

# Vowel transparency as balance

## 1 Introduction

Transparent vowels are problematic for Optimality Theory: Either they are analysed as underspecified even though OT would predict them to be fully specified (e.g., Ringen & Vago, 1998, Ringen & Heinämäki, 1999), or their analysis requires elaborate technical tools which render OT too powerful (Walker, 1998, 1999, Baković, 2000).

Aim of talk: an account of transparency as Local Constraint Conjunction (Smolensky, 1993, Lubowicz, 1999) in Correspondence Theory (McCarthy & Prince, 1995)

Overview of talk:

sections 1-4: Finnish transparency as balance;

section 5: extension of the proposal to other patterns of transparent/neutral vowels in Uyghur and Enarve Vepsian, to height-uniform harmony in Yawelmani, and to derivationally opaque vowels in Hungarian.

section 6: summary and conclusion.

### 1.1 Finnish vowel harmony

#### (1) The Finnish vowel system

		front		back	
		unrounded	rounded	unrounded	rounded
high	i	y			u
mid	e	ö			o
low	ä			a	

#### (2) Finnish vowel harmony

- a. pöytä-nä 'table' essive  
b. pouta-na 'fine weather' essive  
c. hämärä-nä 'dusk' essive (Ringen & Heinämäki 1999: 305)

#### (3) Finnish neutral vowels in medial position<sup>1</sup>

- a. näke-vät 'see-3pl'  
b. värttinä-llä-ni-hän 'with spinning wheel, as you know'  
c. lyö-dä-kse-ni-kö 'for me to hit'  
d. tunte-vat 'feel-3pl'  
e. palttina-lla-ni-han 'with linen cloth, as you know'  
f. luo-da-kse-ni-ko 'for me to create'

<sup>1</sup> Examples (a,d) provided by Tuulikki Virta, a native speaker of Finnish; the rest taken from van der Hulst & van de Weijer (1995: 499).

#### (4) Finnish transparent vowels in initial position

- a. velje-llä 'brother' adess.  
b. tie-llä 'road' adess. (Ringen & Heinämäki 1999: 305f)

#### (5) Mono-syllabic stems and affixation

- a. *-oks* 'result nominalisation'  
/kiitt-oks/ → kiitos 'thanks'  
/pett-oks/ → petos 'fraud'
- b. *-u* 'action nominalisation'  
/itk-u/ → itku 'crying'  
/pes-u/ → pesu 'wash' (Kiparsky 1973: 117)
- c. /tul-koon/ → tulcoon 'let him come'  
/näk-koon/ → näkköön 'let him see'  
/men-koon/ → menköön 'let him go'
- d. /tul-o/ → tulo 'coming'  
/näk-o/ → näkö 'sight'  
/men-o/ → meno 'going' (Kiparsky 1973: 115)

#### (6) Poly-syllabics

- a. /piene-nt-oks/ → pienennös 'a reduction (in size)'  
/siki-nt-oks/ → siinös 'zygote'
- b. /vie-tt-el-u/ → viettely 'seduction'  
/repi-el-u/ → repeily 'becoming torn' (Kiparsky 1973: 117)

#### (7) Disharmonic words in Finnish

- a. vulgääri 'vulgar' afääri 'affair'  
tyranni 'tyrant' analyysi 'analysis' (Ringen & Heinämäki 1999: 306)
- b. velka 'debt' piru 'devil' (Kiparsky 1973: 38)

### 1.2 Previous approaches

#### (8) Analyses of transparency

- a. *Non-local assimilation*: Harmony of the active feature skips over the neutral vowel. (Ringen, 1975, Anderson, 1980, Kiparsky, 1981, Booij, 1984, Spencer, 1986, Archangeli & Pulleyblank, 1987, Steriade, 1987, Vago, 1988, Ringen & Vago, 1998)
- b. *Feature copying*: The neutral vowel blocks the spreading of the harmonic feature like an opaque vowel, but then the feature is copied onto the vowel on the other side of the neutral one and spreading proceeds as usual. (Archangeli & Pulleyblank, 1994, Pulleyblank, 1996)
- c. *Derivational opacity*: The neutral vowel is harmonic at an intermediate stage of derivation and is later neutralised. (Bach, 1968, Vago, 1976, Clements, 1976, McCarthy, 1984, Ni Chiosáin & Padgett, 1997, Walker, 1998, 1999, Baković, 2000)

#### (9) Vowel harmony in OT

- a. *Alignment* (Smolensky, 1993, Kirchner, 1993, Pulleyblank, 1996, a.m.m.):  
ALIGN(Feature, L/R, M/Cat, L/R)  
Vocalic feature spans are aligned with morphological or prosodic edges.

- b. *Extrinsically triggered*: Harmony is a result of interacting IO-faithfulness and markedness constraints.
- c. *Correspondence* (Krämer, 1998, 2001a/b, Baković, 2000): Adjacent segments/feature bearers agree with respect to a feature via a syntagmatic correspondence relation.

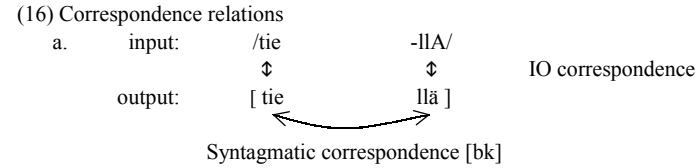
**2 Balance**

- (10) Vowels and their neighbours
  - i. Balance (transparency)
    - a. harmony  $V \leftrightarrow V_B \leftrightarrow V$   $[\alpha F] = [\alpha F] = [\alpha F]$
    - b. disharmony  $V \not\leftrightarrow V_B \not\leftrightarrow V$   $[\alpha F] \neq [-\alpha F] \neq [\alpha F]$
  - ii. Imbalance (opacity)
    - a. harmony  $V \leftrightarrow V_i \leftrightarrow V$   $[\alpha F] = [\alpha F] = [\alpha F]$
    - b. disharmony  $V \not\leftrightarrow V_i \leftrightarrow V$   $[\alpha F] \neq [-\alpha F] = [-\alpha F]$

Balanced vowels are either harmonic to all their direct neighbours or disharmonic to all their direct neighbours, never harmonic to one neighbouring vowel and disharmonic to the other.

**3 A Correspondence Theoretic implementation of Balance**

- (11) The IDENT(F) Constraint Family (McCarthy & Prince, 1995: 264)
  - Let  $\alpha$  be a segment in  $S_1$  and  $\beta$  be any correspondent of  $\alpha$  in  $S_2$ .
  - If  $\alpha$  is  $[\gamma F]$  then  $\beta$  is  $[\gamma F]$ .
  - (Correspondent segments are identical in feature F.)
- (12) IO-IDENT(bk): Correspondent segments in the input and in the output have identical backness specifications.
- (13) IDENT-IO<sub>HARM/ROOT</sub> (Ringen & Heinämäki, 1999: 317): Correspondent harmonic root vowels have identical specifications for backness in the input and output (where harmonic vowels are vowels that are either low or round).
- (14) IO-IDENT<sub>ROOT</sub> 'Correspondent root vowels have identical backness specifications in input and output.'
- (15) Harmony constraint Syntagmatic Identity (Krämer, 1998, 2001a)
  - S-IDENT(bk): Adjacent syllables have identical backness specifications.



- (17) The basic harmony grammar of Finnish: IO-IDENT<sub>ROOT</sub> >> S-IDENT(bk) >> IO-IDENT(bk)

(18) Unimpeded harmony tableau

	/póuta-nä/	IO-IDENT <sub>ROOT</sub>	S-IDENT(bk)	IO-IDENT(bk)
a.	pöytänä	***!		***
b.	póutanä		*!	
☞ c.	póutana			*

(19) Disharmonic roots

	/piru/	IO-IDENT <sub>ROOT</sub>	S-IDENT(bk)	IO-IDENT(bk)
a.	puuru	*!		*
b.	piry	*!		*
☞ c.	piru		*	

- (20) a. \*ALIEN: \*[u, ɤ] or \*[-lo, -rd, +bk]. 'No high, back, unrounded vowels, please!'
- b. \*[i, e] or \*[-lo, -rd, -bk]. 'No high, front, unrounded vowels, please!'

(21) Ranking II: \*ALIEN >> IO-IDENT(hi), IO-IDENT(rd) >> IO-IDENT(bk)

(22) The fate of potential underlying back, high, unrounded vowels in Finnish

	/u/	*ALIEN	IO-IDENT(hi)	IO-IDENT(rd)	IO-IDENT(bk)
a.	u	*!			
b.	a		*!		
c.	u			*!	
☞ d.	i				*

- (23) OCP \*S-IDENT(bk) (Krämer, 1998, 2001a): Adjacent syllables do not have identical specifications for backness.

(24) Harmony and the OCP

			S-IDENT(bk)	*S-IDENT(bk)
a.	transparent	tunte-vat	**	
b.	opaque	*tunte-vät	*	*
c.	harmonic	näke-vät		**
<i>tunte-vat</i> 'feel-3pl', <i>näke-vät</i> 'see-3pl'				

(25) Local Conjunction (Smolensky, 1993, 1995, Lubowicz, 1998, Itô & Mester, 1998)

A local conjunction of two constraints A & B is violated if and only if both its conjoints are violated within the specified local domain.

(26) Local Conjunction BALANCE(bk): \*[-lo, -rd, -bk] & S-IDENT & \*S-IDENT

'Do not violate the markedness constraint against nonlow front unrounded vowels, the backness OCP, and the constraint on backness harmony at the same occasion.'

(27) A local conjunction of OCP and harmony constraint only would result in an unattested dissimilation pattern: \* Co Ci Co Cö Co

(28) Finnish ranking:

\*ALIEN, IO-IDENT(hi,lo,rd) >> IO-IDENT<sub>ROOT</sub> >>  
BALANCE(bk) >> S-IDENT(bk) >> IO-IDENT(bk) >> \*S-IDENT(bk)

(29) Balance tableaux

i. /tuntevat/	*ALIEN	IO-ID(hi,lo,rd)	IO-ID <sub>ROOT</sub>	BALANCE	S-ID(bk)	IO-ID(bk)
a. tuntevat	*!		*			*
b. tuntevät			*!			**
c. tuntevät				*!	*	*
d. tuntevät					**	

ii. /näkevat/	*ALIEN	IO-ID(hi,lo,rd)	IO-ID <sub>ROOT</sub>	BALANCE	S-ID(bk)	IO-ID(bk)
a. näkevat	*!		*			**
b. näkevät			*!		*	*
c. näkevät				*!	*	
d. näkevät						*

iii. /poutana/	*ALIEN	IO-ID(hi,lo,rd)	IO-ID <sub>ROOT</sub>	BALANCE	S-ID(bk)	IO-ID(bk)
a. pöytänä			***!			***
b. poutana					*!	
c. poutana						*

## 4 Two problems with complex forms

### 4.1 Locality

(30) Finnish sequences of balanced vowels

adjektiivejä 'adjectives (partitive pl.)'  
partikkel-eistä 'particles (relative pl.)'

(Campbell 1980: 252)

(31) Finnish neutral vowels between trigger and target

a. ui-da 'to swim' b. ui-ske-nt-ele-mi-se-ni-ko 'my swimming around?'  
syö-dä 'to eat' syö-ske-nt-ele-mi-se-ni-kö 'my constant eating?'  
teh-dä 'to do' tee-ske-nt-ele-mi-se-ni-kö 'my pretending?'

(Kiparsky 2000: 2)

The whole sequence of balanced vowels is either seen as one monolithic entity or checked syllable-wise by the BALANCE constraint.

(32) Monolithic balance

vs. syllabic balance

i.	BALANCE	S-ID(bk)
a. adjektiivejä	*! (a-eie-ä)	*
b. adjektiiveja		**

ii.	BALANCE	S-ID(bk)
a. adjektiivejä	* (a-e-i)	*
b. adjektiiveja	* (a-e-i) *! (i;-e-a)	**

### 4.2 Uniform behaviour of balanced vowels within one representation

(33) Balanced vowels besieged by ordinary vowels

a. värttinä-llä-ni-hän 'with spinning wheel, as you know'  
b. palttina-lla-ni-hän 'with linen cloth, as you know'

(34) Why maximal disharmony?

	BALANCE	S-IDENT(bk)
⊖ a. palttina-lla-ni-hän		****!
⊙ b. palttina-llä-ni-hän		***

(35) Breaking down violations of constraints in the BALANCE conjunction

	BALANCE	S-ID(bk)	*S-ID(bk)	*[-lo, -rd, -bk]
⊖ a. paltti <sub>1</sub> na-lla-ni <sub>2</sub> -han		* (a-i <sub>1</sub> ) * (i <sub>1</sub> -a) * ! (a-i <sub>2</sub> ) * (i <sub>2</sub> -a)	* (a-a)	* (i <sub>1</sub> ) * (i <sub>2</sub> )
⊙ b. paltti <sub>1</sub> na-llä-ni <sub>2</sub> -hän		* (a-i <sub>1</sub> ) * (a-ä) * (i <sub>1</sub> -a)	* (ä-i <sub>2</sub> ) * (i <sub>2</sub> -ä)	* (i <sub>1</sub> ) * (i <sub>2</sub> )

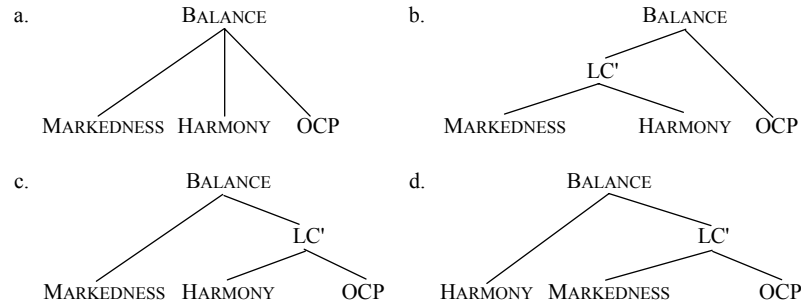
(36) A 'generic' interpretation of BALANCE

	BALANCE	S-ID(bk)	*S-ID(bk)	*[-lo, -rd, -bk]
⊙ a. paltti <sub>1</sub> na-lla-ni <sub>2</sub> -han	✓	* (a-i <sub>1</sub> ) * (i <sub>1</sub> -a) * (a-i <sub>2</sub> ) * (i <sub>2</sub> -a)	* (a-a) ∅	* (i <sub>1</sub> ) * (i <sub>2</sub> )
⊙ b. paltti <sub>1</sub> na-llä-ni <sub>2</sub> -hän	*!	* (a-i <sub>1</sub> ) * (i <sub>1</sub> -a) * (a-ä)	* (ä-i <sub>2</sub> ) * (i <sub>2</sub> -ä)	* (i <sub>1</sub> ) * (i <sub>2</sub> )

The set of all elements that violate \*[-lo, -rd, -bk] in one representation, has to satisfy either S-IDENT or \*S-IDENT, or both.

## 5 Decomposing the Balance constraint

(37) Possibilities of multiple constraint conjunction



### 5.1 Evidence for part of the BALANCE conjunction in Turkic and Finno-Ugric

(38) Uyghur (Kiparsky 2000):

- backness harmony like Finnish;
- between two vowels, neutral vowels either agree or disagree with both neighbours;
- Isolated balanced vowels do not trigger assimilation in attached suffix vowels, they cause dissimilation.

(39) Uyghur

- a. yaz-ǧu-či-lar 'writers'  
kör-gü- či-lär 'watchers'
- b. tizil-maq 'lining up'  
dil-ǧa 'to heart'
- (Kiparsky 2000)

(40) Enarve Vepsian (Kiparsky 2000): neutral vowels are completely insensitive to the preceding vowel, and disagree in backness with the following vowel through the board.

Markedness & OCP \*[-lo, -rd, -bk]&\*S-IDENT(bk) at work in Uyghur and Vepsian.

(37d) is the favourable decomposition of balance.

(41) Cross-linguistic rankings and conjunctions

- Finnish: BALANCE >> S-IDENT(bk) >> \*[-lo, -rd, -bk]&\*S-IDENT(bk)  
Uyghur: BALANCE >> \*[-lo, -rd, -bk]&\*S-IDENT(bk) >> S-IDENT(bk)  
Enarve Vepsian: \*[-lo, -rd, -bk]&\*S-IDENT(bk) >> S-IDENT(bk)

### 5.2 Evidence for another part of the BALANCE conjunction in Yawelmani

Yawelmani height-uniform harmony can be analysed as a conjunction of the harmony constraint with the OCP constraint.

(42) The Yawelmani vowel system

	[-back]	[+back]
[-low]	i, i:(e)	u, u:(o:)
(mid)	(e)	
[+low]	a, a:	o, o:

(43) RoBA: \*[αround, -αback]. A vowel which is [αback] is [αround].

(44) Yawelmani height uniform harmony

- a. xil-hin 'tangles, non-future'  
dub-hun 'leads by the hand, non-future'
- b. xat-al 'might eat'  
bok'-ol 'might find'
- c. xat-hin 'eats, non-future'  
bok'-hin 'finds, non-future'
- d. xil-al 'might tangle'  
dub-al 'might lead by the hand'
- e. bok'-k'o 'find (it)!'  
bok'-sit-k'a 'find (it) for (him)!' (Cole & Kisseberth 1995: 1f)

(45) Syntagmatic Identity constraints relevant in Yawelmani

- a. \*S-IDENT(lo): Adjacent syllables are not identical in the specification of the feature [±low].
- b. S-IDENT(bk): Adjacent syllables are identical in the specification of the feature [±back].
- c. LC(a&b) UNIFORMVH: \*S-IDENT(lo)&S-IDENT(bk) (or: S-IDENT(lo) → S-IDENT(bk))

- (46) a. IO-IDENT(bk): Specifications of [±back] on correspondent segments in input and output are identical.  
b. IO-IDENT(lo): Specifications of [±low] on correspondent segments in input and output are identical.

(47) RoBA, IO-IDENT(lo) >> UNIFORMVH >> IO-IDENT(bk) >> \*S-IDENT(lo), S-IDENT(bk)

(48) Harmony of height uniform vowels in Yawelmani

/bok'+al/	RoBA	IO-ID(lo)	UNIFORMVH	IO-ID(bk)	*S-IDENT(lo)	S-IDENT(bk)
a. bok'al			*!		*	*
b. buk'al		*!				*
c. bik'al		*!		*		
d. bok'il		*!				
e. bok'ol	*!				*	
f. bok'ol				*	*	

(49) Height heterogeneous vowels in Yawelmani

/bok'+hin/	RoBA	IO-ID(lo)	UNIFORMVH	IO-ID(bk)	*S-IDENT(lo)	S-IDENT(bk)
a. bok'hin						*
b. bok'hon		*!			*	
c. bæc'hin	*!				*	
d. bak'hin				*!		
e. bok'hun				*!		
f. bok'hun	*!					

5.3 Markedness, faithfulness, and the OCP: Trojan vowels in Hungarian

Hungarian has two types of neutral vowels. The pattern can be accounted for by the assumption of a conjunction of markedness and the OCP (37d) with a faithfulness constraint.

(50) Hungarian vowel inventory (Ringen & Vago, 1998: 394)

	front				back			
	[-round]		[+round]		[-round]		[+round]	
	short	long	short	long	short	long	short	long
high	i [i]	i: [i:]	ü [ü]	ü [ü:]			u [u]	ú [u:]
mid	e [e]	e: [e:]	ö [ö]	ő [ö:]			o [o]	ó [o:]
low	e [e]				á [a:]		a [a]	

(51) Hungarian basic harmony

		Dative	Adessive
a. ház	'house'	ház-nak	ház-nál
b. tök	'pumpkin'	tök-nek	tök-nél
c. radír	'eraser'	radír-nak	radír-nál
→ d. víz	'water'	víz-nek	víz-nél
→ e. híd	'bridge'	híd-nak	híd-nál
f. nüansz	'nuance'	nüansz-nak	nüansz-nál
g. sofőr	'chauffeur'	sofőr-nek	sofőr-nél

(52) First ranking for Hungarian

\*ALIEN, IO-IDENT(hi), \*[-lo]&IO-IDENT(rd) >> S-IDENT(bk) >> IO-IDENT(rd, bk)

(53) The possible Hungarian underlying back, high, unrounded vowel in isolation

/u/	*ALIEN	IO-ID(hi)	*[-lo]&IO-ID(rd)	...	IO-ID(bk)
a. u	*!				
b. u		*!			
c. u			*!		
d. i					*

(54) Hungarian balanced /i/

/radír-næk/	*ALIEN	IO-ID(hi)	*[-lo]&IO-ID(rd)	BALANCE	S-ID(bk)	IO-ID(rd)
a. radírnek				*!	*	
b. radur nek	*!					
c. radurnök			*!			*
d. radírnök					**	

(55) Hungarian transparent versus Trojan vowels

stem	gloss	adess.	UR
a. kéz	'hand'	kéznél	s.l.
film	'film'	filmnél	s.l.
		ablative	
b. híd	'bridge'	hídtól	/hu:d/
cél	'aim; target'	céltól	/tsɛ:l/

(Olsson 1992: 79)

(56) The constraint on Trojan vowels in Hungarian

TROY: \*[-lo, -bk, -rd]&IO-IDENT(bk)&\*S-IDENT(bk)

(57) The Trojan vowel in Hungarian

/hu:d-næk/	*ALIEN	IO-ID(hi)	*[-lo]&IO-ID(rd)	TROY	S-ID(bk)
a. hu:dnök	*!				
b. ha:dnök		*!			
c. hu:dnök			*!		
d. hi:dnök				*!	
e. hi:dnök					*

(58) The balanced vowel in Hungarian II

/vüz-næk/	*ALIEN	IO-ID(hi)	*[-lo]&IO-ID(rd)	TROY	S-ID(bk)
a. vu:znök	*!				
b. va:znök		*!			
c. vu:znök			*!		
d. vi:znök					
e. hi:dnök					*!

## 6 Conclusion

- ↻ Transparency = Balance: The vowels that make the system imbalanced are balanced with regard to their neighbourhood, i.e. harmonic with both neighbours or disharmonic with both, but never harmonic with one neighbour and disharmonic with the other.
- ↻ Technically, Balance is an indirect OCP effect.
- ↻ Local Conjunction of markedness, harmony and OCP constraints liberates the theory from additional assumptions like step-wise derivation, Sympathy, constraint targeting etc.
- ↻ Without further assumptions, the approach can be extended to other opacity phenomena of vowel harmony as well as height-uniformity.
- ↻ cross-linguistic variation is not just a matter of different constraint rankings but also of differing constraint conjunctions.

(59) Crucial constraint conjunctions:

Balanced vowels:	*[-lo, -rd, -bk]&*S-IDENT(bk)&S-IDENT(bk);
Disharmonic neutral vowels:	*[-lo, -bk, -rd]&*S-IDENT(bk)
Trojan vowels:	*[-lo, -bk, -rd]&*S-IDENT(bk)& <b>IO</b> -IDENT(bk);
Height uniform harmony:	*S-IDENT(lo)&S-IDENT(bk)

Comments welcome!

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