Tonal alternation of the proximal demonstrative suffix *-na* in Dagaare

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Introduction

- **Dagaare**: Mabia language, Niger-Congo family, spoken in Ghana and Burkina Faso

- Register tone language with two-tone system {H, L} (Anttila & Bodomo, 1996, 2007)

- Mora is the tone bearing unit (TBU)

  - Short vowels can carry only one tone, e.g., mà 'mother'

  - Long vowels and diphthongs may carry two, e.g., t͡síɛ̀ 'tree'

Introduction

- Prior studies on Dagaare have reported tonal phenomena like tonal polarity, downstep, and tone alternation in nouns and verbs (Angsongna, 2021; Anttila & Bodomo, 2000)

- **What about tonal phenomena that target function words?**

Objective

- Carry out an Optimality Theory (OT) analysis (McCarthy & Prince, 1995; Prince & Smolensky, 2008) to examine tonal alternation of the proximal demonstrative suffix –*na* in Dagaare, which alternates between H tone *-ná* and L tone *-nà*.

Methodology

- Data collected from a 27-year-old native speaker of the Nandome dialect of Dagaare

- All elicitation sessions recorded at a quiet location at Georgetown University

- A corpus of phrases with the proximal demonstrative in different phonological environments was elicited

- The tones were determined with reference to the F0 measurements in Praat (Boersma & Weenink, 2022)

- The demonstrative construction in Dagaare has the basic structure of [definite article prefix + noun root + demonstrative suffix]

  - E.g., [à-dɔ́ɔ́-nà] 'This man' (It is one morphological word)

- Definite article: /à-/, L-toned

- The noun root can have various surface tone patterns, HH, LL, HL, LH, etc.

  - Underlyingly, the noun roots can end with a H tone (e.g., dɔ́ɔ́ 'man'), a L tone (e.g., nàà 'chief'), or no tone (e.g., bíe 'child')

- When the noun ends with a **H** tone, the L tone allomorph -nà is always used

à-dɔ́ɔ́-**nà**	à-báá-**nà**
DEF-man.SG-DEM.PROX	DEF-dog.SG-DEM.PROX
'This man'	'This dog'
à-jír-**nà**	à-ɲã̀ã̀ɲúé-**nà**
DEF-house-DEM.PROX	DEF-thief.SG-DEM.PROX
'This house'	'This thief'

Data description

- For nouns that end with a **L** tone, the realization of -na is more variable

  - Sometimes it is realized as a **H** tone **-ná**, e.g., à-tɪ́ɛ̀-**ná** 'This tree'

  - Other times it is realized as a **L** tone **-nà**, e.g., à-bɪ́ɛ̀-**nà** 'This child'

à-tɪ́ɛ̀-**ná**

DEF-tree- DEM.PROX

'This tree'

à-nàà-**ná**

DEF-chief.SG- DEM.PROX

'This chief'

à-bɪ́ɛ̀-**nà**

DEF-child.SG- DEM.PROX

'This child'

Data description

- Special case for words like **bàà** 'river' and **dàà** 'stick'
  - The roots in à-**báá**-nà 'This river' and à-**dáá**-nà 'This stick' change in tone from L to H
  - -na receives a L tone to become **-nà**
- Instead of alternating the tone of the demonstrative -na, the tone of the noun root is changed

à-**báá**-nà	à-**dáá**-nà
DEF-river.SG- DEM.PROX	DEF-stick.SG- DEM.PROX
'This river'	'This stick'

Phonological analysis

- The demonstrative suffix /-na/ is underlyingly toneless

  - It receives a surface tone opposite to the last tone in the noun root to satisfy the Obligatory Contour Principle (OCP).

  - E.g., à-dɔ́ɔ́-**nà** 'This man' vs. à-nàà-**ná** 'This chief'

Phonological analysis

- What about à-tíɛ̀-**ná** 'This tree' and à-ɓíè-**nà** 'This child'?

  - Different alternation patterns of *-na* despite the noun roots having the same surface tones

- Differences in the <u>underlying</u> tone patterns of the noun root

  - tíɛ̀ has an HL tone pattern while ɓíè has an HØ tone pattern

- Since the underlying tones differ between these two noun roots, *-na* alternates accordingly

Phonological analysis

- Another exception: à-nàà-ná 'This chief' and à-báá-nà 'This river'

  - The noun roots are both L-toned (nàà for chief and bàà for river), but the OCP effect is satisfied in different ways

  - The demonstrative is assigned a H tone in à-nàà-**ná** 'This chief'

  - The tone of the noun root is changed in à-**báá**-nà 'This river'

- The difference is caused by <u>lexically-associated co-phonologies</u>

  - The words nàà and bàà have different OT constraint rankings, which leads to different strategies in tonal alternation

OT Analysis

OT constraints required to explain the patterns in the data:

*TONELESS: assign one violation mark for every TBU in the output that does not have a tone

IDENT(tone): assign one violation mark for every output tone in a TBU that differs from its input correspondent

OCP: assign one violation mark for every adjacent identical tonal feature

OT Analysis

OT constraints required to explain the patterns in the data:

DEP(association): assign one violation mark for every association between an underlying tone and a TBU that is not present in the input (not applicable to inserted tones)
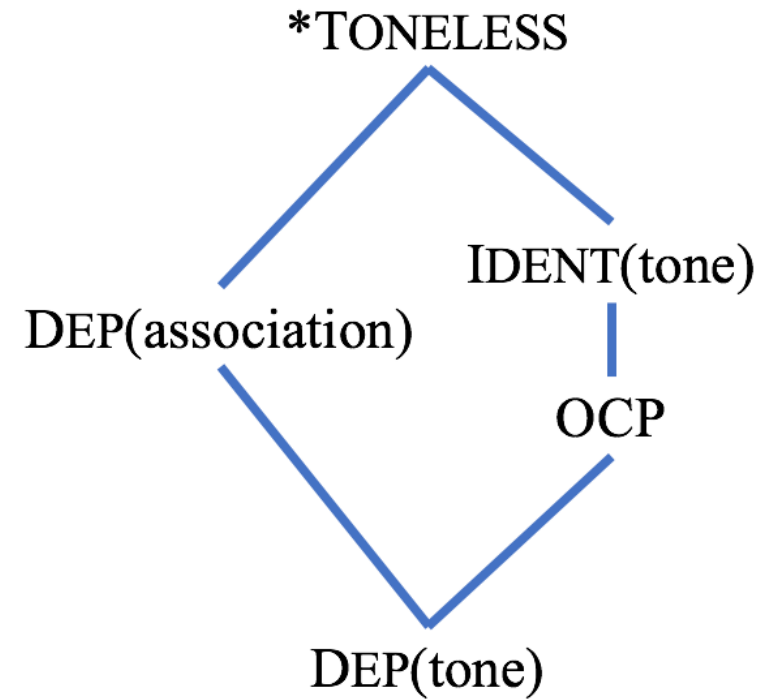
DEP(tone): assign one violation mark for every tone in the output that does not have an input correspondent

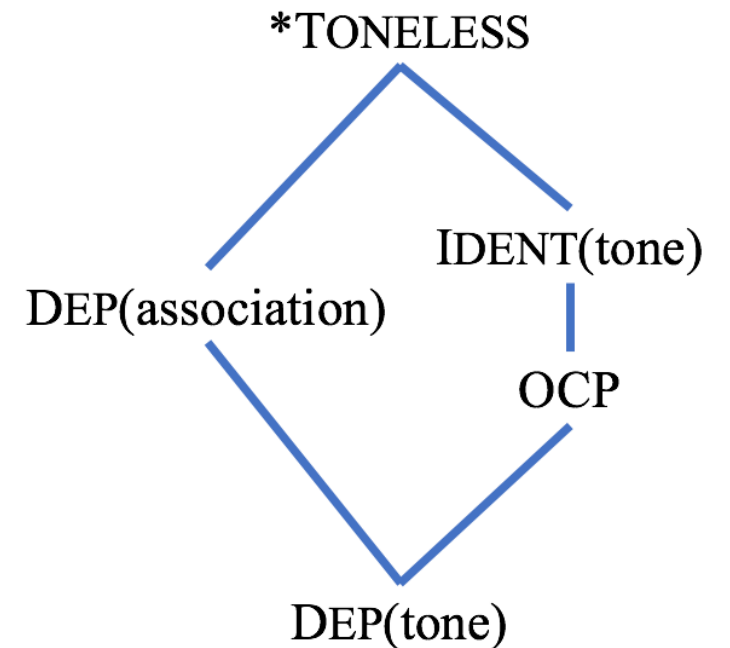# OT Analysis

*TONELESS >> IDENT(tone) >> OCP >> DEP(tone)

*TONELESS >> DEP(association) >> DEP(tone)

- *TONELESS is undominated because all
  TBUs in Dagaare must have tones
- All TBUs in Dagaare always carry either
  H tone or L tone, and there are no TBUs
 that are toneless

OT Analysis

- IDENT(tone) dominates OCP because consecutive sequences of the same tone are allowed within a phonological word
  - *E.g.,* à-bàà 'The river'
  - The definite article prefix à- is always realized with a L tone regardless of its phonological context, so underlyingly L-toned
  - The noun root bàà has L tone in its citation form, so underlyingly L-toned

*TONELESS
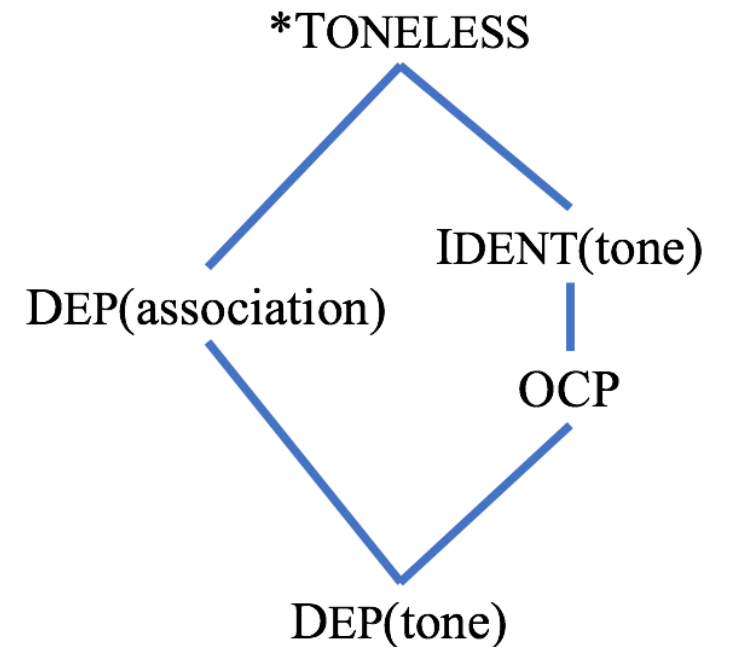
DEP(association)

IDENT(tone)

OCP

DEP(tone)

OT Analysis

- Since the tone of neither the prefix or the root is changed from the input to the output, maintaining the underlying tones in the output (i.e., IDENT(tone)) must be more important than avoiding consecutive sequences of the same tone (i.e., OCP)

*TONELESS

DEP(association)

IDENT(tone)

OCP
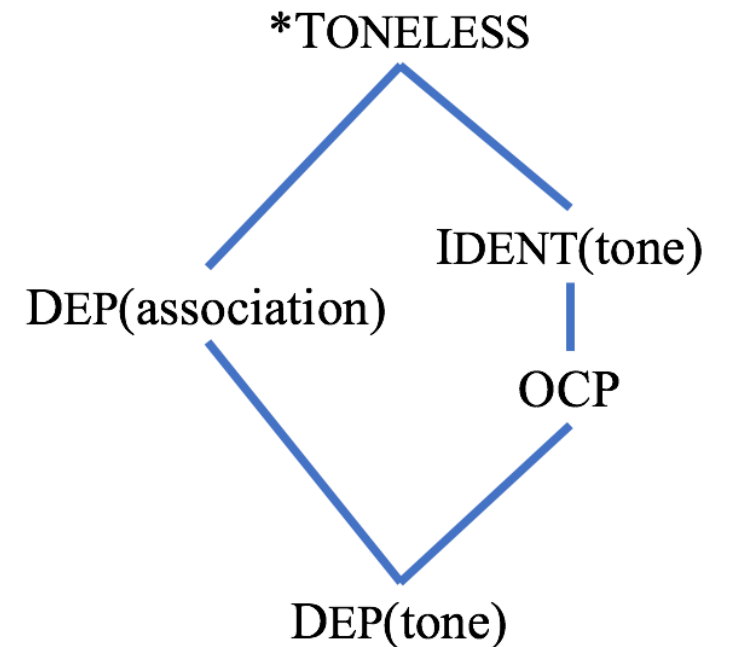
DEP(tone)

OT Analysis

- OCP dominates DEP(tone) because underlyingly toneless TBUs receive surface tones through insertion of tones opposite to those of the adjacent TBUs

OT Analysis

- E.g., à-jír-nà 'This house'
  - -na receives a L tone because the preceding tone in jír is H
  - L tone is inserted instead of H tone to satisfy OCP
  - Since tone insertion occurs, DEP(tone) must be the lowest ranked

*TONELESS

DEP(association)

IDENT(tone)

OCP

DEP(tone)
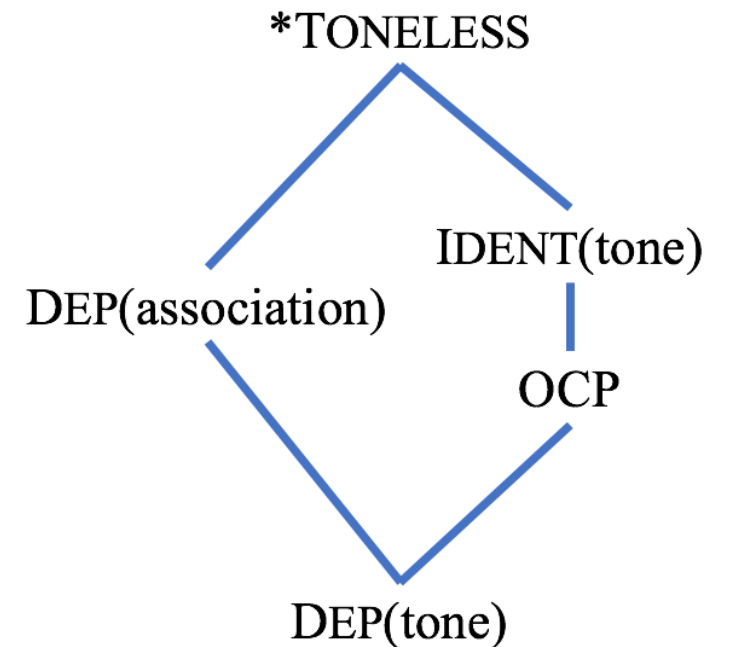
OT Analysis

- DEP(association): toneless TBUs do not receive surface tones through tone spreading from adjacent TBUs

- Disallows association between an underlying tone and a TBU that is not present in the input

*TONELESS

IDENT(tone)

DEP(association)

OCP

DEP(tone)
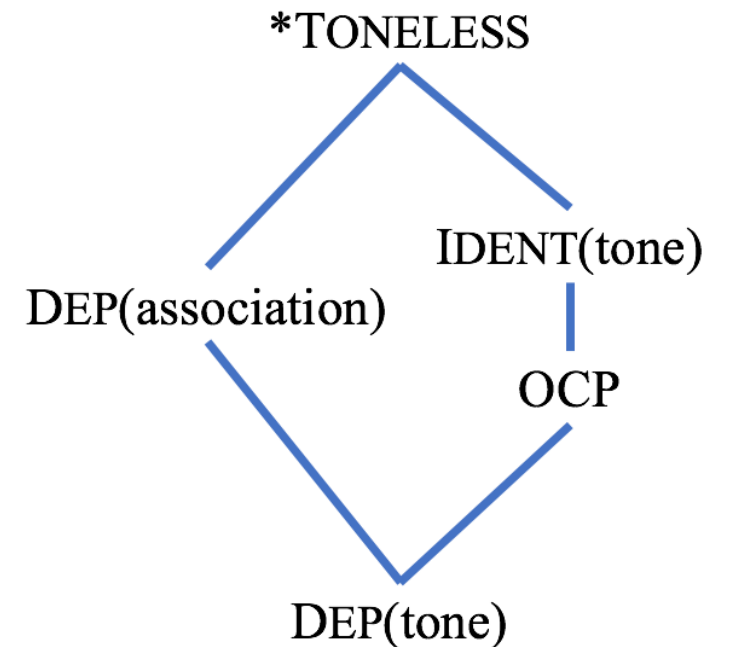
OT Analysis

- *E.g.,* /bíe/ 'child' surfaces as bíè, not *bíé

- The second mora in bíe is underlyingly toneless, so it must receive a surface tone to avoid violation of *TONELESS

- Instead of spreading the H tone from the first mora, a L tone is inserted

- Thus, DEP(association) dominates DEP(tone), and *TONELESS dominates DEP(association)

- However, the ranking of DEP(association) in relation to IDENT(tone) and OCP is unknown
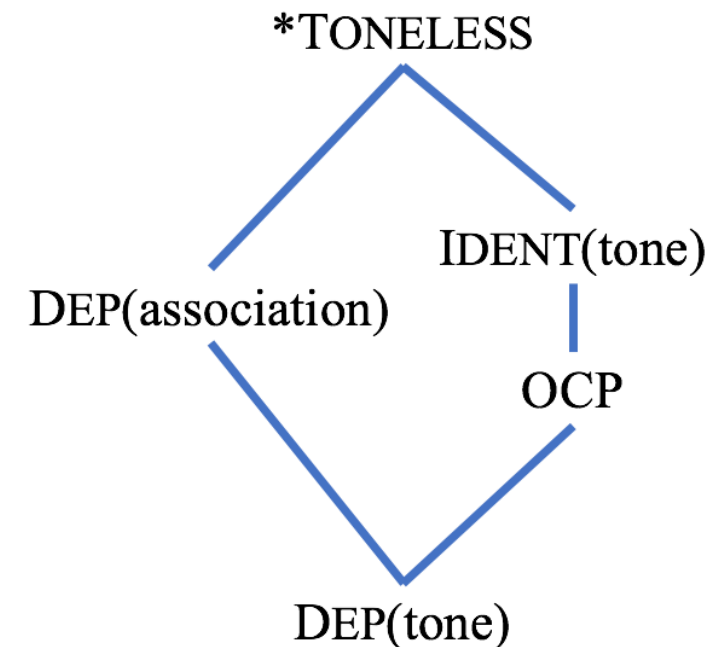
OT Tableaux

E.g., /à-báá-na/ 'This dog', which contains a H-toned noun root

- (d) loses as *-na* remains toneless on the surface

- (b) loses because it contains two consecutive H tones, violating OCP

/à-báá-na/ | \| L H	*Toneless	Ident(tone)	OCP	Dep (association)	Dep(tone)
a. ☞ à-báá-nà | \| | L H **L**					*
b. à-báá-ná | \| | L H **H**			*!		*
c. à-báá-ná | \ | / L H				*!	
d. à-báá-na | \| L H	*!				
e. à-bàà-ná | \| | L **L H**		*!	*		**

OT Tableaux

- (c) loses because the H tone from *báá* spreads to *-na*, which violates DEP (association)
- (e) loses because the tone of the noun root is changed from H in the input to L in the output

/à-báá-na/ | \\\| L H	*Toneless	Ident(tone)	OCP	Dep (association)	Dep(tone)
a. ☞ à-báá-nà | \\\| | L H **L**					*
b. à-báá-ná | \\\| | L H **H**			*!		*
c. à-báá-ná | \\ | / L H				*!	
d. à-báá-na | \\\| L H	*!				
e. à-bàà-ná | \\\| | L **L H**		*!	*		**

OT Tableaux

- (a) *à-báá-nà* wins because it does not violate any of the higher ranked constraints

/à-báá-na/ | \\\| L H	*TONELESS	IDENT(tone)	OCP	DEP (association)	DEP(tone)
a. ☞ à-báá-nà | \\\| | L H **L**					*
b. à-báá-ná | \\\| | L H **H**			*!		*
c. à-báá-ná | \\ | / L H				*!	
d. à-báá-na | \\\| L H	*!				
e. à-bàà-ná | \\\| | L **L H**		*!	*		**

OT Tableaux

- E.g., /à-nàà-na/ 'This chief', which contains a L-toned noun root
- (e) loses as -na remains toneless on the surface
- (b) loses because the tone of the noun root is changed from L in the input to H in the output

/à-nàà-na/ | \\\| L L	*Toneless	Ident(tone)	OCP	Dep (association)	Dep(tone)
a. ☞ à-nàà-ná | \\\| | L L **H**			*		*
b. à-náá-nà | \\\| | L **H** L		*!			*
c. à-nàà-nà | \\\| | L L L			**!**		*
d. à-nàà-nà | \\\| / L L			*	*!	
e. à-nàà-na | \\\| L L	*!		*		

OT Tableaux

- (c) loses because it contains three consecutive L tones, two violations of OCP
- (d) loses because the L tone from *nàà* spreads to *-na*
- (a) *à-nàà-ná* wins because it only violates OCP once

/à-nàà-na/ | \\| L L	*TONELESS	IDENT(tone)	OCP	DEP (association)	DEP(tone)
a. ☞ à-nàà-ná | \\| | L L **H**			*		*
b. à-náá-nà | \\| | L **H** L		*!			*
c. à-nàà-nà | \\| | L L **L**			**!		*
d. à-nàà-nà | \\| / L L			*	*!	
e. à-nàà-na | \\| L L	*!		*		

OT Tableaux

- E.g., /à-bíe-na/ 'This child'. The noun root has a HØ tone pattern with the last TBU being toneless.

- (e) loses as both the noun root and *-na* remain toneless

- (b) loses because a H tone is inserted after a H tone

/à-bíe-na/ | | L H	*Toneless	Ident(tone)	OCP	Dep (association)	Dep(tone)
a. ☞ à-bíè-nà | | \ | L H **L**					*
b. à-bíe-ná | | \ | L H **H**			*!		
c. à-bíè-ná | || | L H**LH**					**!
d. à-bíe-nà | |/ | L H **L**				*!	
e. à-bíe-na | | L H	**!				

OT Tableaux

- (d) loses because the H tone from the first mora of *bíe* spreads to the second mora

- (c) loses because it violates DEP(tone) twice with two different tones being inserted

/à-bíe-na/ | | L H	*Toneless	Ident(tone)	OCP	Dep (association)	Dep(tone)
a. ☞ à-bíè-nà | | \ | L H **L**					*
b. à-bíé-ná | | \ | L H **H**			*!		
c. à-bíè-ná | || | L H**LH**					**!
d. à-bíé-nà | |/ | L H **L**				*!	
e. à-bíe-na | | L H	**!				

OT Tableaux

- (a) *à-bíè-nà* wins because it does not violate any of the higher ranked constraints

- Although it violates DEP(tone), it is more optimal than (c) as it only violates the constraint once

/à-bie-na/ | | L H	*Toneless	Ident(tone)	OCP	Dep (association)	Dep(tone)
a. ☞ à-bíè-nà | | \ | L H **L**					*
b. à-bíé-ná | | \ | L H **H**			*!		
c. à-bíè-ná | || | L H**LH**					**!
d. à-bíé-nà | |/ | L H **L**				*!	
e. à-bíe-na | | L H	**!				

OT Tableaux

- E.g., /à-bàà-na/ 'This river'
- Since the tone of the noun root is changed in the output, and *-na* receives an opposite tone from the surface tone of the noun root, OCP must dominate IDENT(tone)

/à-bàà-na/ | \\| L L	*TONELESS	OCP	IDENT(tone)	DEP (association)	DEP
a. ☞ à-báá-nà | \\| | L **H** **L**			*		**
b. à-bàà-ná | \\| | L L **H**		*!			*
c. à-bàà-nà | \\| | L L L		**!			*
d. à-bàà-nà | \\| / L L		*!		*	
e. à-bàà-na | \\| L L	*!	*			

OT Tableaux

- Lexically-associated co-phonology

- *TONELESS >> OCP >> IDENT(tone) >> DEP(tone) instead of the default *TONELESS >> IDENT(tone) >> OCP >> DEP(tone)

/à-bàà-na/ | \\\| L L	*TONELESS	OCP	IDENT(tone)	DEP (association)	DEP
a. ☞ à-báá-nà | \\\| | L **H** **L**			*		**
b. à-bàà-ná | \\\| | L L **H**		*!			*
c. à-bàà-nà | \\\| | L L L		**!*			*
d. à-bàà-nà | \\\| / L L		*!		*	
e. à-bàà-na | \\\| L L	*!	*			

OT Tableaux

- (e) loses as *-na* remains toneless on the surface

- (b), (c), and (d) all lose because they violate OCP with sequences of consecutive L tones

- (a) *à-báá-nà* wins because it does not violate *TONELESS and OCP

/à-bàà-na/ | \\\| L L	*TONELESS	OCP	IDENT(tone)	DEP (association)	DEP
a. ☞ à-báá-nà | \\\| | L **H** **L**			*		**
b. à-bàà-ná | \\\| | L L **H**		*!			*
c. à-bàà-nà | \\\| | L L L		**!			*
d. à-bàà-nà | \\\| / L L		*!		*	
e. à-bàà-na | \\\| L L	*!	*			

Conclusion

- The proximal demonstrative suffix **-na** in Dagaare is underlyingly toneless

- It receives a surface tone opposite to the preceding underlying tone through tone insertion

- Generated by the OT constraint rankings of *TONELESS >> IDENT(tone) >> OCP >> DEP(tone) and *TONELESS >> DEP(association) >> DEP(tone)

Conclusion

- However, some L-toned noun roots are subject to lexically-associated co-phonologies

- Instead of alternating the tone of -na, the tone of the noun root itself is changed

- The rankings of OCP and IDENT(tone) are flipped in the lexically-associated co-phonologies of these noun roots
  - *TONELESS >> OCP >> IDENT(tone) >> DEP(tone)

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