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Proceedings of the 25th Annual Meeting of the Berkeley Linguistics Society: Special Session on Caucasian, Dravidian, and Turkic Linguistics (2000), pp. 42-53

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The Annual Proceedings of the Berkeley Linguistics Society is published online via [eLanguage](#), the Linguistic Society of America's digital publishing platform.

The phonology of the past tense in Tamil*

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1. Introduction

Tamil is a Dravidian language spoken in Sri Lanka and Tamil Nadu, India. Verbs in Tamil are traditionally divided into two major categories, strong vs. weak, with seven classes of tense markers (Arden 1942); this classification is still used in teaching Tamil (Lindholm and Paramasivam 1980). The two major classes are based on the form of the present tense marker, a single *-k-* in weak classes and double *-kk-* in strong. Five forms are used for the past tense: *-t-*, *-nt-*, *-in-*, doubling, and *-tt-*.

	<u>Class</u>	<u>Root</u>	<u>Past</u>	<u>Present</u>	<u>Gloss</u>
(1) Weak:	1a,b	sey-, kol	-t-	-kir-	'do', 'kill'
	2	viḷ-	-nt-	-kir-	'fall'
	3	tirump-	-in-	-kir-	'return' (intrans.)
	4	viṭ-	double	-kir-	'leave'
	5a	en-	-t-	-kir-	'say'
(1) Strong:	5b	keel-	-t-	-kkir-	'ask'
	6	paar-	-tt-	-kkir-	'look'
	7	naṭa-	-nt-	-kkir-	'walk'

Two forms of the past appear in both weak and strong classes (5a/5b, 2/7), and Class 1 is subdivided based on the result when the past is added.¹ The five forms undergo further variation in the phonology, resulting in at least nine phonetic variants (2).²

(2)	<u>past</u>	<u>imper.</u>	<u>past+3fsg</u>	<u>gloss</u>	<u>Class</u>	<u>Past UR</u>
a.	[in]	tirumbu	tirumbinaa	'she returned'	3b.	/in/
b.	[nd]	naḍa	naḍandaa	'she walked'	7	/nt/
c.	[ṇḍ]	koḷu	koṇḍaa	'she had'	1b	/nt/
d.	[ṇj]	eri	eriṇjaa	'she burned'	2	/nt/
e.	[ḍ]	aḷu	aḷuḍaa	'she cried'	1a	/t/
f.	[t]	viḍu	vittaa	'she left'	4	/t/
g.	[tt]	koḍu	koḍuttaa	'she gave'	6	/t/
h.	[cc]	ciri	ciriccaa	'she laughed'	6	/t/
i.	[tt]	keelū	keettāa	'she asked'	5b	/t/

Building on the insights of Christdas (1988) and Vasanthakumari (1989), I argue here

that only three forms of past tense markers are required to account for the phonology of Tamil past tense formation. By using output constraints, this account brings motivation to the system of alternations and captures generalizations missed by Christdas (1988). The formulation of constraints also does away with some of the arbitrary specifications required in a rule-based account, such as the direction of spreading, the choice of consonants to be deleted, and the ordering of rules. Furthermore, although Christdas required that the past tense markers be added at two different levels in her Lexical Phonology model, interleaved with level-specific rules, I show that a single level is sufficient in a constraint-based framework such as Optimality Theory (Prince and Smolensky 1993).

2. Analysis of past tense realization in OT

The analysis within OT relies on a set of cross-linguistically motivated constraints ('2.1), ranked in a language-specific order for Tamil ('2.2). The input representations used here for the past tense are indicated on the right in (2). The choice of affix is determined by the morphological class of the root: /t/ for Classes 1a-b, 4, 5a-b, and 6, /nt/ for 2 and 7, and /in/ for 3. The realization of /in/ is straightforwardly [in], while the realizations of input /t/ and /nt/ are output [ð,tt,cc,tʃ,nd,ŋd,nj], with assimilation or deletion of stem-final sonorants. Rather than a series of rules, the surface-based constraints active in Tamil phonology combined with universal correspondence constraints determine how output varies from input.

2.1 Constraints

The constraints involved in the realization of the past tense have been previously motivated both cross-linguistically and in accounts of Tamil noun phonology (Beckman 1998, Kaun 1998, Wiltshire 1998a). First, assuming sonorant geminates are moraic, Tamil obeys the cross-linguistic tendency to avoid trimoraic syllables, *TRI-μ. Syllables may thus have long vowels (3a) or short vowels plus a sonorant coda (3b), but long vowels followed by geminate sonorants are not allowed (3c).

(3) a.	single sonorant after long V:	[kaalw]	'leg'
b.	moraic sonorant after short V:	[kallw]	'stone'
c.	*moraic sonorants after long V:	*[kaallw]	
d.	linked nasal+obstruent after long V:	[paambu]	'snake'
e.	geminate obstruents after long V:	[kaattw]	'wind' (noun)

Long vowels may be followed by a linked nasal plus stop (3d) or geminate obstruents (3e). I will stipulate that laterals, rhotics, and glides in coda position are moraic, but nasals and obstruents are not (see Kaun 1999 for an alternative account).

The second cross-linguistically common constraint is NoCODA_{PL}, which is violated by a coda consonant with a place of articulation distinct from that of the

following onset. While this constraint is violable in the first syllable of nouns (see Beckman 1998 for a positional-faithfulness account), such violations are not tolerated in verb forms. Both assimilation (4a) and epenthesis (4b) are motivated by this constraint (Wiltshire 1998a). Epenthesis is also motivated by the constraint *COMPLEX, first proposed by Prince and Smolensky (1993), which bars clusters of consonants in onsets and codas, as in (4b).

- (4) a. /maram+ka/ 'tree, pl' [maran̪ga] 'trees'
 b. /payyan+kk/ 'boy, dat' [payyanuɸkkuɸ] 'to the boy'

The three general phonotactic constraints discussed so far are given in (5) below.

- (5) a. *TRI-μ: No trimoraic syllables. (Christdas 1988:259, Kaun 1998)
 b. NOCODA_{PL}: C-Place in onset position only. (Wiltshire 1998a)
 c. *COMPLEX: No C clusters in onset or coda (Prince and Smolensky 1993)

In order to discuss the remaining constraints, I provide the phonemic inventory of Tamil in Table (6), which also illustrates the (fairly traditional) transcriptions I use here. Tamil has a five vowel system, and also distinguishes long vowels from short.

(6) Phonemic inventory of Tamil

Vs	Front		Central		Back	
High	i	ii			u	uu
Mid	e	ee			o	oo
Low	a aa					
Cs Place ₆ Manner ₉	Labial	Dental/	Alveolar	Retroflex	(Al)Pal	Velar
Stop	p	t	ɸ	ɸ̠	c	k
Nasal	m		n	ɸ̠	ɸ	
Fricative			s	ʂ	ʃ	
Lateral glide			l	ɸ̠		
Tap			r			
Glide	ɸ			ɸ̠	y	

Many of the consonants in the inventory can be single or geminate. The phonemic inventory of Tamil shows three sub-places of articulation within the coronal region.

For most consonants, the dental-alveolar contrast is not distinctive, though in Christdas's dialect dental and alveolar stops do contrast.

All dialects of Tamil distinguish between dental, palatal, and retroflex obstruents and nasals, but dental stops become palatal after [i,e,y] and retroflex after retroflex consonants. Following Gnanadesikan (1994) and Hume (1994), this can be captured by analyzing front vowels as having a coronal node with a laminal articulation. Dental coronals are the most unmarked, and hence have no subnode; palatals have a laminal subnode like front vowels, and retroflexes have an apical node.

(7) Front Vs	Dentals	Palatals	Retroflexes
V	C	C	C
Cor	Cor	Cor	Cor
Lam		Lam	Apical

In palatalization, a dental takes on the laminal articulation of an adjacent vowel or consonant and becomes a palatal. Retroflexes resist due to their apical specification. In retroflexion, a dental takes on the apical node of an adjacent consonant. Palatals resist due to their laminal specification.

To force the spreading of coronal subplaces, I have formulated the constraint in (8a), which states that coronal subnodes are realized on post-vocalic consonants. The motivation for this constraint is acoustic. While most place features are most salient during the release of a consonant onto the following sonorant, some, like retroflexion, are unusual in that their cues are most salient during the transition from a vowel to a consonant (Steriade 1995). Hence the constraint in (8a) states that subcoronal features, laminal and apical, appear in post-vocalic position.

- (8) a. SUBCOR(V): Coronal subplaces are realized on post-vocalic Cs.
 b. HAVEPLACE Consonants have a place of articulation.

The phonotactic (8b), forces consonants to take on some place of articulation (c.f. FILL^{PLACE} from Prince and Smolensky 1993:181). This supports assimilation in positions in which independent place features are prevented, such as in the coda, and in consonants which do not have place features in input.

The inventory in (6) shows only voiceless stops, as voicing is not distinctive in native Tamil words. Generally in Tamil, post-nasal obstruents are voiced. As observed by Pater (1995), many languages do not allow sequences of nasals followed by voiceless obstruents; such underlying clusters surface with a voiced obstruent or without the nasal. Pater proposes a cross-linguistically justified constraint:

- (9) *NC_{vi}: No nasal-voiceless obstruent sequences (Pater to appear)

In Tamil, input sequences of nasal plus voiceless obstruent surface with voiced obstruents due to the high ranking of this constraint.³

The above constraints are formulated in terms of permissible surface structures. The second kind of constraints required are correspondence constraints (McCarthy and Prince 1995), which evaluate how input and output differ from each other. MAX-IO constraints force underlying segments of input to surface in output; deletion of a consonant violates (10a), for example. DEP-IO constraints regulate whether output matches input; an epenthetic vowel in the output is a violation of (10b). Finally, to limit assimilation, the IDENT family of constraints requires a segment in output to have the same features as its corresponding segment in input (10c).⁴

(10) Correspondence Constraints (McCarthy & Prince 1995)

- a. MAX-IO(C): Input consonant has a correspondent in the output.
- b. DEP-IO(V): Output vowel has a correspondent in the input.
- c. IDENT-IO(X): Output segments have the same specification for the feature [X] as do their correspondents in the input.

The relationship between phonotactics and correspondence constraints is one of language-specific ranking. To account for surface variation in the past tense marker in Tamil, we will find a single ranking which matches inputs and outputs. The phonotactics important throughout Tamil will rank high, showing that the alternations in the past tense markers reflect general properties of Tamil rather than requiring arbitrary rules.

2.2 Rankings

The realizations of the past tense forms relative to the input involve voicing, assimilation, and gemination, while stem-final sonorants are subject to deletion. The ranking of the constraints is shown to be general, but requires a few statements about the assumptions of the underlying forms of stems. The stem is determined based on its singular imperative, but if the final vowel of that form is /u/, it is assumed to be epenthetic. In some cases, following Christdas (1988), the UR of the stem will be represented with a final empty C-slot; such cases are motivated in §2.2.5.

2.2.1 Bleeding of epenthesis: /-in/

Assuming that the final vowel /u/ is not part of the root but rather appears word-finally for syllabification (Wiltshire 1998a), the lack of epenthesis before the vowel-initial past suffix /-in/ is easily explained. An epenthetic vowel appears when *COMPLEX would otherwise be violated, as in the imperative in Tableau 1; this motivates the ranking of *COMPLEX above DEP(V). In forms in which the past tense suffix is /-in/, as in (2a), an epenthetic vowel is superfluous, as *COMPLEX is in no

danger of being violated in the faithful surface candidate; this is shown in the past tense form in Tableau 2.

Tableau 1 Input: /tirump/ = [tirumbu] ‘return!’

Candidates	*COMPLEX	DEP(V)
tirumb	*!	
√ tirumbu		*

Tableau 2 Input: /tirump + in + aa/⁵ = [tirumbinaa] ‘she returned’

Candidates	*COMPLEX	DEP(V)
tirumbuinaa		*!
√ tirumbinaa		

2.2.2 Post-nasal voicing: /-nt/

The form of the past tense in /nt/ shows a voiced obstruent in all its phonetic realizations, as in (2b,c,d). This is attributed to the high ranking of the *NC_{vl} constraint from (9), whose force is seen throughout Tamil, above the correspondence constraint IDENT([voice]). In the forms of class 7, in which /nt/ surfaces unchanged except as to voicing, this ranking correctly provides the past tense form as [nd]:

Tableau 3 Input: /naṭa + nt + aa/ = [naḍandaa] ‘she walked’

Candidates	*NC _{vl}	IDENT([voice])
naḍantaa	*!	*
√ naḍandaa		**

2.2.3 Assimilation: /-nt/, /-t/

The /-nt/ and /-t/ forms of the past tense marker are also subject to two forms of assimilation: palatalization to give [ɲj] and [cc] in (2d,h), and retroflexion to give [ɳd] and [tt̚] in (2c,f,i). In all cases, assimilation extends from a verb-final segment rightward onto the suffix. In some cases, assimilation is accompanied by the loss of the triggering segment, which requires ordering in a rule based account; the account here is compatible with having no ordering between the two (§2.2.4).

Retroflexion comes from a retroflex stem-final consonant. In the simplest cases, retroflex-final verb stems, like *viṭ* ‘to leave’, surface with a geminate [tt̚] in the past tense. This is due to ranking the constraint NOCODA_{P_L} above IDENT([subcor]). Both

candidates in Tableau 4 satisfy SUBCOR(V), so its ranking is not yet determined; NoCODA_{PL} alone guarantees the assimilation.

Tableau 4 Input: /vit + t + aa/ = [vittaa] ‘she left’

Candidates	NoCODA _{PL}	IDENT([subcor])
vittaa	*!	
√ vittaa		*

Palatalization shows that SUBCOR(V) ranks above IDENT([subcor]). When the /-nt/ past is added to a verb ending in a front vowel, palatalization extends through the cluster due to the combined effects of SUBCOR(V) and NoCODA_{PL}. High ranking *NC_{vi} continues to force the voicing of post-nasal obstruents. Hence the result is [ɲj].

Tableau 5 Input: /eri + nt + aa/ = [erɲjaa] ‘she burned’

Candidates	SUBCOR(V)	NoCODA _{PL}	*NC _{vi}	IDENT ([subcor])	IDENT ([voice])
erintaa	*!		*!		
erindaa	*!				*
erɲdaa		*!		*	*
erɲcaa			*!	**	
√ erɲjaa				**	*

2.2.4 Loss of sonorant with assimilation: /-nt/

Stem-final sonorants are lost before /-nt/ due to two high ranking constraints, *TRI-μ and *COMPLEX, which limit syllable size. For a verb such as aa/ ‘rule’, adding the past /-nt-/ results in output aaɲdaa ‘she ruled’.

Tableau 6 Input: /aa/ + nt + aa/ = [aaɲdaa] ‘she ruled’

Candidates	SUBCOR(V)	*TRI-μ	MAX(C)	IDENT([subcor])
aalntaa	*!	*!		
aaɲdaa		*!	*	*
aaɲaa			**!	*
√ aaɲdaa			*	**

The retroflex place is preserved and spread into the past marker due to the interaction between SUBCOR(V), which requires the retroflex place feature to survive on the coda consonant, and the NOCODA_{Pl}, which requires codas to share place features with the following onset. The loss of the lateral is motivated by the constraint that syllables may not be trimoraic, *TRI- μ ; the lateral is lost rather than some part of the suffix since the loss of a nasal or obstruent will not satisfy *TRI- μ .

For verbs like *kol* 'have' or *sey* 'do' with short vowels, the addition of the past tense /-nt-/ also results in surface forms without a final sonorant: *konɖaa* 'she had' and *seɲjaa* 'she did', although *TRI- μ is not at stake. The loss of the final sonorant is due to the phonotactic against complex clusters in onset or coda, *COMPLEX. Furthermore, that laterals and glides are lost rather than part of the suffix is due to the higher ranking of a specific correspondence constraint that preserves nasals and obstruents, MAX(C-[-cont]), above the general constraint MAX(C). A similar ranking of MAX(C) sub-constraints has been motivated for IruLa (Wiltshire 1994).

Tableau 7 Input: /ko/ + nt + aa/ = [konɖaa] 'she had'

Candidates	SUBCOR (V)	*COMPLEX	MAX (C-[-cont])	MAX(C)	IDENT ([subcor])
kondaa	*!			*	
koɳdaa		*!			
koɭdaa			*!	*	*
√ konɖaa				*	**

Tableau 8 Input: /sey + nt + aa/ = [seɲjaa] 'she did'

Candidates	SUBCOR (V)	*COMPLEX	MAX (C-[-cont])	MAX(C)	IDENT ([subcor])
sendaa	*!			*	
seyndaa		*!			
sey.jaa			*!	*	*
√ seɲ.jaa				*	**

These surface forms of the past tense verbs appear to have undergone right-spreading assimilation followed by consonant deletion. Rather than order such rules, the OT account chooses the optimal output candidate by simultaneously evaluating the

constraint ranking in Tamil on a set of candidate outputs.

2.2.5 Gemination: /-t/

In some cases, as in Class 5b, assimilation results in a geminate obstruent (2i). While the stem-final sonorant is not totally lost, in order to satisfy *TRI- μ it can no longer retain the feature [lat] from input, hence violating IDENT([lat]) in Tableau (9):

Tableau 9 Input: /kee/ + t + aa/ = [keet[aa] ‘she asked’

Candidates	NoCODA _{PL}	*TRI- μ	SUBCOR(V)	MAX(C)	IDENT([lat])
keet[aa]	*!	*!			
keet[daa]		*!			
keet[daa]		*!	*!		
keet[da]				*!	*
✓ keet[taa]					**

Similarly, stems ending in /r/, such as *paar* ‘look’, which take the past /-t/, appear without the final rhotic, which has assimilated due to *TRI- μ to become a geminated /tt/. As neither /r/ nor /t/ has a subcoronal place, SUBCOR(V) is not at issue here:

Tableau 10 Input: /paarC + t + aa/ = [paattaa] ‘she saw’

Candidates	NoCODA _{PL}	*TRI- μ	SUBCOR(V)	MAX(C)	IDENT([r])
paattaa	*!	*!			
paattaa		*!			
paattaa				*!	*
✓ paattaa					*

For other cases showing geminates in the past (2g,h), I use the inputs forms argued for in Christdas. She distinguishes verbs that end in a specified consonant or vowel from verbs that end in an unspecified consonantal slot, here represented with C. This allows us to account for the geminated tense suffixes that appear on these verbs in all three tenses. Gemination of features to an empty C-slot requires that constraint (8b), HAVEPLACE, outranks the constraint requiring identity of output features, IDENT([place]). Two cases are shown below. In the first, Tableau (11), only the major place [cor] appears on the output consonant corresponding to the input C-

slot. In the second, Tableau (12), the subplace from the adjacent front vowel spreads to both the C-slot and the past tense marker, due to the high ranking of SUBCOR(V) and NoCODA_{PL}.

Tableau 11 Input: /koʃuC + t + aa/ = [koʃuttaa] ‘she gave’

Candidates	HAVEPLACE	IDENT([place])
koʃuCtaa	*!	
√ koʃuttaa		*

Tableau 12 Input: /ciriC + t + aa/ = [ciriɕaa] ‘she laughed’

Candidates	SUBCOR(V)	HAVEPLACE	NoCODA _{PL}	IDENT([place])
cirittaa	*!			*
ciriCtaa	*!	*!		*
cirictaa			*!	*
√ ciriɕaa				**

2.2.6 Summary of rankings

The rankings used for the alternations in the past tense forms are given in (11); I have separated three sets of rankings since many of the constraints cannot be directly ranked relative to one another. (11a) forces the change in voicing after a nasal. (11b) shows that three constraints can force a mismatch between underlying and surface place features: SUBCOR(V), HAVEPLACE and NoCODA_{PL}.

- (11) a. *NC_{vi}
 |
 MAX-IO([voice])
- b. {SUBCOR(V), HAVEPLACE, NoCODA_{PL}}
 \ | /
 {IDENT([place]), IDENT([subcor])}
- c. {*COMPLEX, MAX([-cont]), *TRI-μ}
 \ \ /
 MAX(C)
 |
 { IDENT([lat]), IDENT([r]) }

(11c) gives the constraints that force deletion or the mismatch of manner features: *COMPLEX, MAX([-cont]), and *TRI-μ. Each of the high-ranked constraints is motivated both cross-linguistically and in Tamil generally. The use of constraints in

analyzing the past-tense alternations reveals that they are not arbitrary and isolated, but fit naturally into the system of Tamil phonology.

3. Comparison with Alternatives

In the analysis presented here, rule ordering and level ordering are unnecessary. In Christdas (1988), tense markers are added at two different levels in a Lexical Phonology account. In Level 1, the past tense is added for all strong verbs and for weak verbs which take /-t/ and /-nt/. In Level 2, the past tense for the remaining weak verbs, /-n/, is added, with a rule of epenthesis supplying the vowel before it. In Christdas' analysis, verb inflection precedes some of the more productive derivational morphology, and strong verbs are treated as relatively more irregular than weak verbs; both are questionable morphologically but necessary for her phonological system of rules to work. She also requires ordering relationships, so that, for example, coronal assimilation between a stem and past tense marker bleeds epenthesis. Such rule orderings are avoided here by prioritizing the constraints.

Furthermore, using rules provides the formal power to write similar rules that are unmotivated cross-linguistically, such as adding a vowel to vowel clusters rather than to unsyllabifiable consonant clusters. Constraints, by contrast, are general and cross-linguistically motivated, and reranking them does not produce impossible languages. Furthermore, constraints capture the motivation behind alternations, and as these motivations are general throughout Tamil, the same constraints should account for further facts of Tamil and related languages, a project I leave for future research.

4. Conclusions

The analysis has reduced the number of classes of past tense markers from five to three, and the number of levels to input and output, without intermediate stages. Output forms have been motivated by phonotactics, so that the account is both simpler and more general than previous analyses. The constraints invoked here are also found highly ranked in related languages, and allow us to state the similarities between them. For example, most Dravidian languages have some form of a coda-place constraint motivating assimilation and/or deletion (Telugu, IruLa, and Malayalam in Wiltshire (1994, 1998b), Mohanan (1982, 1998)). Dentals commonly assimilate to retroflexes and palatals, favoring preservation of the subplaces of coronal over the unmarked dental place, though this may be more general than in Dravidian alone (Gnanadesikan 1994). Furthermore, IruLa similarly preserves obstruents and nasals at the expense of glides and laterals (Wiltshire 1994). The case study of the past tense shows that its alternations are motivated by constraints relevant for Tamil, for Dravidian, and more generally.

Notes

I thank Laura Downing, Larry Hyman, Abby Kaun, and Catherine Ringen for useful comments and suggestions on the oral version of this paper, and take sole responsibility for any failings in the version presented here. I dedicate this paper to the memory of Naay Kutji.

¹ Some classes can be described in phonological terms (Lindholm and Paramasivam 1980): 1b=lat.-final weak, 3=non-minimal [u]-final, 4=minimal [tu]/[ru]-final, 5a=nas.-final, 5b=lat.-final strong, 7=all [a]-final plus *iru* 'to be'. Two others, 2 (weak) and 6 (strong), act as default classes. Correlations between these observations and the choice of past marker are beyond the scope of this paper.

² See (6) for an indication of the transcription used here. Although the palatal stop symbol /c/ is used, it traditionally indicates an alveopalatal affricate in Tamil.

³ A similar analysis for allophonic intervocalic lenition, a general process of Tamil seen in (2e), is omitted for reasons of space, but see Kaun (1998), who uses a LENITE constraint.

⁴ Since the correspondence constraints here compare input and output, I omit '-IO' to save space.

⁵ The final /l/ of the 3rd f.sg. suffix appears if a vowel-initial suffix follows, such as the question marker *-aa*. Its deletion word-finally is not explicitly analyzed here.

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