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Grandfather effects in Laoling disyllabic tone sandhi

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Abstract. In Optimality Theory, grandfather effects refer to the phenomena in which a structure that already exist in the input is allowed to surface while the same structure that is derived (i.e. not in the input) is forbidden. Most studies on this issue focus on segmental processes, and only few on tonal processes. This study presents the data of Laoling regular disyllabic tone sandhi, which demonstrates a grandfathering effect where some tones are allowed in non-derived contexts but banned in derived contexts. We propose a constraint-based analysis adopting Comparative Markedness (McCarthy 2003) constraints.

Keywords. tone sandhi; grandfather effects; comparative markedness

1. Introduction. Originating from the legal term, "grandfather clause", the phonological phenomenon, "grandfather effect" refers to the situation where old violations of a markedness constraint are pardoned, while new violations of the same markedness constraint are forbidden. The phenomenon is challenging to classic Optimality Theory (Prince and Smolensky 1993/2004) because a general markedness constraint does not distinguish a new marked structure from an old one.

Suppose a hypothetical language forces all low rising base tones (LM) to undergo tone sandhi. A ranking such as *LM >> Ident-T may be posited. But such ranking is problematic when the tonal restriction applies only in some derived environment. For instance, only derived LM tones are banned; non-derived ones are allowed. The disyllabic tone sandhi of Laoling, a Shandong dialect spoken in Laoling City, China, displays such grandfather effects.

Previous literature on grandfather effects mostly focuses on segmental processes (Łubowicz 2002, McCarthy 2003, Crowhurst 2003, among others), and only few of them on tonal processes (tone shift: Yip 2003; Obligatory Contour Principle (OCP): Hsiao 2015). This study presents data of Laoling regular disyllabic tone sandhi (TS), which exhibits grandfather effects, and demonstrates how they may be treated in Optimality Theory (Prince and Smolensky 1993/2004) via Comparative Markedness (McCarthy 2003).

2. Tones and tone sandhi in Laoling. In Laoling, there are four lexical tones (LM, HM, ML, H) and one non-lexical tone (MH), which only appears in the sandhi position (i.e. the non-final position), as shown in (1)[1]. The structure of tone is adopted from Bao (1990, 1999), Yip (1989, 2002).

(1) Surface tones in Laoling

Tone	LM	HM	ML	H	MH
Structure	[Lr, lh]	[Hr, hl]	[Lr, hl]	[Hr, h]	[Hr, lh]
Tone value	13	53	31	55	24

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[1] The data of this study were collected from five native speakers of Laoling dialect. They were all born in Laoling city and are native speakers of the Laoling dialect. Only one of the informants have lived in cities outside Laoling. The data include 233 monosyllabic words and 217 disyllabic words/phrases.

Two low register (Lr) and three high register (Hr) tones are observed. There are two types of low register tones, one with a rising contour (lh), the other with a falling contour (hl). And there are three types of high register tones, one with a falling contour, another with a level contour, the other with a rising contour. The MH tone does not belong to the tonal inventory, because it can only be derived.

The dialect allows only one level tone, H, and forbids the others, such as L and M. Hence, the constraints, *L and *M, must be ranked above the tonal faithfulness constraints, which then dominate *H, as shown in (2-(7). It should be noted that the constraints, *L, *M, and *H respectively penalizes the level tones, L, M, and H, and that contour tones such as LM, ML, HM, etc. do not violate these constraints.

(2) *L: Assign one violation mark for every L tone.
(3) *M: Assign one violation mark for every M tone.
(4) *H: Assign one violation mark for every H tone.
(5) Ident-Contour: Assign one violation mark for every contour change from the input to output.
(6) Ident-Register: Assign one violation mark for every register change from the input to output.
(7) *L, *M >> Ident-Contour, Ident-Register >> *H

The tone sandhi in Laoling only affects the non-final tone, as shown in (8). The non-final base tones are listed in the leftmost column, while the final ones are given in the topmost row. The shaded cells indicate no tone sandhi. There are altogether eight sandhi processes.

(8) Disyllabic tone patterns

Final / Non-final	LM	ML	H	HM
LM	(a) MH.LM *shu zhuo* 'desk'	(c) MH.ML *sheng ming* 'life'	LM.H *zhong wi* 'noon'	LM.HM *tian e* 'swan'
ML	ML.LM *da deng* 'headlights'	(d) MH.ML *dian hua* 'telephone'	ML.H *dian ying* 'movie'	ML.HM *tai yang* 'the Sun'
H	(b) HM.LM *shou ji* 'cellphone'	H.ML *tu di* 'land'	(f) ML.H *shui guo* 'fruit'	H.HM *lao lu* 'old donkey'
HM	HM.LM *ping an* 'safe'	(e) H.ML *yang rou* 'lamb'	(g) ML.H *mang guo* 'mango'	(h) ML.HM *yang mao* 'wool'

The sandhi processes are mainly driven by tonal spreading and OCP. In patterns (8b, e), the final tone is assimilated to the non-final tone via leftward tonal spreading on the melodic level. In (8b), the l-melody of LM spreads leftward and produces the sandhi tone HM. In (8e), the h-melody of ML spreads leftward and changes HM into H. The spreading is enforced by ranking Align-L-t, as defined in (9), above Ident-Contour.

(9) Align-L-t: Assign one violation mark for every h or l melody associated with a head mora whose left edge does not coincide with its immediately preceding non-head mora.

The alignment requires the left edge of every tone melody of a head/non-final mora (Hyman 1992) to align with the left edge of the immediate preceding non-head/final mora. The alignment is satisfied by altering the contour of the non-final tone.

Patterns (8a, c, d) and (8f, g, h) undergo register change to avoid adjacent identical registers, which is enforced by ranking OCP-Register, as defined in (10), above Ident-Register.

(10) OCP-Register: No adjacent identical tonal registers.

Exceptions to the tonal spreading and OCP are resulted from two higher ranked constraints, Ident-ML, which forbids any change in the ML tone, and *M, as demonstrated in (11)-(12). In addition, Ident-ML is dominated by OCP-ML, which forbids adjacent ML tones, so that the tone sandhi in (8d) is not blocked by Ident-ML.

(11) Exceptions to leftward spreading

/LM.LM/	Ident-ML	*M	Align-L-t	Ident-Contour
☞a. MH.LM			*	
b. $M^{[Hr,l]}$.LM		*!		*
/ML.H/				
☞c. ML.H			*	
d. LM.H	*!			*
/HM.HM/				
☞e. ML.HM			*	
f. $M^{[Lr, h]}$.HM		*!		*

(12) Exceptions to OCP-Register

/ML.LM/	Ident-ML	*M	OCP-Register	Ident-Register
☞a. ML.LM			*	
b. HM.LM	*!			*
/H.HM/				
☞c. H.HM			*	
d. $M^{[Lr,h]}$.HM		*!		*

However, the current analysis runs into problems with two sandhi processes, as shown in (13)-(14). In terms of faithfulness violations, candidates (a)'s and (b)'s in both tableaux fare the same. In terms of markedness, candidate (13a), the attested output, violates Align-L-t, so the analysis wrongly predicts (13b) as the winner. Candidates (14a, b) tie with each other.

(13) Wrong prediction: unattested output

/H.H/	Align-L-t	OCP-Register	Ident-Contour	Ident-Register
a. ML.H	*!		*	*
💣b. LM.H			*	*
c. H.H		*!		

(14) Wrong prediction: tied candidates

/ML.ML/	Align-L-t	OCP-Register	Ident-Contour	Ident-Register
☞a. MH.ML			*	*
☞b. H.ML			*	*
c. ML.ML		*!		

Traditionally, the solution to these problems is to add general constraints into the hierarchy to rule out LM.H, as in (13b), and H.ML, as in (14b). Yet, neither general markedness nor faithfulness constraints can be added here to resolve the problems.

Markedness constraints that penalize LM.H or H.ML would predict that such sequences are forbidden across the board, which is not the case, as shown in (8). Faithfulness constraints cannot help with the situation either because the distance from H to ML, as in (13a) and H to LM, as in (13b) is basically identical. And the change from ML to MH, as in (14a), which involves two contour feature changes (hl→lh), is probably further than that from ML to H, as in (14b), which only involves one feature change (hl→h).

3. A constraint-based solution. The problems can be resolved if we adopt Comparative Markedness constraints (McCarthy 2003), and separate markedness constraints into new and old versions. Simply put, the new markedness constraints penalize the derived marked structure that is not present in the input. The old ones penalize the non-derived marked structure that is already present in the input.

Closer observations of the surface tones in the non-final position show that there are few non-final LM and H tones. Among the non-final LM's, all of them are non-derived. Derived LM's are not found. Among the non-final H's, only one of them is derived, due to tonal spreading, as in (8e).

The tendency in Laoling to avoid derived LM's and H's but preserve non-derived ones motivate the constraints in (15)-(18). The new constraints, $_{N}$*LM and $_{N}$*H are ranked above faithfulness constraints. The old constraints, $_{O}$*LM and $_{O}$*H, are ranked below faithfulness constraints. This predicts a grandfather effect that tolerates pre-existing LM's and H's but forbids newly created LM's and H's.

(15) $_{N}$*LM: Assign one violation mark for every surface LM tone that does not correspond to an input LM tone.

(16) $_{O}$*LM: Assign one violation mark for every surface LM tone that corresponds to an input LM tone.

(17) $_{N}$*H: Assign one violation mark for every surface H tone that does not correspond to an input H tone.

(18) $_{O}$*H: Assign one violation mark for every surface H tone that corresponds to an input H tone.

Adding these constraints to the hierarchy fixes the problems in (13)-(14) without making wrong predictions in other surface forms, as shown in (19)-(20).

(19) Correct prediction by adding $_{N}$*LM

/H.H/	$_{N}$*LM	OCP-Register	Align-L-t	Ident-Contour	Ident-Register
☞a. ML.H			*	*	*
b. LM.H	*!			*	*
c. H.H		*!			

(20) Correct prediction by adding $_{N}$*H

/ML.ML/	OCP-Register	Align-L-t	$_{N}$*H	Ident-Contour	Ident-Register
☞a. MH.ML				*	*
b. H.ML			*!	*	*
c. ML.ML	*!	*			
/HM.ML/					
☞d. H.ML			*	*	
e. HM.ML		*!			

As shown above, $_{N}$*LM rules out the unattested output, as in (19b), and $_{N}$*H breaks the tie between (20a, b). Furthermore, $_{N}$*H must be dominated by Align-L-t, so that spreading is not suspended in (20d).

4. Summary. The grammar of Laoling disyllabic tone patterns is summarized in (21). The dialect forbids any level tones other than the H tone, hence the undominated *L and *M. The tone sandhi is motivated by tonal spreading (Align-L-t) and OCP (OCP-ML, OCP-Register). The ML tone ignores tonal spreading and OCP-Register, but is still subject to OCP-ML (OCP-ML >> Ident-ML >> Align-L-t, OCP-Reg >> Ident-Cont, Ident-Reg).

(21) *L, *M, OCP-ML, $_{N}$*LM >> Ident-ML >> OCP-Reg >> Align-L-t >> $_{N}$*H >> Ident-Cont, Ident-Reg >> $_{O}$*LM, $_{O}$*H

The grandfather effects ($_{N}$*LM, $_{N}$*H >> Faith >> $_{O}$*LM, $_{O}$*H) explain why possible candidates that fare better or the same as the attested output cannot surface, which is difficult to explain in terms of classic OT constraints.

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