Objectives:

- **Factorial typology of segment distribution — Implications**
- **Child phonology in OT**

Background preparation:

- *Exercise: Fac. typ. of segmental distribution*

0. Today's plan

- General OT check-in
  - How much do we want to go over the last few prep questions?
  - Any clarification questions on WU #2?
- Factorial typology of segmental distribution
- Comparing models: Child phonology

0. General OT check-in

- All prep questions except 04.04 are now graded
  - Any questions / any points to go over?

- Any clarification questions on WU #2?

1. Review: Complementary distribution

- What are the three *general* types of constraints we need in order to analyze a pattern of complementary (predictable) distribution?

1. Review: Complementary distribution

- What are the three *general* types of constraints we need in order to analyze a pattern of complementary (predictable) distribution?

Context-specific M	**Context-free M**	**F**
(penalizes **default** allophone in **specific context**)	(penalizes **specific** allophone in **general**)	(the faithfulness constraint(s) on the features that **distinguish** the two allophones)

- How are they **ranked** for complementary distribution?

1. Review: Complementary distribution

- **Context-specific M » Context-free M » F**
- *F dominated by both M:* Input choice of allophone is irrelevant; the M constraints will decide everything
  - This is exactly what we need for complementary (**predictable**) distribution!
- *Context-specific M » Context-free M:* Specific allophone is always avoided, except in its specific context, where the default allophone is worse
  - These are the constraints that determine **which allophone** appears where

2. Factorial typology and segmental distribution

- Here are the three constraints we proposed for our analysis of complementary distribution in Greek

NoVelar+FrontVowel

Assign one * for any sequence of segments [dors] [–bk] in which the [dors] segment is not also [cor]

*Cor-Dors (aka "No palatals")

Assign one * for any segment that is [cor, dors]

Ident[cor]

Assign one * for any output segment that differs from its input segment with respect to [coronal]

2. Factorial typology and segmental distribution

- How many rankings are there for these three constraints? **NoVel+FrV, *Cor-Dors, Ident[cor]**

  What are they?

- For each of the rankings…
  - What would happen to the following inputs?
    /ka/ /ke/ /ce/ /ca/
  - Describe what **distribution pattern** we see for the segments [k] and [c] in a language with this ranking

2. Factorial typology and segmental distribution

- How many rankings are there for these three constraints? **NoVel+FrV, *Cor-Dors, Ident[cor]**

  What are they?

2. Factorial typology and segmental distribution

- How many rankings are there for these three constraints? **NoVel+FrV, *Cor-Dors, Ident[cor]**

  What are they?

  3! = 6 rankings

1	NoVel+FrV	»	*Cor-Dors	»	Ident[cor]	*(= Greek)*
2	Ident[cor]	»	*Cor-Dors	»	NoVel+FrV	
3	Ident[cor]	»	NoVel+FrV	»	*Cor-Dors	
4	NoVel+FrV	»	Ident[cor]	»	*Cor-Dors	
5	*Cor-Dors	»	NoVel+FrV	»	Ident[cor]	
6	*Cor-Dors	»	Ident[cor]	»	NoVel+FrV	

2. Factorial typology and segmental distribution

- For each of the rankings…
  - What would happen to the following inputs?

    /ka/ /ke/ /ce/ /ca/
  - Describe what **distribution pattern** we see for the segments [k] and [c] in a language with this ranking

2. Factorial typology and segmental distribution

- Ranking (1): NoVel+FrV » *Cor-Dors » Ident[cor]
  (this is the ranking for Greek)

/ka/	NoVelar+FrV	*Cor-Dors	Ident[cor]
→ (a) **[ka]**			
(b) [ca]		*!	*

/ke/	NoVelar+FrV	*Cor-Dors	Ident[cor]
(a) [ke]	*!		
→ (b) **[ce]**		*	*

2. Factorial typology and segmental distribution

- Ranking (1): NoVel+FrV » *Cor-Dors » Ident[cor]
  (this is the ranking for Greek)

/ce/	NoVelar+FrV	*Cor-Dors	Ident[cor]
→ (a) **[ce]**		*	
(b) [ke]	*!		*

/ca/	NoVelar+FrV	*Cor-Dors	Ident[cor]
(a) [ca]		*!	
→ (b) **[ka]**			*

2. Factorial typology and segmental distribution

- Ranking (1): NoVel+FrV » *Cor-Dors » Ident[cor]

  (this is the ranking for Greek)

  - Outcomes:

    /ka/ → **[ka]** /ca/→ **[ka]**

    /ke/ → **[ce]** /ce/→ **[ce]**

  - Distribution:

2. Factorial typology and segmental distribution

- Ranking (1): NoVel+FrV » *Cor-Dors » Ident[cor]

  (this is the ranking for Greek)

  - Outcomes:

    /ka/ → **[ka]** /ca/→ **[ka]**

    /ke/ → **[ce]** /ce/→ **[ce]**

  - Distribution: **complementary** (predictable)

    - Faithfulness is lowest — choice of [k] vs. [c] in input has *no influence*
    - Context-specific M » context-free M — environment determines [k] vs. [c]

2. Factorial typology and segmental distribution

- Pause for an important question:

  What about all the other candidates?

  - What are some **other useful losers** for this output?

/ke/	NoVelar+FrV	*Cor-Dors	Ident[cor]
(a) [ke]	*!		
→ (b) **[ce]**		*	*
…			

2. Factorial typology and segmental distribution

- Pause for an important question:

  What about all the other candidates? Examples:

/ke/	NoVelar+FrV	*Cor-Dors	Ident[cor]
(a) [ke]	*!		
→ (b) **[ce]**		*	*
(c) [ka]		L	L
(d) [e]		L	L
(e) [kre]		L	L

2. Factorial typology and segmental distribution

- What about all the other candidates? Examples:

/ke/	Ident [bk/lo]	NoDel	No Epenth	NoVel+ FrV	*Cor-Dors	Ident [cor]
(a) [ke]				*!		
→ (b) **[ce]**					*	*
(c) [ka]	* W				L	L
(d) [e]		* W			L	L
(e) [kre]			* W		L	L

- Other constraints outrank *Cor-Dors, Id[cor] in Greek

2. Factorial typology and segmental distribution

- What about all the other candidates?
  - **Other constraints** » *Cor-Dors, Id[cor] in Greek
  - For the rest of the discussion, we will keep our focus on languages where such other constraints dominate the key CS-M and F constraints
  - Why? Only because we are interested in **how constraints can predict distribution patterns between two segments**
    - The above other types of patterns are also predicted to exist! — that's just a separate discussion topic

2. Factorial typology and segmental distribution

- Ranking (2): IDENT[COR] » *COR-DORS » NOVEL+FRV
- Ranking (3): IDENT[COR] » NOVEL+FRV » *COR-DORS

/ka/	IDENT[COR]	*COR-DORS	NOVELAR+FRV
→ (a) **[ka]**			
(b) [ca]	*!	*	

/ke/	IDENT[COR]	*COR-DORS	NOVELAR+FRV
→ (a) **[ke]**			*
(b) [ce]	*!	*	

2. Factorial typology and segmental distribution

- Ranking (2): IDENT[COR] » *COR-DORS » NOVEL+FRV
- Ranking (3): IDENT[COR] » NOVEL+FRV » *COR-DORS

/ce/	IDENT[COR]	*COR-DORS	NOVELAR+FRV
→ (a) **[ce]**		*	
(b) [ke]	*!		*

/ca/	IDENT[COR]	*COR-DORS	NOVELAR+FRV
→ (a) **[ca]**		*	
(b) [ka]	*!		

2. Factorial typology and segmental distribution

- Ranking (2): IDENT[COR] » *COR-DORS » NOVEL+FRV
- Ranking (3): IDENT[COR] » NOVEL+FRV » *COR-DORS
  - Outcomes:

    /ka/ → **[ka]** /ca/→ **[ca]**

    /ke/ → **[ke]** /ce/→ **[ce]**
  - Distribution:

2. Factorial typology and segmental distribution

- Ranking (2): IDENT[COR] » *COR-DORS » NOVEL+FRV
- Ranking (3): IDENT[COR] » NOVEL+FRV » *COR-DORS
  - Outcomes:
    /ka/ → **[ka]** /ca/→ **[ca]**
    /ke/ → **[ke]** /ce/→ **[ce]**
  - Distribution: **contrastive** (unpredictable)
    Note the presence of "minimal pairs"!
    - Faithfulness is highest — input [k] and [c] will both survive unchanged, no matter what

2. Factorial typology and segmental distribution

- Ranking (4): NoVel+FrV » Ident[cor] » *Cor-Dors

/ka/	NoVelar+FrV	Ident[cor]	*Cor-Dors
→ (a) **[ka]**			
(b) [ca]		*!	*

/ke/	NoVelar+FrV	Ident[cor]	*Cor-Dors
(a) [ke]	*!		
→ (b) **[ce]**		*	*

2. Factorial typology and segmental distribution

- Ranking (4): NoVel+FrV » Ident[cor] » *Cor-Dors

/ce/	NoVelar+FrV	Ident[cor]	*Cor-Dors
→ (a) **[ce]**			*
(b) [ke]	*!	*	

/ca/	NoVelar+FrV	Ident[cor]	*Cor-Dors
→ (a) **[ca]**			*
(b) [ka]		*!	

2. Factorial typology and segmental distribution

- Ranking (4): NoVel+FrV » Ident[cor] » *Cor-Dors
  - Outcomes:

    /ka/ → **[ka]** /ca/→ **[ca]**

    /ke/ → **[ce]** /ce/→ **[ce]**

  - Distribution:

2. Factorial typology and segmental distribution

- Ranking (4): NoVel+FrV » Ident[cor] » *Cor-Dors
  - Outcomes:
    /ka/ → **[ka]** /ca/→ **[ca]**
    /ke/ → **[ce]** /ce/→ **[ce]**
  - Distribution: **neutralization**
    Note "minimal pair" [ka] ≠ [ca], but /ke/→[ce]
    - NV+FV requires 'special' segment in special context
    - Otherwise, faithfulness prevails

2. Factorial typology and segmental distribution

- Ranking (5): *Cor-Dors » NoVel+FrV » Ident[cor]
- Ranking (6): *Cor-Dors » Ident[cor] » NoVel+FrV

/ka/	*Cor-Dors	NoVelar+FrV	Ident[cor]
→ (a) **[ka]**			
(b) [ca]	*!		*

/ke/	*Cor-Dors	NoVelar+FrV	Ident[cor]
→ (a) **[ke]**		*	
(b) [ce]	*!		*

2. Factorial typology and segmental distribution

- Ranking (5): *Cor-Dors » NoVel+FrV » Ident[cor]
- Ranking (6): *Cor-Dors » Ident[cor] » NoVel+FrV

/ce/	*Cor-Dors	NoVelar+FrV	Ident[cor]
(a) [ce]	*!		
→ (b) **[ke]**		*	*

/ca/	*Cor-Dors	NoVelar+FrV	Ident[cor]
(a) [ca]	*!		
→ (b) **[ka]**			*

2. Factorial typology and segmental distribution

- Ranking (5): *Cor-Dors » NoVel+FrV » Ident[cor]
- Ranking (6): *Cor-Dors » Ident[cor] » NoVel+FrV
  - Outcomes:

    /ka/ → **[ka]** /ca/→ **[ka]**

    /ke/ → **[ke]** /ce/→ **[ke]**

  - Distribution:

2. Factorial typology and segmental distribution

- Ranking (5): *Cor-Dors » NoVel+FrV » Ident[cor]
- Ranking (6): *Cor-Dors » Ident[cor] » NoVel+FrV
  - Outcomes:

    /ka/ → **[ka]** /ca/→ **[ka]**

    /ke/ → **[ke]** /ce/→ **[ke]**

  - Distribution: **"inventory gap"** (illegal segment)

    Note that there is no [c] in any output ever

    - 'Special' segment is banned, regardless of context and regardless of input
    - This is how OT handles **absent** segments

2. Factorial typology and segmental distribution

- **Summary** of rankings and distribution patterns:

(1) NoVel+FrV » *Cor-Dors » Ident[cor]	predictable
(2) Ident[cor] » *Cor-Dors » NoVel+FrV (3) Ident[cor] » NoVel+FrV » *Cor-Dors	contrastive
(4) NoVel+FrV » Ident[cor] » *Cor-Dors	neutralization
(5) *Cor-Dors » NoVel+FrV » Ident[cor] (6) *Cor-Dors » Ident[cor] » NoVel+FrV	inventory gap

2. Factorial typology and segmental distribution

- Implications of the OT approach to segmental distribution:
  - If some language has a context-specific allophone and a default (“elsewhere”) allophone…
  - …which one is predicted to be an illegal segment in another language?

- Rule-based phonology does not make this connection

3. Summary: Segmental distribution in OT

- General ranking for **predictable distribution**:

  Context-specific M » Context-free M » F

- General ranking for **contrastive distribution**:

  F » { Context-specific M , Context-free M }

- General ranking for **neutralization**:

  Context-specific M » F » Context-free M

- General ranking for **inventory gap**:

  Context-free M » { Context-specific M , F }

4. Child phonology in OT

- PP: Consonant patterns in child phonology

  /ʌðə/ → [ʌdə] 'other' /swiŋ/ → [wiŋ] 'swing'

  /zu:/ → [du:] 'zoo' /bʌmp/ → [bʌp] 'bump'

- Review:
  - In general, how do child **surface forms** differ from adult surface forms?
  - In a **rule-based model** of phonology, how do we have to say a child's **grammar** differs from the target (adult) grammar?

4. Child phonology in OT

- PP: Consonant patterns in child phonology

  /ʌðə/ → [ʌdə] ‘other’ /swiŋ/ → [wiŋ] ‘swing’

  /zu:/ → [du:] ‘zoo’ /bʌmp/ → [bʌp] ‘bump’

- Review:
  - In general, how do child **surface forms** differ from adult surface forms? | **simpler**
  - In a **rule-based model** of phonology, how do we have to say a child’s **grammar** differs from the target (adult) grammar? | **more rules — more complex (?!)**

4. Child phonology in OT

- PP: Consonant patterns in child phonology

  /ʌðə/ → [ʌdə] ‘other’ /swiŋ/ → [wiŋ] ‘swing’

  /zu:/ → [du:] ‘zoo’ /bʌmp/ → [bʌp] ‘bump’

- What does the child’s grammar look like in OT?
  - Cluster simplification patterns
  - Fricative ‘stopping’ pattern

5. Cluster simplification

- *Child grammar:* What are the constraint rankings?

/swiŋ/ ‘swing’		
→ (a) **[wiŋ]**		
(b) [swiŋ]		

/bʌmp/ ‘bump’		
→ (a) **[bʌp]**		
(b) [bʌmp]		

5. Cluster simplification

- *Child grammar:* What are the constraint rankings?

/swiŋ/ 'swing'	NoOnsetCluster	NoDeletion
→ (a) **[wiŋ]**		*
(b) [swiŋ]	* W	L

/bʌmp/ 'bump'	NoCodaCluster	NoDeletion
→ (a) **[bʌp]**		*
(b) [bʌmp]	* W	L

5. Cluster simplification

- *Child grammar:* What are the constraint rankings?
  - NoOnsetCluster » NoDeletion

/swiŋ/ 'swing'	NoOnsetCluster	NoDeletion
→ (a) **[wiŋ]**		*
(b) [swiŋ]	* W	L

  - NoCodaCluster » NoDeletion

/bʌmp/ 'bump'	NoCodaCluster	NoDeletion
→ (a) **[bʌp]**		*
(b) [bʌmp]	* W	L

5. Cluster simplification

- *Adult grammar:* What are the constraint rankings?

/swiŋ/ 'swing'	NoOnsetCluster	NoDeletion
(a) [wiŋ]		*
→ (b) **[swiŋ]**	*	

/bʌmp/ 'bump'	NoCodaCluster	NoDeletion
(a) [bʌp]		*
→ (b) **[bʌmp]**	*	

5. Cluster simplification

- *Adult grammar:* What are the constraint rankings?
  - NoDeletion » NoOnsetCluster

/swiŋ/ 'swing'	NoDeletion	NoOnsetCluster
(a) [wiŋ]	* W	L
→ (b) **[swiŋ]**		*

  - NoDeletion » NoCodaCluster

/bʌmp/ 'bump'	NoDeletion	NoCodaCluster
(a) [bʌp]	* W	L
→ (b) **[bʌmp]**		*

6. Fricative ‘stopping’

- *Child grammar:* What are the constraint rankings?

/ʌðə/ ‘other’		
→ (a) **[ʌdə]**		
(b) [ʌðə]		

/zuː/ ‘zoo’			
→ (a) **[duː]**			
(b) [zuː]			

6. Fricative 'stopping'

- *Child grammar:* What are the constraint rankings?

/ʌðə/ 'other'	NoFricative	Ident[±cont]
→ (a) **[ʌdə]**		*
(b) [ʌðə]	* W	L

/zuː/ 'zoo'	NoFricative	Ident[±cont]	Ident[±strid]
→ (a) **[duː]**		*	*
(b) [zuː]	* W	L	L

6. Fricative 'stopping'

- *Child grammar:* What are the constraint rankings?
  - NoFricative » Ident[±cont]

/ʌðə/ 'other'	NoFricative	Ident[±cont]
→ (a) **[ʌdə]**		*
(b) [ʌðə]	* W	L

  - NoFricative » { Ident[±cont], Ident[±strid] }

/zuː/ 'zoo'	NoFricative	Ident[±cont]	Ident[±strid]
→ (a) **[duː]**		*	*
(b) [zuː]	* W	L	L

6. Fricative ‘stopping’

- Is there really evidence for a NoFricative constraint?
  - World Atlas of Language Structures (WALS)
    Online map: Languages with no fricatives

6. Fricative 'stopping'

- *Adult grammar:* What are the constraint rankings?

/ʌðə/ 'other'	NoFricative	Ident[±cont]
(a) [ʌdə]		*
→ (b) **[ʌðə]**	*	

/zuː/ 'zoo'	NoFricative	Ident[±cont]	Ident[±strid]
(a) [duː]		*	*
→ (b) **[zuː]**	*		

6. Fricative 'stopping'

- *Adult grammar:* What are the constraint rankings?
  - IDENT[±cont] » NOFRICATIVE

/ʌðə/ 'other'	IDENT[±cont]	NOFRICATIVE
(a) [ʌdə]	* W	L
→ (b) **[ʌðə]**		*

  - { IDENT[±cont] <*or*> IDENT[±strid] } » NOFRICATIVE

/zuː/ 'zoo'	IDENT[±cont]	IDENT[±strid]	NOFRICATIVE
(a) [duː]	* W	* W	L
→ (b) **[zuː]**			*

7. Child vs. adult grammars in OT

- In general, how do child **surface forms** differ from adult surface forms? | **simpler**

- In a **constraint-based model** of phonology, how do we have to say a child's **grammar** differs from the target (adult) grammar?

- What occurs during children's acquisition of phonology?

7. Child vs. adult grammars in OT

- In general, how do child **surface forms** differ from adult surface forms? | **simpler**

- In a **constraint-based model** of phonology, how do we have to say a child's **grammar** differs from the target (adult) grammar? | **different ranking, same constraints**

- What occurs during children's acquisition of phonology?

  → The constraints **get reranked** to match adults

7. Child vs. adult grammars in OT

- Can we make any **generalizations** about *how* the child and adult rankings differ across these patterns?

Child:

{ NoOnsetCluster, NoCodaCluster } » NoDeletion

NoFricative » { Ident[±cont], Ident[±strid] }

Adult:

NoDeletion » { NoOnsetCluster, NoCodaCluster }

{ Ident[±cont] } » NoFricative

4. Child vs. adult grammars in OT

- Can we make any **generalizations** about *how* the child and adult rankings differ?

Child: Markedness » Faithfulness

{ NoOnsetCluster, NoCodaCluster } » NoDeletion

NoFricative » { Ident[±cont], Ident[±strid] }

Adult: Faithfulness » Markedness

NoDeletion » { NoOnsetCluster, NoCodaCluster }

{ Ident[±cont] } » NoFricative

- We'll pick this up next time