

Optimality Theory and Implicational Relations in Phonological Development



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Abstract

In clinical settings, Optimality Theory may help determine treatment priorities. If error processes are implicationally related due to a fixed constraint ranking, we can target the higher-ranked process to force demotion of both constraints. Dinnsen & O'Connor (2001) described an implicational relationship between harmony and gliding in the productions of phonologically delayed children. This study demonstrates that their generalization does not extend to a younger child with developmentally appropriate harmony.

Background

Consonant Harmony (CH)

• A process of assimilation of nonadjacent consonants, typically observed in children younger than 3;0. Can target place or manner features.

Harmony Type	Target Word	Child's Production
Place ([coronal]-[dorsal])	take	[keik]
Place ([labial]-[dorsal])	back	[gæk]
Manner ([nasal])	sewing	[sonɪŋ]
Manner ([continuant])	wave	[veiv]

Dinnsen & O'Connor (2001)

- **Observation:** In a sample of over 200 children with phonological disorders, all subjects exhibiting **manner harmony** also showed **gliding** (/r/→[w]).
- **Hypothesis:** There is a universal implicational relation such that manner harmony implies gliding.
- **Claim:** This generalization can be captured through the mechanisms of Optimality Theory by positing a fixed constraint ranking, ***R >> ALIGN**.

Case Study

Question

- Does the implicational relationship between gliding and manner harmony extend to normal phonological development?

Subject

- BF, 2;11-year-old boy exhibiting multiple forms of consonant harmony.
 - Adopted from Korea at 7 months.
 - Medical history unremarkable.
 - Decreased intelligibility due to multiple phonological processes.

Study Design

- BF's speech was recorded during two story-reading activities and two sentence-repetition games. Story and game materials were loaded with phonemic targets designed to elicit CH (e.g. *duck, sock, tiger*).
- All utterances were transcribed, and the following analyses were carried out:
 - Complete inventory of phonological processes
 - Percent occurrence of CH and gliding.

Sample Tableaux: Harmony and Gliding

/veiv/ "wave"	*R	MAX-manner	ALIGN	LICENSE	MAX-root	/ruʃ/ "roof"	*R	MAX-manner	ALIGN	LICENSE	MAX-root
weiv C			*!			wuʃ C		*!	*		*
weiv A C				*!		→wuʃ A C				*	*
reiv A C	*!				*	ruʃ A C	*!				
→veiv C					*	vʊʃ C		*!			

Results

I. Phonological Processes

- Six processes were found to occur robustly (>50% application) in BF's speech.

1. Initial voicing	cat → [gæʔ]
2. Initial stopping	that → [dæʔ]
3. Consonant harmony	pig → [gik]
4. Cluster simplification (initial /s/)	snow → [noʊ]
5. Single consonant deletion (initial /h/)	have → [af]
6. Final devoicing	eyes → [ajs]
7. Final nasal deletion with vowel nasalization	dancing → [dæsi]
8. Denasalization	snake → [geik]

- BF's overall profile is consistent with an early stage of typical development (under 3;0).

II. Consonant Harmony

- Types of harmony observed:
 - Place assimilation: Coronal/labial to velar
 - *tiger* → [gaigər]; *pig* → [gik]
 - Manner harmony: Glide to fricative
 - *woof* → [vʊʃ]

Harmony Type	Frequency of application	
Place	40/42	95%
Manner	9/10	90%

III. Gliding

- Correct /r/ production was attested in 43/44 instances.
 - Singleton /r/ in initial, medial, and final positions.
 - *roar* → [rɔr]; *Gregory* → [grɛgɔrij]
 - [r]-blends in initial and final positions
 - *tree* → [drij]; *art* → [art]
- No gliding of [r] was observed.

Conclusion

- BF exhibits **manner harmony** but **not gliding**.
- In terms of OT constraints, it appears that **ALIGN** is still active but ***R** has been demoted.
 - This case provides evidence against a universal fixed ranking ***R >> ALIGN**.
- Why is BF's pattern unattested in Dinnsen & O'Connor's phonological database?
 - A possible implicational relationship of severity in disordered phonology.
 - If disorder is severe enough to include CH, gliding is also likely to be present.
 - Because BF is within the normal age range for CH, considerations of severity do not apply.
- Fixed constraint rankings can still be a powerful tool for determining treatment priorities.
 - However, we need to consider various data sources (disordered phonology, typical development, cross-linguistic typologies) before assuming a fixed constraint ranking.

References

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