1. Introduction

The Makassar languages, spoken in South Sulawesi (Celebes), Indonesia, include Makassarese (also called Lakiung), Selayarese, and Konjo. All three languages are characterized by distinct classes of affixes which exhibit various differences in phonological patterning, some of which are illustrated by the Konjo data in (1):

(1) Konjo
   a. δίνίν 'cool'
   b. δίνινι 'make cool'
   c. δίνινι 'he/she/it/they is/are cold'

While the two affixes in (1b) and (1c) are phonologically identical, they are associated with different phonological effects. First, both the bare stem (1a) and the form affixed with the transitivizing suffix (1b) receive (normal) penultimate stress, while the third person absolutive affix in (1c) falls outside the stress domain. Second, the stem-final nasal is realized as a singleton before the transitivizer in (1b) but as a geminate before the absolutive marker in (1c). We will argue, following earlier proposals, that the distinct phonological patterns associated with the two affix classes reflect the different ways in which the affixes are incorporated into prosodic structure (Mithun and Basri 1986, Aronoff et al. 1987, Friberg and Friberg 1991, McCarthy and Prince 1994, Basri 1999, Selkirk 1999, Basri et al. 2000). Affixes like the transitivizing -i are true suffixes, which adjoin to a stem and form part of the same morphosyntactic and prosodic word. Affixes like the absolutive -i are phrasal clitics which fall outside the morphosyntactic and prosodic word.

Makassarese and Selayarese have been the focus of considerable attention (Mithun and Basri 1986, Aronoff et al. 1987, McCarthy and Prince 1994, Basri 1999, Selkirk 1999, Basri et al. 2000), much of it directed at the interface between morphosyntactic and prosodic structure. While Konjo shares with Selayarese and Makassarese many of the patterns distinguishing suffixes and clitics, Konjo exhibits additional complex patterns involving gemination that are not attested in the other two languages. We will argue that the Konjo gemination data provide additional support for the analysis of the relationship between morphosyntactic and prosodic structure that has been proposed for the other two languages.

We begin with a review of the suffix/clitic contrasts in Makassarese and Selayarese, noting similarities and differences among the three languages. In section 3 we outline the Konjo gemination facts and offer an analysis of these patterns in terms of constraints making reference to right edges of prosodic words (PWds) and right edges of stems. We argue that

Acknowledgement footnote

The Makassarese group (part of the Austronesian family) also includes Turatea and Bantaeng. These two languages are less well described than Makassarese, Selayarese, and Konjo.
the gemination found at the right edge of a PWd in Konjo is reminiscent of the phenomenon of intrusive [r] found in many dialects of English (McCarthy 1993).

2. Suffixes vs. Clitics in Makassar Languages

In this section we review evidence for the morphosyntactic and prosodic structure of suffixes and clitics in Makassarese, Selayarese, and Konjo. We propose an analysis of the behavior of these affixes with respect to stress, epenthesis, and the alternation of velar and glottal stop, grounded in different structures.

2.1. Syntactic Behavior

The differing behaviors of suffixes and clitics with respect to stress and gemination, illustrated in (1), as well as the other differences in phonological behavior that will be discussed in the following sections correlate with a difference in syntactic patterning.

The class of true suffixes includes transitivizers, comparatives, and benefactives, while the class of phrasal clitics includes absolutive markers and aspectuals. While true suffixes always appear attached to a stem, phrasal clitics are mobile, generally appearing in sentential second position (Friberg 1996, Basri 1999, Finer 2000, 2002). For example, the Konjo and Selayarese absolutives appear following the verb in (2a,3a) but following the fronted prepositional phrase in (2b,3b):^2

(2) Konjo Phrasal Clitics (Friberg 1996)

a. am-malli-kö juku? ri pasara sikarie?
   it.-buy-2A  fish  prep  market  yesterday
   ‘You bought fish at (the) market yesterday’

b. ri pasara-kö am-mali juku? sikarie?
   prep  market-2A  itr.-buy  fish  yesterday
   ‘At (the) market, you bought fish yesterday’

(3) Makassarese (Basri field notes, 1998)

a. am-malli-a? juku? ri pasarak-a subaŋi
   Itr-buy-1A  fish  prep  market-DEF  yesterday
   ‘I bought fish at the market yesterday.’

b. ri pasarak-a? am-mali juku? subaŋi
   prep  market-1A  itr-buy  fish  yesterday
   ‘At (the) market, you bought fish yesterday’

Similarly, in Selayarese the second person absolutive in (3) may appear following a verb, a preposition, or auxiliary verb:

^2Interlinear glosses have been regularized, where ‘E’=ergative, ‘Abs’=absolutive, ‘Itr’= intransitive marker, ‘prep’= preposition, ‘DEF’ = definite.
(4) Selayarese (Basri 1999, Finer 2002)

a. la-taro-\(i\) loka-\(\text{ñjo}\) rinni
\[3E-put-3A \quad \text{banana-DEF here}\]
'He put the bananas here'

b. rinni-\(i\) la-taro loka-\(\text{ñjo}\)
\[here-3A \quad 3E-put \quad \text{banana-DEF}\]
'He put the bananas here'

c. mina-\(i\) rinni la-taro loka-\(\text{ñjo}\)
\[used\ to-3A \quad here \quad 3E-put \quad \text{banana-DEF}\]
'He used to put the bananas here'

The full list of suffixes and clitics, classified both according to their syntactic patterning (mobility for clitics, fixed position for suffixes) and their phonological patterning, appears below:

(5) true suffixes (fixed position; inside stress domain)

a. Selayarese: -\(a\) (comparative, benefactive) -\(i\) (transitivizer, plural)

b. Makassarese: -\(a\) (comparative, benefactive), -\(i\) (transitivizer)

c. Konjo: -\(a\) (comparative, benefactive, nominalizer)
-\(i\) (transitivizer, prohibitivizer, perpetualizer)
-\(a\) (warning)

(6) phrasal clitics (mobile; outside stress domain)

a. Selayarese absolutes
-\(a\) (first person singular)
-\(ka\text{ñ}\) (first person plural, exclusive)
-\(ko\) (second person singular)
-\(ki\) (second person honorific/first person plural, inclusive)
-\(i\) (third person singular, plural)
aspectuals
-\(mo\) (with second person, third person, first plural, exclusive)
-\(ma\) (with first person singular, first person plural, inclusive)

b. Makassarese absolutes
-\(a\text{ñ}\) (first person singular)
-\(ko\) (second person singular)
-\(ki\) (second person honorific, first person plural)
-\(i\) (3)
aspectual: -\(ma\)
c. Konjo: absolutes
   -a (first person singular)
   -ko (second person singular)
   -ki (second person honorific)
   -i (third person)
aspectual: -ma

2.2. Prosodic Structure
We will assume that true suffixes attach directly to a stem to form a single morphosyntactic word, a process designated affixation to stem by Selkirk (1999). Phrasal clitics, in contrast, are not part of the morphosyntactic word; they constitute functional category items (FNC) which attach directly to the phonological phrase (Selkirk’s (1999) affixation to word). The relationship between the morphosyntactic and prosodic structures is dictated by alignment constraints such as the following, from Selkirk 1995:

(7) Word Alignment
Align (Lex, L/R; PWd L/R): The left/right edge of a lexical category word must be aligned with the left/right edge of a prosodic word.

Exemplary structures for the Konjo forms (1b) dįįįįį (dįįį ‘cool/cold’ plus transitivizing suffix -i) and (1c) dįįįį (dįįį plus third person absolute clitic -i) are given below:

{8) Morphosyntactic and prosodic structure

<table>
<thead>
<tr>
<th>a. true suffix</th>
<th>b. phrasal clitic</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPhrase</td>
<td>PPhrase</td>
</tr>
<tr>
<td>PWord</td>
<td>PWord</td>
</tr>
<tr>
<td>dinįįi</td>
<td>dinįįi</td>
</tr>
<tr>
<td>stem Fnc</td>
<td>stem</td>
</tr>
<tr>
<td>MWord</td>
<td>MWord Fnc</td>
</tr>
</tbody>
</table>

In the following sections we will examine the behavior of suffixes and clitics with respect to a number of phonological patterns: stress, vowel epenthesis, consonant place alternations, and consonant gemination, and will argue that the different patterns exhibited by suffixes and clitics are consistent with the morphosyntactic and prosodic structures posited above.

2.3. Stress
Stress in all three languages normally falls on the penultimate syllable, regardless of syllable makeup, as illustrated by data from Selayarese:

(9) Selayarese
    a. sampúlo 'ten'
    b. palóla 'eggplant'
c. balíka? 'arm'
d. barámbaŋ 'chest'
d. kalihára 'ant'
e. kalumánti 'big black ant'
f. katiálo 'fly'

Stress may be analyzed as the realization of a bisyllabic trochaic foot aligned with the right edge of the PWd. We assume the following constraints:

(10)  a. $F_{T Bin}, F_{T Form}=\text{Troch}$: All feet are bisyllabic and trochaic.
     b. $\text{Align-R} (\text{PWd}, F_T)$: The right edge of a prosodic word must be aligned with the right edge of a foot.

The constraints requiring feet to be bisyllabic and trochaic are undominated in these languages. All lexical category words contain at least two syllables, and monosyllabic borrowed words are augmented to reach the bisyllabic minimum (Basri 1999, Broselow 1999, Friberg and Friberg 1991), consistent with the requirement that a lexical word must also be a prosodic word.

As mentioned above, true suffixes fall inside the stress domain while phrasal clitics fall outside it. Again, this is consistent with the claim that while the stem plus suffix combination constitutes a single prosodic word, clitics do not form a prosodic word with a preceding stem:

(11)  a. Selayarese
   bámbaŋ} 'hot'
   bambāŋ-i} 'make hot' (-i = transitivizer)
   bámbaŋ} -i 'he is hot' (-i = 3rd person absolutive)

b. Makassarese
   lómpo} 'big'
   lompó-aŋ} 'bigger' (-aŋ = comparative)
   lómpo}-ma-ko 'you are already big' (ma = aspectual, ko = 2 sg. absolutive)

b. Konjo
   háji?} 'good'
   hajík-aŋ} 'better' (-aŋ = comparative)
   háji?}-a 'I am good' (-a = 1st person absolutive)

The right PWd boundaries, represented by curly brackets in (10), provide the location for the right edge of the bisyllabic trochaic stress foot that determines the location of stress. Phrasal clitics are therefore not part of the PWd containing the stem. These clitics cannot, however, constitute PWds on their own. Clitics are monosyllabic and therefore fall below the minimal word size. Furthermore, even a sequence of two clitics (as in the Makassarese example in (11b) lómpo}-ma-ko ‘you are already big’), which could in principle support a bisyllabic foot, fails to attract stress. The absence of stress on clitic sequences is consistent with the structure posited in (8b) in which a clitic is part of the phonological phrase but not part of a
prosodic word: a metrical foot must be aligned with the right edge of a prosodic word, but the clitic sequence contains no PWd edge.

2.4. Copy Vowel Epenthesis

A second difference between suffixes and clitics involves the appearance of epenthetic vowels. As has been well established (Mithun and Basri 1986, Aronoff et al. 1987, Friberg and Friberg 1991, Alderete 1999b, McCarthy 1998, Broselow 1999, 2008), the final vowel of words with antepenultimate stress is epenthetic. Stems undergoing vowel epenthesis share three characteristics: they constitute the only monomorphemic words with antepenultimate rather than penultimate stress; their final syllable begins with one of the three consonants [r,l,s]; and they end in a vowel which is identical to the vowel preceding this [r,l,s]:

(12) Selayarese r/l/s-final stems
   a. sähala /sahal/ 'profit'
   b. lâmbere /lamber/ 'long'
   c. süssulu /sussul/ 'burn'
   d. pâ?risi /pâ?ris/ 'painful'
   e. maŋkásara /maŋkasar/ 'Makassar'

Vowel epenthesis after stem-final [r,l,s] is motivated by the fact that the only permitted word-final codas in all three languages are velar nasal and glottal stop. Thus, stems ending in [r,l,s] undergo copy vowel epenthesis when the stem-final consonant would otherwise surface in coda position. Note that the presence of [r,l,s] flanked by identical vowels is a necessary but not sufficient condition for antepenultimate stress. For example, alongside Selayarese sähala ‘profit’ (12a) we find sahála ‘sea cucumber’. The epenthetic status of the final copy vowel is supported by the disappearance of this vowel before a vowel-initial suffix. Lexical vowels, in contrast, remain before vowel-initial suffixes:

(13) Epenthetic vs. Lexical Vowels (Selayarese)
   a. Epenthetic vowel
      lâmbere ‘long’ /lamber/
      lambérəŋ ‘longer’ /lamber+aŋ/
   b. Lexical vowel
      tirére ‘thirsty’ /tirere/
      tiréraŋ ‘thirstier’ /tirere+aŋ/

In Makassarese, a word-final glottal stop is inserted as well, following the epenthetic vowel; we return to this phenomenon in section 2.5.2:

(14) a. Selayarese: bótolo ‘bottle’ /botol/
     b. Konjo: bótolo ‘bottle’ /botol/
     c. Makassarese: bótolo? ‘bottle’ /botol/
We adopt the analysis of the connection between antepenultimate stress and word-final epenthesis suggested by Alderete (1999a, 1999b), which relies on the following constraint forbidding the main stress foot to contain an epenthetic vowel:

\[(15) \text{HEAD-DEP} \ (\text{Alderete} \ 1999a, \ 1999b, \ \text{see also Broselow} \ 1999, \ 2008):\]
\[\text{Every vowel contained in a prosodic head in } S \text{ has a correspondent in } S_1.\]

This constraint dominates ALIGN-R (PWD, FT), and therefore chooses the footing \{bóto\lo\}, in which the main foot contains only lexical vowels, over \{bo(tólo)\}, with normal penultimate stress.

The interesting feature of copy vowel epenthesis for the purposes of this paper is the behavior of \[r,l,s\]-final stems before true suffixes and clitics. In all three languages, an epenthetic vowel is present before a clitic, even when the clitic begins with a vowel. Below we provide data from Selayarese and Konjo, postponing discussion of the parallel Makassarese data to the following section:

\[(16) \text{Selayarese}\]
\[\begin{array}{ll}
\text{a. lámbusu} & \text{‘straight’} \\
\text{b. lambús-a\ñ} & \text{‘straighter’} \\
\text{c. lámbusu\ñ-a} & \text{‘I am straight’} \\
\end{array}\]

\[(17) \text{Konjo}\]
\[\begin{array}{ll}
\text{a. jámmara} & \text{‘dirty’} \\
\text{b. jammárr-i} & \text{‘make dirty’} \\
\text{c. jámmara\ñ-i} & \text{‘he is dirty’} \\
\end{array}\]

The gemination of [r] before the comparative suffix in Konjo is discussed in section 3. The question we focus on at this point is why vowel epenthesis is found in (16c) and (17c), when \[r,l,s\] could simply be syllabified as onsets to the following clitic-initial vowel (that is, why (16c) and (17c) are not realized as \*lambus-a and \*jammari, respectively.\)

To account for this, we adopt the suggestion of Selkirk (1999) that a set of Output-Output constraints (Benua 1995) demands identity between the isolation form of a morphosyntactic word and all its surface exponents (that is, forms containing the same syntactic features). The retention of the epenthetic vowel in the preclitic form is due to the following constraint:

\[(18) \text{O-O(W Or)D\text{MAX}(V): Where two strings } S \text{ and } S' \text{ are in an O-O}_{\text{word}} \text{ correspondence relation and } S \text{ is the base and } S' \text{ is the affiliate of that correspondence relation, a vocalic segment } s' \text{ belonging to } S' \text{ must have a vocalic segment to which it corresponds in } S.\]

\[\]

\[\text{An alternative analysis would prevent syllabification of } [r,l,s] \text{ as onset to a clitic by banning syllabification which crosses a PWd boundary. However, we will see in the following sections evidence that syllabification across PWd boundaries is in fact possible in at least some cases.}\]
The epenthetic vowel is necessary in the base form to prevent \([r,l,s]\) from surfacing in coda. This vowel therefore appears in the base-plus-clitic forms as well:

(19) Selayarese

<table>
<thead>
<tr>
<th>/lambus/ + a straight + 1(^{st}) abs. base: [lambusu]</th>
<th>*[r,l,s]CODA</th>
<th>O-O(WORD)MAX(V)</th>
<th>DEP(V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. lambus(_)w(_)a</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>⇋ b. lambusu(_)w(_)a</td>
<td></td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

The identity between the isolation form and the preclitic form (as opposed to the presuffixal form) supports the claim that a stem-suffix sequence constitutes a single morphosyntactic (and therefore prosodic) word, in contrast to a stem-clitic sequence.

2.5. Velar Stop-Glottal Stop alternation

2.5.1. Lexical Glottal Stop

A third diagnostic for suffix vs. clitic involves the alternation between velar and glottal stops. In all three languages, a stem-final glottal stop surfaces as [k] before a true suffix:

(20) a. Selayarese:
   bákka\(\_\) 'big'
   bakká-k-añ\(\_\) 'bigger'

b. Konjo
   hájí\(\_\) 'good'
   hajík-añ\(\_\) 'better'

c. Makassarese
   bájí\(\_\) 'good'
   bajík-añ\(\_\) 'better'

This alternation reflects a more distributional restriction of glottal stop to coda and velar stop to onset position.\(^5\) We will assume that this alternation is motivated by the following constraint:\(^6\)

---

\(^5\)In all three languages, intervocalic glottal stop is possible in some monomorphemic words when the flanking vowels are identical (e.g. Konjo te?eñ ‘tea’, Friberg and Friberg 1991). In the three languages in question, subminimal foreign CVC words are generally adapted as CV?VC, with insertion of glottal stop and a copy vowel (Broselow 1999).

\(^6\)There are a number of possible approaches to this alternation; for example, Basri 1999 posits a constraint requiring onset consonants to have a specified place feature. Full investigation of alternative approaches is beyond the scope of this paper, and we adopt the *GLOTTAL\_ONSET approach as a matter of convenience.
*[?]Onset: Glottal stops cannot occur in syllable onset.

The complementary distribution of glottal stop and [k] breaks down in one context, however; in Selayarese and Konjo, final glottal stop is retained before a phrasal clitic:

(22) a. Selayarese:
   bákkà?} 'big'
   bakká-k-an} 'bigger'
   bákkà?}-a 'I am big'

   b. Konjo
   háji?} 'good'
   hajík-an} 'better'
   háji?}-a 'I am good'

We follow Selkirk 1999 in viewing the retention of glottal stop in preclitic forms as another reflection of the mandate for identity between all exponents of morphosyntactic words containing the same syntactic features, expressed in the following constraint:

(23) O-O(WoRD)IDENTPLAcE(CONS) (Selkirk 1999): Where two strings S and S’ are in an O-O_MWord correspondence relation and S is the base and S’ is the affiliate of that correspondence relation, a consonantal segment s’ belonging to S’ must be identical in place feature composition to the segment s to which it corresponds in S.

This constraint outranks *[?]Onset in Selayarese and Konjo, preserving the final glottal stop of the base MWord in all its surface exponents. This ranking is not common to all three languages, however; in Makassarese, prevocalic stem-final stop is realized as [k] before both suffixes and clitics:

(24) Makassarese
   báji?} 'good'
   báji-k-an} 'better'
   báji?-a 'I am good'

We can account for the difference among these languages by assuming the following rankings:

(25) Rankings
   a. Selayarese, Konjo:  O-O(WoRD)IDENTPLAcE >> *[?]Onset
   b. Makassarese:      *[?]Onset >> O-O(WoRD)IDENTPLAcE

2.5.2. Epenthetic Glottal Stop
In 2.4 we saw that whereas a copy vowel is inserted after stems ending in [r,l,s] in all three languages, Makassarese additionally inserts a glottal stop following the copy vowel (Aronoff et al. 1987, McCarthy and Prince 1994); cf. bótolo ‘bottle’ in Selayarese and Konjo, bótolo? ‘bottle’ in Makassarese). Like the lexical glottal stop, Makassarese epenthetic glottal stop is also realized as [k] before a vowel, whether that vowel is contained in a suffix or a clitic:
Makassarese glottal stop epenthesis was analyzed by McCarthy and Prince (1994) as an effect of a constraint which requires prosodic words to end in a consonant. Makassarese, unlike Selayarese and Konjo, ranks this constraint above Dep(C), which forbids consonant insertion:

(27) Presence vs. Absence of Epenthetic Glottal Stop
a. Constraints

Final-C: A prosodic word must end in a consonant.
Dep(C): Any consonant in the output must have a correspondent in the input.

b. Rankings
Selayarese, Konjo: Dep(C) >> Final-C
Makassarese: Final-C >> Dep(C)

The epenthetic glottal stop appears in Makassarese only after stems ending in [r,l,s] – that is, stems that undergo vowel epenthesis – while stems that end underlyingly in a vowel do not undergo glottal stop epenthesis, even though they violate Final-C. McCarthy and Prince ascribe the failure to epenthesize a consonant after vowel-final stems to a constraint Align-Stem-Right which requires the right edge of a stem to be coterminous with the right edge of a syllable. We will assume a slightly different version of this constraint, a (categorical) Anchor constraint rather than a gradient alignment constraint:

(28) Anchor-Right (stem, syllable): The segment at the right edge of the (morphosyntactic) stem must be at the right edge of a syllable.

Glottal stop epenthesis after a vowel-final stem would violate the Anchor constraint. Stems ending in [r,l,s], however, can never satisfy this constraint, as [r,l,s] cannot surface in coda. Epenthetic glottal stop appears in a second context. In Makassarese (Aronoff et al. 1987, McCarthy and Prince 1994), a stem of two syllables is copied in its entirely, e.g. tau-taú ‘doll’ (vocalic sequences are always heterosyllabic). However, reduplicants are maximally bisyllabic, which forces incomplete copying of longer bases. In all three languages, incomplete copying is associated with the appearance of a glottal stop at the right edge of the reduplicant, as in balaʔ-balao ‘toy rat. McCarthy and Prince (1994) point out that this is also a context in which the constraint demanding that the right edges of stems be coterminous with the right edges of syllables cannot be satisfied, allowing Final-C to be decisive.7 We will see

7While neither Selayarese nor Konjo inserts glottal stop after [r,l,s]-final stems, these languages do have epenthetic glottal stop in incomplete reduplicants. We can account for this difference by assuming that in Selayarese and Konjo, the constraint Dep(C)B-R, which demands that any segment contained in the reduplicant also be contained in the base, outranks Final-C.
in the next section that Final-C and Anchor-R(STEM,Syll) are instrumental in accounting for Konjo gemination.

2.6. Summary

This section has outlined three diagnostics for true suffixes vs. phrasal clitics: stress, copy vowel epenthesis, and the velar stop-glottal stop alternation. In the following section we will consider patterns specific to Konjo involving consonant gemination.

3. Konjo Gemination

Konjo exhibits two phenomena which are not attested in either Selayarese or Makassarese. The first, called η-gemination by Friberg and Friberg (1991), affects velar nasals followed by clitics. The second, Friberg and Friberg’s A-gemination, affects consonants followed by true suffixes but not clitics. We will argue that these two gemination processes are responses to two previously motivated constraints, each dictating a relationship between morphosyntactic and phonological structure. Gemination at the right edge of the prosodic word (η-gemination) is motivated by the Final-C constraint, while PWd-internal A-gemination is motivated by the constraint Anchor-Right(STEM,Syllable).

Our investigation of Konjo gemination is indebted to Friberg and Friberg’s (1991) lucid and insightful discussion of this phenomenon. Examples in the following sections are taken from Hasan Basri’s (1998) field notes or from Friberg and Friberg (1991).

3.1. Overview: Konjo η-Gemination and A-Gemination

The process of η-gemination is illustrated in (29), where the final nasal of the stem diŋŋ ‘cool’ surfaces as a singleton before the transitivizing suffix in (29a) but as a geminate before the phonologically identical absolutive clitic in (29b):

(29) η-gemination: stem-final C
   a. diŋŋ-i} ‘cool (something)’ (-i transitivizer)
   b. diŋŋ-i ‘it is cold’ (-i absolutive)

Again, the curly brackets in (29) indicate the right edge of the prosodic word, as indicated by stress on the penultimate syllable within the PWd.

Velar gemination is not limited to stem-final consonants; the final nasal of the comparative/benefactive/nominalizing suffix aŋ also geminates in a pre-clitic environment:

(30) η-gemination:
   a. diŋŋ-aŋ{-i ‘he is colder (than)’
      cool/cold -comparative- 3rd absolutive
   b. paka-diŋŋ-aŋ{-a ‘cool it for me’
      imperative- cool/cold-benefactive-1st absolutive

In contrast, A-gemination applies only to consonants followed by a true suffix: to undergo A-gemination, a consonant must be stem-final and must be followed by a vowel within its own PWd. The geminating consonant must, for Friberg and Friberg’s speakers, also be preceded by the vowel [a]:

11
(31) a. A-Gemination (Friberg and Friberg 1991)
   tarāŋ-i} ‘make (something) sharp’
   sharp-transitivizer

   b. failure of A-Gemination after vowel other than [a] (Friberg and Friberg 1991)
   diŋŋ-i} ‘make (something) cold’
   cool/cold-transitivizer

Both gemination processes may apply in a single form. In (32), the true suffix (the
benefactive -aŋ) provides the context for A-gemination of the final consonant of the stem
/tarāŋ/, while the clitic (absolutive -a) provides the context for ŋ-gemination of the PWd-final
consonant.

(32) Both ŋ-gemination and A-gemination (Friberg and Friberg 1991)
   paka-tarāŋ-ŋ-aŋ]-a ‘sharpen it for me’
   imperative-sharp-benefactive-1st absolutive

The [a] before the geminate surfaces as a schwa, a fact we will return to below.

While ŋ-gemination is limited to velar nasals, any stem-final consonant is subject to
A-gemination in the proper context. Recall that Konjo, like Selayarese and Makassarese,
exhibits a regular alternation between glottal stop in coda position and [k] in onset. With
stem-final glottal stops, gemination is accompanied by change in place:

(33) a. A-gemination before true suffix
   lumpākk-i} ‘jump (on something)’ (stem /lumpa?/)
   jump-transitivizer

   b. No A-gemination before a clitic
   lūmpa?-i ‘he jumps’
   jump-3rd absolutive

For Friberg and Friberg’s (1991) speakers, A-gemination of glottal stop, like that of velar
nasal, is limited to post-[a] context:

(34) Failure of A-gemination following vowel other than [a] (Friberg and Friberg 1991)
   hajik-i} ‘make good’ (stem /haji?/)
   good-transitivizer

   tekék-aŋ ‘to carry on saddle / load carried on saddle’ (stem /teke?/)
   carry on saddle-nominalizer

   The remaining stem-final consonants, [r,l,s], also surface as geminate following [a]
and preceding a true suffix. Recall that stems ending in [r,l,s] undergo epenthesis of a copy
vowel. This epenthetic vowel surfaces both when the word is final, and when it is followed
by a clitic. However, no copy vowel is inserted when the [r,l,s] is followed by a suffix vowel,
and it is in precisely this position that [r,l,s] may undergo A-gemination, as in (35b):
A-gemination: Stem /ajar/ ‘teach’

a. aŋng-ajon}-i  ‘he teaches’
   trans. teach-i 3rd abs.

b. ajór-i}  ‘teach (someone)’
   teach-trans.

Again, A-gemination may fail to apply if the preceding vowel is other than [a], as in Friberg and Friberg’s (1991) example áko báñju? bañjul-i ‘don’t joke around’ (root /bañjul plus transitivizer). This restriction appears, however, to be on the road to extinction; Friberg and Friberg (1991) report a tendency for younger speakers to generalize pre-suffixal gemination to other vowel contexts, and the first author of this paper found that gemination was common regardless of the quality of the preceding vowel, so long as the other conditions were met:

It is tempting to ascribe A-gemination to the presence of a stressed vowel preceding the geminate, since addition of a suffix places the stem-final syllable in penultimate (stressed) position. (Recall that because clitics fall outside the stress domain, a bisyllabic stem preceding a clitic is stressed on its initial rather than its final syllable.) However, Friberg and Friberg (1991) anticipate and dismiss this argument, pointing out that A-gemination occurs even when the addition of two true suffixes moves stress to the right of the geminating consonant, as in (36b):

(36) A-gemination following unstressed vowel (Friberg and Friberg 1991):
   a. áko} {kapáll-i}  ‘don’t make (something) too thick’ (stem /kapal/)
      neg thick-transitivizer
   b. áko} {kapall-i-?i}  ‘don’t make (everything) so thick’
      neg thick-transitivizer-perpetualizer

3.2. Interim Summary: Conditions for Gemination
The following chart summarizes the conditions for the two gemination processes in Konjo:

(37) Summary: Conditions for Gemination
   a. ŋ-Gemination applies to a velar nasal that is
      i. before a clitic, and
      ii. followed by a vowel.
   b. A-Gemination applies to any consonant that is
      i. before a suffix, and
      ii. preceded by [a] (for some speakers).

In the following two sections we will develop an analysis of Konjo gemination, addressing the questions of the motivation for the two gemination processes, as well as for the contextual restrictions on each process.

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8Friberg and Friberg (1991; 92) also note additional constraints on A-gemination: “a preceding nasal-stop sequence and a glottal-voiced stop sequence (those perceived as /bb dd jj gg/ by native speakers) override any doubling effect, though there are counterexamples.”
3.3. η-Gemination: FINAL-C Effect

3.3.1. English intrusive [r] as FINAL-C Effect

As discussed in section 2.5.2, the appearance of epenthetic glottal stop at the right edge of [r,l,s]-final stems in Makassarese has been analyzed (McCarthy and Prince 1994) as an effect of the FINAL-C constraint, which requires prosodic words to end in a consonant. FINAL-C is also responsible, according to McCarthy (1993), for the appearance of intrusive [r] in a number of dialects of English. We will argue that the conditions for η-gemination parallel those for intrusive [r]. We begin by briefly reviewing McCarthy’s analysis of intrusive [r].

As is well known, many English dialects typically ban [r] from syllable coda (e.g., *He put the tuna down* and *He put the tuner down* will be homophonic, with no [r] in *tuner*).

Some r-dropping dialects also show an intrusive [r] following word-final [θ, a, ə], as in *He put the tuna[r] away*, which is pronounced in McCarthy’s Eastern Massachusetts dialect as homophonic with *He put the tuner away*. McCarthy notes that this intrusive [r] appears only intervocalically, where, he argues, it is ambisyllabic (associated both with coda and with the following onset). This ambisyllabicity protects intrusive [r] from the prohibition on coda [r] that leads to the loss of [r] in, e.g., *tuner down*. However, the intervocalic context is necessary but not sufficient for the appearance of the intrusive [r], which typically appears only when the first vowel is contained in a lexical category word:

(38) Grammatical context for intrusive [r] (McCarthy 1993)

a. intrusive [r] after LEX
   The tuna [r] is...

b. No intrusive [r] after FNC
   *I’m gonna [r] eat.

Appealing to Selkirk’s (1984) insight that in English, lexical word edges are isomorphic with prosodic word edges, McCarthy ascribes intrusive [r] following lexical words (like tuna) to FINAL-C, which requires a PWd to end in a consonant. In contrast, a function word (such as gonna) is not subject to FINAL-C, since in English function words attach directly to the phonological phrase, much like the Makassarese, Selayarese, and Konjo phrasal clitics.9

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9The requirement that the lefthand context of r-intrusion must contain one of the vowels [θ, a, ə] stems from the fact that other English vowels are diphthongal ([ij, ej, uw, ow]) and therefore contain their own consonantal elements. In McCarthy’s analysis, [r] is inserted; however, Gick (1999) argues that schwa actually contains an underlying consonantal gesture which is normally attenuated in final position; see Broselow 2005 for further discussion.
(39) Intrusive [r] at PWd boundary (McCarthy 1993)

<table>
<thead>
<tr>
<th></th>
<th>FINAL-C</th>
<th>DEP(C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>/tuna is/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. tuna} is</td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>∴ b. tuna r} is</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>/gonna eat/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. gonna eat}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. gonna r eat}</td>
<td></td>
<td>*!</td>
</tr>
</tbody>
</table>

The sole exceptions to the prohibition on intrusive [r] at the right edge of a functional category involve cases in which FNC appears at the right edge of a phonological phrase:

(40) Intrusive [r] after FNC

I said I was gonna [r], and I did.

This fact is consistent with the analysis of intrusive [r] as appearing at the end of PWd, since Selkirk’s constraint ALIGN (PPH, R, PWD, R) ensures that the right edge of a phonological phrase will also be the right edge of a prosodic word:

(41) Intrusive [r] at PPh/PWd boundary

<table>
<thead>
<tr>
<th>/gonna, and.../</th>
<th>CODA-COND</th>
<th>FINAL-C</th>
<th>DEP(C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. gonna}, and</td>
<td></td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>∴ b. gonna r}, and</td>
<td></td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

3.3.2. η-Gemination

We now return to Konjo η-gemination, which we will argue is quite similar to English [r] intrusion. For intrusive [r] to appear, two conditions must be met: a phonological condition (flanking vowels) and a prosodic condition (PWd edge). Konjo η-gemination is subject to similar conditions.

Note first that Konjo geminates, like English intrusive [r], occur only intervocally. This follows from the assumption (Hayes 1989) that geminate consonants represent a single feature matrix linked to two prosodic positions, coda and onset. Since Konjo limits both onsets and codas to a single consonant, the only possible position for a geminate is between two vowels.

Second, recall that η-gemination applies to velar nasals followed by a clitic, but not to velar nasals followed by a true suffix. As we have seen, the preclitic context corresponds to the right edge of a prosodic word. Gemination permits the PWd to end in a consonant, while still allowing the consonant to serve as onset to the following vowel. Thus, FINAL-C accounts naturally for gemination in a preclitic context, so long as FINAL-C and Onset outrank the constraint that forbids a lexical singleton from being realized as a geminate. Following Hayes (1989), we assume that singletons are underlyingly nonmoraic, while geminates are
dominated by a mora; realization of an underlying singleton as geminate can be prevented by MoraFaith (Broselow, Chen, and Huffman 1997):

(42) MoraFaith: If the number of moras linked to Si = n and Si $\notin$ So, then the number of moras linked to So = n. (A segment linked to n moras in the input must be linked to n moras in the output.)

The following tableau illustrates the role of Final-C and Onset in triggering gemination:

(43) \(\eta\)-gemination before clitics but not suffixes

<table>
<thead>
<tr>
<th>/dinya-/ (trans.) ‘make cold’</th>
<th>Final-C</th>
<th>Onset</th>
<th>MoraFaith</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. dinya. (\eta)-i}</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. dinya (\eta)-i</td>
<td>*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>/dinya-/ (abs.) ‘he/she/it is cold’</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. dinya. (\eta)-i</td>
</tr>
<tr>
<td>b. dinya. (\eta)-i</td>
</tr>
<tr>
<td>c. dinya. (\eta)-i</td>
</tr>
</tbody>
</table>

If gemination is motivated by the mandate that prosodic words should end in a consonant, we would expect that all words ending in velar nasal, not only those followed by a clitic, should be subject to \(\eta\)-gemination, so long as there is a following vowel to supply the correct phonological context. As Friberg and Friberg (1991) point out, this is indeed the case. They give the example below in which the first member of a phrase containing two lexical items exhibits \(\eta\)-gemination:

(44) \(\eta\)-Gemination in V#V Context (Friberg and Friberg 1991)

a. báju ‘ingredients’
b. úta ‘vegetables’
c. báju\(\eta\) úta ‘vegetable makings’

We conclude, then, that Konjo \(\eta\)-gemination, like the appearance of final glottal stop in Makassarese epenthetic words and the appearance of intrusive [r] in English, can be ascribed to a constraint requiring the right edges of PWd to be consonantal. While this constraint is ranked below DEP(C) in Konjo, thereby preventing addition of a new consonant, it is ranked above the constraint preventing gemination of a lexical single consonant. Thus gemination is a valid strategy for ensuring C-finality in PWds, so long as the phonological context supports a geminate. The next question to consider is why gemination is restricted to final velar nasals.
3.3.3. Restriction of η-Gemination to Velar Nasals

In all three languages under consideration, words may end in a vowel, a velar nasal, or a glottal stop. In section 2.5 we saw that the three languages evidence an alternation between velar and glottal stops: generally, [k] appears in onset and [ʔ] in coda, though in Selayarese and Konjo, a PWd-final glottal stop is retained even before a vowel-initial clitic:

(45) Konjo k ~ ṭ
a. Final position
   hájīʔ} ‘good’
b. Before suffix
   hájik-i} ‘make good’
c. Before clitic
   hájīʔ}-i ‘he is good’

We analyzed the retention of the glottal stop in preclitic position as an effect of an Output-Output constraint demanding identity in place between the consonants contained in the surface exponents of the same morphosyntactic word. This same Output-Output constraint can account for the failure of glottal stop to geminate in preclitic position (45c), the same position where a velar nasal is realized as geminate. Recall that glottal stops may undergo A-gemination; the geminate realization of glottal stop is [kk]:

(46) A-gemination
   lúmpaʔ} ‘jump’
   lumpákk-i} ‘jump on (something)’

If η-gemination of PWd-final consonants were extended to affect PWd-final glottal stops, such stops would necessarily be realized as geminate [k], violating the constraint requiring place identity between the base form and the preclitic form. The ranking of this O-O constraint above \textsc{final-c} blocks gemination, as illustrated in the following tableaux. Note that A-gemination (as in lúmpaʔ ‘jump’ vs. lumpákk-i ‘jump on’) is not blocked by the Output-Output constraint, since the transitivizing suffix -i forms part of the morphosyntactic word, and the base form ‘jump, intransitive’ is not in a correspondence relation with the derived from ‘jump, transitive’:
(47) η-Gemination blocked with final [?] by Ident(CPlace)O-O:

<table>
<thead>
<tr>
<th>/hajiʔ+i/</th>
<th>IDENT (CPLACE) O-O</th>
<th>*[?]ONSET</th>
<th>FINAL-C</th>
<th>ONSET</th>
<th>MORAFAITH</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ha.jiʔ.-i}</td>
<td>*!</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. ha.ji.k.-i}</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| c. ha.jiʔ.-i} | * | ! | | *
| d. ha.ji.k.-i} | * | * | | *

(48) A-gemination

a. tarāŋ} ‘sharp’

b. tarāŋ-i} ‘make (something) sharp’

*sharp*-trans.

We argue that A-gemination occurs in response to ANCHOR-R(STEM,SYLLABLE), which requires the right edge of a stem to correspond to the right edge of a syllable. Recall that McCarthy and Prince (1994) have argued that such a constraint operates in Makassarese to force insertion of a glottal stop at the right edges of stems ending in epenthetic vowels but not those ending in lexical vowel (e.g., botoloʔ ‘bottle’ from stem /botol/, but lompo ‘big’ (*lompoʔ) from stem /lompo/). We repeat the constraint below:

(49) ANCHOR-R(STEM,SYLLABLE): The right edge of a stem should coincide with the right edge of a syllable (McCarthy and Prince 1994).

Assuming that geminate consonants are ambisyllabic, gemination permits a stem-final consonant before a vowel-initial suffix to satisfy both ONSET and ANCHOR-R.
(50) A-gemination

A-gemination

<table>
<thead>
<tr>
<th>Stem</th>
<th>Onset</th>
<th>Anchor-R(STEM, SYLL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>/taraŋ + i/ ‘make sharp’ (trans. suffix)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. ta ra ŋ i}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. ta ra ŋ + i}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. ta ra ŋ + i}</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If untrammelled by other constraints, Anchor-R should cause any stem-final consonant in prevocalic position to be geminate, regardless of whether the following vowel is contained in a suffix or a clitic. However, stem-final glottal stops geminate only before true suffixes, even though they are, of course, stem-final in the preclitic position as well:

(51) Stem /lumpaʔ/ ‘jump’

a. gemination before true suffix
  lumpákk-i} ‘jump (on something)’

  jump-trans.

b. no gemination before clitic
  lúmpaʔ}-a ‘I jump’

  jump -1st abs.

We argued above that gemination of glottal stops in preclitic position is blocked by the Output-Output constraint requiring all consonants in the preclitic form to have the same place specification as their correspondents in the isolation form. Ranked above Anchor-R(STEM, SYLL), the Output-Output constraint will block gemination before clitics, but not before suffixes, because the base form and the preclitic form are in correspondence. However, the base and the presuffix form are not in correspondence, as they constitute separate words with separate sets of morphosyntactic features.

The remaining consonants that may occur in stem-final position are [r,l,s]. Like glottal stop, these consonants geminate before true suffixes but not before clitics:

(52) Stem /ājar/ ‘teach’ (Friberg and Friberg date)

a. A-gemination before suffix
  jáko} ajárr-i} -7i ‘don’t teach him’

  neg teach-trans-prohibitivizer

b. No A-gemination before clitic
  anŋ-ājarə} -i ‘he teaches’

trans. teach-i 3rd abs.

The failure of stem-final [r,l,s] to geminate before a clitic is puzzling. In a form like anŋ-ājarə} -i ‘he teaches’ the following vowel provides a context in which stem-final [r] could
geminate—and we cannot appeal here to an Output-Output constraint to block gemination (as we did with final glottal stops).

To account for the failure of gemination in (52b), we appeal to another difference between [r,l,s]-final stems and those ending in velar nasal or glottal stop: the anomalous stress induced by vowel epenthesis. The foot structures of the relevant forms (with foot edges marked by parentheses) are as follows:

(53)  
\begin{align*}
\text{a. } & \text{ a(járr-i)} \quad \text{‘teach (someone)’} \\
\text{b. } & \text{ aŋŋ (ája)ra}-i \quad \text{‘he teaches’ (*ájar)ra}-i
\end{align*}

Note that in (53a), the geminate [r] is contained within a foot. What is needed to rule out gemination of [r,l,s] before an epenthetic vowel, as in (53b), is a constraint that forbids syllable association lines from crossing the right edge of a foot. We appeal here to the family of constraints proposed by Itô and Mester (1994, 1999) demanding that the edges of prosodic constituents be ‘crisp’:

(54)\text{CrispEdge-Right(Foot): Any segment contained within a foot is linked only to syllables contained exclusively within that foot.}

Ranked above \text{Anchor-R(STEM, Syllable)}, the \text{CrispEdge(Foot)} constraint will prevent gemination of [r,l,s] before an epenthetic vowel.

Note that η-gemination may produce violations of CrispEdge, as in \((díŋiŋ)ŋə-i\) ‘it is cold’. This is not surprising, as we have argued that η-gemination and A-gemination reflect two independent constraints: η-gemination is a response to Final-C, which demands that prosodic words end in a consonant, while A-gemination is a response to Anchor-R(stem,syllable), which demands that the final segment of a stem be syllable-final. The ranking Final-C, Onset >> CrispEdge-R(Foot) >> Anchor-R(stem,syllable) allows η-gemination, but not A-gemination, to create non-crisp edges:

(55)\text{η-gemination applies despite CrispEdge}

<table>
<thead>
<tr>
<th>/díŋiŋ + i (3rd absolutive)/</th>
<th>Final-C</th>
<th>Onset</th>
<th>CrispEdge-R(Foot)</th>
<th>Anchor-R(stem,syll)</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘it is cold’</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. (díŋiŋ) i</td>
<td></td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. (díŋiŋ)η i</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(56)\text{A-gemination is blocked by CrispEdge}

<table>
<thead>
<tr>
<th>/ájar + i (3rd absolutive)/</th>
<th>Final-C</th>
<th>Onset</th>
<th>CrispEdge-R(Foot)</th>
<th>Anchor-R(stem,syll)</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘he teaches’</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. (ája)ra} i</td>
<td>*</td>
<td>*</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>b. (ájar)ra} i</td>
<td></td>
<td>*</td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>
Underlying geminates (such as the [mm] in jāmmara ‘dirty’) must also be preserved, even at the cost of violating CrispEdge. Ranked above CrispEdge, MoraFaith (40) will ensure that an underlying geminate remains linked to coda, while Onset will also link that geminate to a following vowel-initial syllable.

3.4.2. Restriction of A-gemination to Post-[a] Context
The remaining fact to explain is why, for at least some speakers, A-gemination is restricted to a particular vocalic context. Crucial to understanding the restriction on A-gemination is an additional fact noted by Friberg and Friberg: that [a] is realized as a schwa before nasal geminates and what they describe as a raised [a] before other geminates. Furthermore, [a] is the only one of Konjo’s five vowels ([i,e,a,o,u]) for which Friberg and Friberg note a distinct pre-geminate allophone. We assume that the pre-geminate [a] represents a reduced vowel, and that for speakers who geminate only after [a], the relevant restriction is that geminates may be derived only if they are preceded by a reduced vowel. To account for this restriction, we propose that geminate consonants in Konjo share a mora with a preceding vowel, rather than occupying their own mora:

\[ \text{(57) Mora-sharing structure for geminates} \]

[diagram]

The option of geminates sharing a mora with a preceding vowel was proposed by Broselow, Chen, and Huffman (1997) for Malayalam geminates, and indeed for all coda consonants that do not add weight to the syllable with which they are affiliated. Broselow, Chen, and Huffman’s set of constraints include constraints restricting the types of segments that can participate in the mora sharing relation. A constraint forbidding a full vowel to share a mora with a consonant, paired with a constraint forbidding reduction of any vowel other than [a], would restrict gemination to the post-[a] context. Again, the differing restrictions on the two gemination processes would follow from the independent rankings of the constraints triggering η-gemination and A-gemination: Final-C would outrank the constraints that limit mora sharing to [a], while Anchor-R(STEM,SYLLABLE) would rank below these constraints.

5. Conclusion
We have seen how the grammars of both English and the Makassar languages accommodate articulatory considerations in light of specific alignment constraints between prosodic and grammatical categories. For Konjo especially, the interactions among prosodic, grammatical, and articulatory factors are particularly complex. Two different manifestations of gemination have their origins in constraints that affect word internal and word-edge structures. These effects in turn correlate with stress alternations, alternations in copy-vowel insertion, and velar-glottal alternations that follow from the differences in prosodic structure between forms involving true affixes and forms involving clitics.
References


Cruz: Linguistics Research Center, UCSC. 27-46.


