats'	saran	'clothing'	!goron	'ankles'
gurun	'wild animals'	garen	'slingshots'	amin	'ostriches'
daron	'children'	garun	'bags'	goman	'cows'
!goren	'zebras'	urin	'lice'		

CVCV roots judged trisyllabic

!gore-i	'zebra'	goma-i	'cow'	garu-i	'bags'
!goro-i	'ankles'	piri-i	'goat'	daro-i	'child'
ami-i	'ostriches'	sara-i	'clothing'	gare-i	'slingshots'
guru-i	'wild animal'	uri-i	'lice'	amira	'ostriches'
pirira	'goats'	!gorera	'zebras'	gurura	'wild animals'
sarara	'clothing'	!gorora	'ankles'	garura	'bags'
urira	'lice'	gomara	'cows'	darora	'children'
garera	'slingshots'				

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