Nasal cluster dissimilation and tier-based strict locality

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- **Nasal cluster dissimilation** (NCD) is a process whereby underlying nasal-stop clusters (NC) lose their nasal feature in the presence of another nasal-stop cluster: /NC...NC/ → /C...NC...C.../
  
  (Blust, 2012; Dixon, 2004; Jones, 2001; Stanton, to appear, 2020)

- **Local**, targeting only NCs in adjacent syllables, or **non-local**, targeting NCs in non-adjacent syllables

  1. **Yindjibarndi** (Pama-Nyungan) topic clitic /-mpa/ (Wordick, 1982)
     a. ʔnaː-mpa 'this' (205)
     b. wunu-wa-mpa-ʔu 'river' (34)
     c. munti-pa 'really' (34)
     d. ʔamaŋka-ʔa-ʔu 'fire' (258)

  2. **Gooniyandi** (Bunuban) ergative postposition /-ŋa/ (McGregor, 1984, 1990)
     a. pokka-ŋa 'baby' (1990:586)
     b. kambajji-ŋa 'boy' (1990:98)
     c. koŋbo-ka 'woman' (1990:98)
     d. kambi-ka 'water' (1990:585)

  3. **Diyari** (Pama-Nyungan) participial /-ŋa/ (Austin, 2013)
     a. dandra-ʔa-ŋa 'hit-refl' (93)
     b. duŋka-ka-ŋa 'emerge-tr' (93)
     c. dandra-ŋa 'hit' (93)
     d. duŋka-ŋa 'emerge' (93)

     a. ʔi-bigaŋu 'masc-fish hook' (1971:44)
     b. nuŋuŋu-ŋuŋa 'abstr-corroboree' (1971:44)
     c. di-wuŋda-ŋu 'masc-tree' (1971:45)
     d. ra-gamba-wu 'fem-sun' (1971:45)

  5. **Timugon Murat** (Austronesian) (Prentice, 1971)
     a. mam-tatu 'T/S will pound [O]' (113)
     b. ma-tumbak 'T/S will thump e.o.' (113)
     c. ʔam-taun 'years' (118)
     d. ʔo-gong 'fistfuls' (118)

This talk examines the complexity of NCD as a phonotactic restriction rather than a process

- §1 presents non-local NCD data from Gurindji and demonstrates it is not TSL with vanilla segmental representations
- §2 demonstrates that non-local NCD is TSL when syllabic roles are encoded in segments
- §3 discusses the connection to monotonicity

1 Non-local NCD in Gurindji

- Gurindji (Pama-Nyungan) (McConvell, 1988; Stanton, 2020); similar patterns in Bilinarra (Pama-Nyungan) (McConvell, 1988; Menkins & Nordlinger, 2014), Djaru (Pama-Nyungan) (Tsunoda, 1981), and Mudbara (Pama-Nyungan) (McConvell, 1988)
• NC and N\texttimes denasalize or delete when preceded by an NC

(6) Gurindji locatives /-ŋka/, /-mpa/
  a. lucu-ŋka ‘ridge’ (137)  d. kani-mpa ‘downstream’ (138)
  b. wunj-k\texttimes ‘spring’ (137)  e. k\texttimes ngka-pa ‘upstream’ (138)
  c. p\texttimes nk\texttimes ka ‘river’ (137)  f. k\texttimes nk\texttimes ula-pa ‘high ground’ (140)

(7) Gurindji elative /-jin/
  a. ku\textza-jin ‘south’ (147)  c. k\texttimes nk\texttimes a-jit ‘upstream’ (148)
  b. ka:\textza-r\textza-jin ‘east’ (147)  d. ku\textza-\textza-n\textza-ul\textza a-jit ‘south side of the river’ (148)

• This is not restricted to adjacent syllables

(8) Long-distance NCD in Gurindji
  a. \textza n\textza i-wuñé a ‘with father’ (139)
  b. éawura-\textza-n-k\textza ri-wué a ‘with another thief’ (140)
  c. Nana-n-p\textza ula ña-ña ‘who do you two see?’ (145)
  d. n\textza mp\textza a-wu-waía-t-é ina p\textza ni ‘why did you hit them?’ (145)

• Dissimilation is blocked by intervening stops and nasals

(9) Stops and nasals are blockers in Gurindji
  a. wæ\textza \textza-i-\textza n\textza ka ‘where are you lot?’ (141)
  b. u\textza-\textza n\textza n\textza i-p\textza ka-\textza-\textza g\textza ku\textza ‘they saw us’ (148)
  c. n\textza mp\textza i-p\textza i-wu\textza ‘female-without’ (141)
  d. p\textza n\textza ku\textza-\textza ti-g\textza ku\textza ‘towards a cross-cousin’ (141)

1.1 Tier-based strictly local languages

• Informal definition: if a stringset is TSL, then you can determine whether a string belongs to that stringset by (1) erasing a designated set of segments (“projecting a tier”), and (2) checking whether the result contains any banned substrings (up to some length $k$) (Heinz et al., 2011)

• TSL languages readily model long-distance phonotactics and blocking effects, and have wide empirical coverage (McMullin & Hansson, 2015; McMullin, 2016; Heinz, 2018)

• Example: liquid dissimilation in Latin (McMullin, 2016:118-120)

(10) Latin adjectival suffix /-al/
  a. nav-\textza-al\textza-is ‘naval’ c. consul\textza-al\textza-is ‘consular’
  b. hiem-\textza-al\textza-is ‘winter’ d. lun-ar\textza-al\textza-is ‘lunar’

(11) Liquids and non-coronals block liquid dissimilation in Latin
  a. flor-al\textza-is ‘floral’ c. gleb-al\textza-is ‘consisting of clods’
  b. plur-al\textza-is ‘plural’ d. leg-al\textza-is ‘legal’

• Tier: \{l, r, p, b, f, m, w, k, g, (h)\}. Banned strings: \{*ll\}

• Words cannot contain two laterals...

(12) lun-ar\textza-is

\begin{center}
\begin{tabular}{cccc}
1 & r & \textza &  \\
\textza & u & n & a & r & i & s \\
\end{tabular}
\end{center}

(13) *lun-al\textza-is

\begin{center}
\begin{tabular}{cccc}
1 &  \\
\textza & u & n & a & l & i & s \\
\end{tabular}
\end{center}
• ...unless a blocker intervenes

(14) \textit{flor-al-is}

\begin{tabular}{c}
  f l o r a l i s \\
  \hline
  f l o r a l i s
\end{tabular}

(15) \textit{gleb-al-is}

\begin{tabular}{c}
  g l e b a l i s \\
  \hline
  g l e b a l i s
\end{tabular}

1.2 Gurindji NCD is not TSL

• Because NCD applies across arbitrarily many vowels and liquids, they cannot be in the tier

(16) *\textit{ampa}k\textit{nta}

\begin{tabular}{c}
  a m p a k n t a \\
  \hline
  a m p a k n t a
\end{tabular}

• However, without projecting vowels onto the tier, we cannot distinguish an NC cluster from NVC

• No tier over $\Sigma = \{V, N, C\}$ distinguishes the illicit *VNCV$^k$NCV from the licit NVCV$^k$NCV, VNV$^k$NV

(17) $\begin{array}{c|ccc}
T & *\text{VNCV}^k\text{NCV} & \text{NVCV}^k\text{NCV} & \text{VNV}^k\text{NV} \\
\hline
\{V\} & V^{k+2} & V^{k+2} & V^{k+2} \\
\{N\} & NN & NN & NN \\
\{C\} & CC & CC & \lambda \\
\{V, N\} & \text{VNCV}^k\text{NCV} & \text{NVCV}^k\text{NCV} & \text{VNV}^k\text{NV} \\
\{V, C\} & \text{VCV}^k\text{CV} & \text{VCV}^k\text{CV} & V^{k+2} \\
\{N, C\} & \text{NCNC} & \text{NCNC} & NN \\
\{V, N, C\} & \text{VNCV}^k\text{NCV} & \text{VNCV}^k\text{NCV} & \text{VNV}^k\text{NV} \\
\end{array}$

• If we could treat NCs as single segments, NCD would be TSL: ban *NC$^N$C$^N$C over $\{N, C, N^C\}$, but because Gurindji allows heterorganic NCs, this is implausible (Stanton, 2020:§4.1.1)

1.3 Gurindji NCD is non-counting

• First-order definable with precedence; at most non-counting (NC) (McNaughton & Papert, 1971)

(18) Definition of successor in terms of precedence

$(x < y) \to (x < y \land \neg \exists z(x < z \land z < y))$

(19) Definition of an NC cluster

$\text{NC}(x, y) \overset{\text{def}}{=} N(x) \land C(y) \land x < y$

(20) Definition of Gurindji NCD

$(\exists x, y(\text{NC}(x, y))) \to (\forall x', y'(\text{NC}(x', y') \to ((x = x' \land y = y') \lor (\exists z(N(z) \lor C(z) \land y < z < x'))) )$

(21) Non-local NCD in the sub-regular hierarchy of stringsets (Heinz, 2018)
• Gurindji NCD is not **locally threshold testable** (LTT)
  
  – A stringset is LTT iff strings with the same number of the same set of $k$-substrings are both licit/illicit (Thomas, 1997)
  – $V^kNCV^kNV^kNCV$ is licit, $*V^kNV^kNCV^kNCV$ is not; they share the same set of substrings
  – NCD without blocking is first-order definable with successor, and thus LTT (Thomas, 1982)

(22) Definition of NCD without blocking

$(\exists x, y(\text{NC}(x, y))) \rightarrow (\forall x', y'(\text{NC}(x', y') \rightarrow ((x = x' \land y = y')$)

• Gurindji NCD is not **piecewise testable** (PT)

  – A stringset is PT iff strings with the same set of $k$-subsequences are both licit/illicit (Simon, 1975)
  – $VNCV(CNV)^k$ is licit, $VNCV(CNV)^k$ is not; both contain every subsequence up to length $k$

2 Non-local NCD is TSL with syllabic representations

• In Gurindji, all dissimilating nasals are either pre-consonantal or word-final; they are likely codas

• Marking up segments by syllabic role distinguishes NC clusters from NVC; codas are marked with $\mu^1$

(23) $ma\,pa\,n_\mu\,ta$

\[
\begin{array}{cccc}
  m & p & n_\mu & t \\
  \cdots & \cdots & \cdots & \tau \\
  m & a & p & a & n_\mu & t & a
\end{array}
\]

(24) $*am\,pan\,ta$

\[
\begin{array}{cccc}
  m & p & n_\mu & t \\
  \cdots & \cdots & \cdots & \tau \\
  a & m_\mu & p & a & n_\mu & t & a
\end{array}
\]

• With this representation, Gurindji NCD is TSL

• Tier: nasals and stops. Banned strings: $\{N_\mu\muCN_\mu\}$

(25) pinka-ka ‘at the river’

\[
\begin{array}{cccc}
  p & n_\mu & k & k \\
  \cdots & \cdots & \cdots & \tau \\
  p & i & n_\mu & k & a & k & a
\end{array}
\]

(26) $*pinka\-nya$ ‘at the river’

\[
\begin{array}{cccc}
  p & \underline{n_\mu} & k & k \\
  \cdots & \cdots & \cdots & \tau \\
  p & i & n_\mu & k & a & n_\mu & k & a
\end{array}
\]

(27) kanka-jit ‘upstream’

\[
\begin{array}{cccc}
  k & n_\mu & k & t_\mu \\
  \cdots & \cdots & \cdots & \tau \\
  k & a & n_\mu & k & a & j & i & t_\mu
\end{array}
\]

(28) $*kanka\-jin$ ‘upstream’

\[
\begin{array}{cccc}
  k & \underline{n_\mu} & k & \underline{n_\mu} \\
  \cdots & \cdots & \cdots & \tau \\
  k & a & n_\mu & k & a & j & i & n_\mu
\end{array}
\]

(29) $n\-uyna\-pipa\-nkulu$ ‘they saw us’

\[
\begin{array}{cccc}
  \eta & \eta & n_\mu & t & p & \eta_\mu & k \\
  \cdots & \cdots & \cdots & \tau \\
  \eta & u & \eta & a & n_\mu & t & i & p & a & \eta_\mu & k & u & l & u
\end{array}
\]

\[\text{1This is just notational; stress is always word-initial in Gurindji (Ennever et al., 2017), so there isn’t independent evidence for the mora being phonologically active.}\]
2.1 Arabana-Wangkangkurru

- NCD only targets retroflex clusters; most consonants block NCD

(30) Arabana-Wangkangkurru (Pama-Nyungan) present tense /-ŋqa/ (Hercus, 1994)
   a. mama-ŋqa ‘grab’ (64) c. wanpa-ŋqa ‘carry’ (58)
   b. wanŋka-ywa-ŋqa ‘rise-TR’ (81) d. ŋunta-ŋqa ‘show’ (199)

(31) /k, r/ onsets are not blockers in Arabana-Wangkangkurru (Hercus, 1994)
   a. wanŋka-ka-ŋqa ‘rise-TR’ (33) c. miŋṭika-ŋqa ‘walk.about’ (58)
   b. ŋaŋka-(k)a-ŋqa ‘sit down for a while’ (58) d. kaŋkara-ŋqa ‘burp’ (58)

- Tier: consonants – {k, r}. Banned strings: {*N, ŋ, q} 

(32) wanŋka-ka-ŋqa ‘rise-TR’

(33) *wanŋka-ka-ŋqa ‘rise-TR’

2.2 Kalkatungu

- NCD targets a specific set of suffixes, including the nasal initial participle /-ɲin/

(34) Kalkatungu (Pama-Nyungan) habitual /-ɲcaNu/ (Blake, 1979)
   a. ŋu-ɲcaNu ‘run’ (19) c. iŋka-ɲcaNu ‘go’ (19)
   b. citaanmaj-ɲcaNu ‘look after’ (56) d. anka-ɲcaNu ‘ail’ (19)

(35) Kalkatungu participle /-ɲin/ (< *ɲca-na (Breen & Blake, 2007:80))
   a. ŋu-ɲin ‘run’ (19) c. iŋka-ɲin ‘go’ (19)
   b. ŋu健全 ‘cry’ (60) d. anka-ɲin ‘ail’ (109)

- Word-initial NC clusters are triggers; derive historically from initial syllable loss (Blake, 1979:133)

(36) Kalkatungu ergative /-ŋku/
   a. ku-ŋku ‘water’ (30) c. ŋka-ŋku ‘yam’ (30)
   b. paľa-ŋku ‘fork (of tree)’ (30) d. ŋja-ŋku ‘stone’ (42)

- All NC clusters are triggers, but coronals and labials are not blockers

(37) Coronal and labial onsets aren’t blockers in Kalkatungu (Blake, 1979)
   a. api-ɲcaNu-ti-ɲcaNu ‘sing-tr-re-habit’ (90) c. ŋita-ɲcaNu-ɲcaNu ‘steal-tr-participle’ (91)
   b. ŋaŋka-ɲti-ɲcaNu ‘cry-plur-habit’ (92) d. ŋta-ɲcaNu-ɲcaNu ‘lie-contin-part’ (115)

- Word-final nasals are not targeted

(38) Kalkatungu concomitant /-aŋ/ (allomorph with C-final stems)
   a. arkun-aŋ ‘battle’ (19) c. jaŋpar-aŋ ‘beard’ (19)
   b. puŋturaŋ ‘good’ (77) d. ŋaŋkur-aŋ ‘cold’ (78)

\[ (39) \text{inka-cin ‘go-participle’} \]

\[ * \text{inka-ñin ‘go-participle’} \]

3 NCD and monotonicity

- Graf (2018) argues that phonotactic restrictions are monotonic with respect to locality

\[ (41) \text{First-last harmony is local } \rightarrow \text{non-local } \rightarrow \text{local} \]

- As analyzed above, long-distance NCD respects monotonicity

\[ (42) \text{Gurindji: local } \rightarrow \text{non-local} \]

\[ (43) \text{Arabana-Wangkangkurru: non-local } \rightarrow \text{local} \]

- Monotonicity would be violated if any of these languages allowed other nasal-initial coda-onset clusters

\[ (44) \text{Non-monotonic NCD in a language with nasal-glide clusters} \]

- This would also make the TSL analysis impossible; cannot distinguish VNWVCVNCV from VNCVNCV and treat glides as transparent

- Happily, all three languages only have flat/falling sonority nasal-initial clusters

\[ (45) \text{Bi-consonantal clusters in Gurindji – bolded clusters also appear word-finally} \]

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(46) Triconsonantal clusters in Gurindji

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All exceptions (boxed) are derived by reduplication; bases for many but not all are in the dictionary:

* lamnlam ‘placenta’
* wumwump ‘singe over and over, singe a number of things’
* wənwan wənwan ‘look around carefully’
* wulaŋwan ‘earless dragon or lizard’
* runjirnjira ‘sob, cry unconsolably’
* wanaŋwan ‘shake head from side to side, like when you say no’
* wuriŋwurir ‘catch fish by stirring up water with bushes or rolling spinifex in water’
* runŋunjirnjira ‘continually barking’
* jirnjirj ‘make noise over and over’
* wiljwilj ‘persuade again and again’
* walŋwaŋ ‘generic term for any small plant’

Arabana-Wangkangkurru (Hercus, 1994:52): pm, tm, tr, mp, ηt, np, nt, ntr, nk, nm, ηl, nc, ηk, ηm, lp, lt, ltr, lk, ηp, ηc, ηk, ηl, mp, lp, lt, lk, lm, lη, lp, lη, lk, lη, ηc, ηk, ηl, lp, lt, lk, lm, lη, lp, lη, lk, lη, ηc, ηk, ηl, lp, lt, lk, lm, lη, lp, lη, lk, lη, ηc, ηk, ηl

Kalkatungu (Blake, 1979:11): mp, ηt, np, nt, nk, nm, ηp, ηt, ηk, ηm, ηp, ηc, ηk, ηl, lp, lt, lk, lm, lη, lp, lη, lk, lη, ηc, ηk, ηl

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References


