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Complexity Theory and Effective Treatment Decisions for Severe Phonological Disorders

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Moderated by:
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Simple Complexity: Facilitating Rapid Change for Severe Phonological Disorders

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Clarity for Communication LLC



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Learning Outcomes

After this course, participants will be able to:

- Identify key factors in selecting speech sound targets, according to research.
- Explain how to summarize a child's knowledge of consonant phonemes, as a basis for target selection.
- Describe how to analyze a child's speech sound deficits in order to determine which target phonemes have the most potential to facilitate progress toward intelligibility.

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References

- See associated handout for references.

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Communication/Vocabulary Check

- What are the 3 phonetic aspects of speech sounds?

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Communication/Vocabulary Check

- What is a sonorant?

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Communication/Vocabulary Check

- What is an obstruent?

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Markedness

- From least marked to most marked
 - Obstruents
 - Stops
 - Fricatives
 - Affricates

Markedness

- From least marked to most marked
 - Sonorants
 - Nasals
 - Glides
 - Liquids

CONTINUED

What do you hope to accomplish for your clients with severely unintelligible speech?

- How are you going to do it?

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Where do you start?

- Let's vote!
 - Earlier developing sounds or later developing sounds?

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Where do you start?

- Let's Vote!
 - Absent phonemes or inconsistently used phonemes?

CONTINUED

Where do you start?

- Let's vote!
 - Stimulable sounds or non-stimulable sounds?

CONTINUED

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Where do you start?

- Let's vote!
 - Sounds with less linguistic complexity or more linguistic complexity?

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Where do you start?

- Let's vote!
 - One target sound (or cognate pair) or multiple target sounds simultaneously?

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Where do you start?

- Let's vote!
 - If targeting more than one phoneme, do you select targets from the same major class or different classes?

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Where do you start?

- Let's vote!
 - Clusters or singletons?

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Multiple routes to intelligibility

- Phonetic perspective - traditional
- Perceptual perspective
- Oral-motor perspective

- Phonemic/phonological perspective



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Learnability - A New Paradigm based on the work of Gierut and colleagues

- Focus on what to work on:
 - Stimulable or non-stimulable
 - Most or least phonological knowledge
 - Early or late developing sounds
 - Least or most linguistically complex

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Order of Acquisition

(Gierut et al., 1996)

- Targeting **early developing** sounds provided **greater generalization of the target sound** to other contexts.
- Targeting **later developing** sounds provided **greater generalization to other sounds and sound classes.**
- *Treating later developing sounds produced greater system-wide change.*

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Inconsistent v. Absent Phonemes

(Dinnsen & Elbert, 1984; Elbert et al., 1984; Gierut et al., 1987)

- Targeting sounds with the **most phonological knowledge** provided faster **generalization of the target sound** to other contexts.
- Targeting sounds with **least phonological knowledge** provided **greater generalization to other sounds and sound contexts.**
- *Treating phonemes with the least knowledge resulted in greater system-wide change.*

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Stimulability

(Powell, Elbert & Dinnsen, 1991)

- Targeting **stimulable sounds** provided faster **generalization of production of the target sound** in other contexts.
- Targeting **non-stimulable sounds** provides more widespread **generalization to other sounds and sound classes**.
- *Treating non-stimulable sounds results in greater system-wide change.*

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Markedness/Complexity

(Elbert, Dinnsen & Powell, 1984)

- Treatment of **less marked/complex phonemes** **did not facilitate acquisition of more marked phonemes**.
- Treatment of **more marked/complex phonemes** **facilitated the acquisition of unmarked properties**.
- *Treatment of more marked or complex phonemes resulted in greater system-wide change.*

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Complexity: Clusters?

(Elbert, Dinssen & Powell, 1984)

- Less complex clusters: stop-liquids.
- More complex clusters: fricative liquids.
- Treating **stop-liquid clusters** results in **generalization to stop-liquids** if the child had no knowledge of fricative liquids.
- Treating **fricative-liquids** resulted in **generalization to both fricative-liquids and stop liquids**
- *Treatment of more complex clusters resulted in greater system-wide change.*

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Treating Clusters

(Williams, 1991)

- If the child had some knowledge of the target phonemes, and no sequences, learning occurred.
- If the child had sequences in his/her system and inventory constraints for the sounds, learning occurred.
- If the child had inventory constraints for the sounds, and also did not have sequences, learning did not occur.

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Influence of Word Selection on Phonological Change

- High frequency words = change (Morrisette & Gierut, 2002)
- Use of non words in treatment may facilitate acquisition of phonemes with no phonological knowledge (Gierut et al., 2010)
- Teaching novel words may have a generalization effect (Storkel, 2001)

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How is this
possible??

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“In fact, it has been shown that simpler input actually makes language learning more difficult because the child is provided with only partial information about linguistic structure.”

(Gierut, 2007, p. 8)

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Some new information about speech sound acquisition (Mclead & Crowe, AJSLP 11/2018)

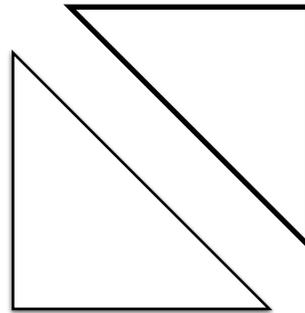
- 75-85% of children in multiple studies acquired consonants over the preschool years:
 - 2 years: [m, n, j, p, w, d, b, f, k, g, ŋ]
 - 3 years: [j, t, s, l, ʃ]
 - 4 years: [tʃ, z, ɹ, ʒ, dʒ, v]
 - 5 years: [ð]
 - 6 years: [θ]

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Maximal Feature Oppositions

Place
Voice
Manner
Major class distinction
(sonorant/obstruent)



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Using maximal contrasts facilitates acquisition of new sounds

- Gierut (1989): Initial known sound contrasted with a maximally different unknown sound yielded no 16 **new** initial consonants.
- Gierut (1990): Maximal contrasts of two **new** phonemes led to greater improvement of targets, **addition of untreated** sounds, and less over-generalization.
- *Treatment using 2 “new” maximally different sounds creates the greatest system-wide change (Gierut, 1992)*

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What is a “new” sound?	Not in child’s inventory Not stimulable Preferably later developing more complex
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What indicates phonologic knowledge?	Presence/absence of a the sound in the child’s inventory Consistency/inconsistency of use Stimulability
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Select the consonants for which the child has the LEAST knowledge as targets

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6 Types of Productive Phonologic Knowledge (Gierut et al., 1987)

1. Consonant is consistently correct in all positions in words
2. Consonant is usually correct, but with some optional or obligatory errors
3. Consonant is generally correct in all positions, and many morphemes, but with fossilized forms in error

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6 Types of Productive Phonologic Knowledge
(Gierut et al., 1987)

- 4. Consonant is correct in some positions. For example, always correct in the initial position.
- 5. Consonant is correct in some positions, but not always.
- 6. Consonant is in error in all positions in all words.



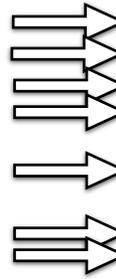
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Language
sample
video

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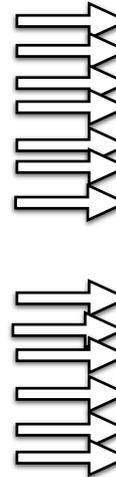
Error Summary

Phoneme	Initial	Medial	Final
m			
b	---		
p	-		-
w	()		
f	p b	t	p -
v	b b	b	
θ	f		- p
ð	d	d	
n			
t	d -	d d	- -
d			
s	d - t	d t	- -
z	d	d	d d d
l		w	Ü
i			

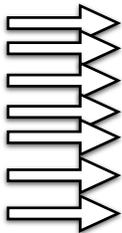


Error Summary

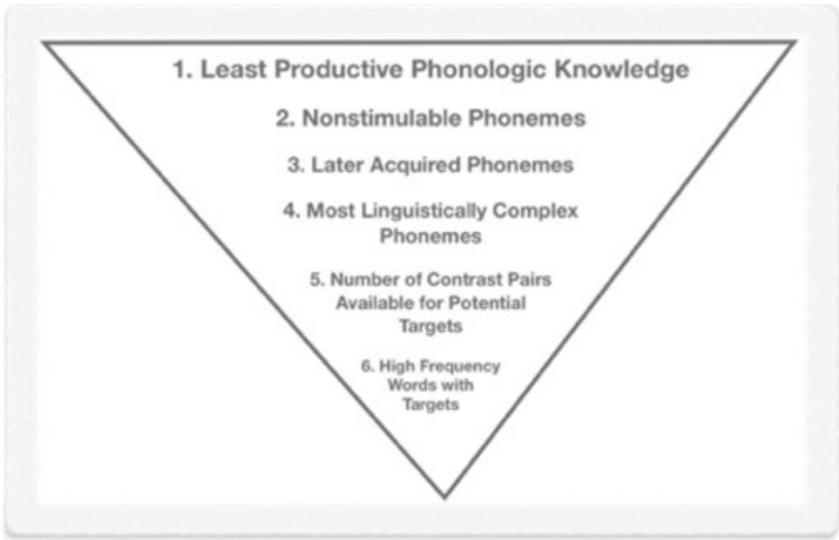
Phoneme	Initial	Medial	Final
l	d d	t	-
ʒ (not tested on GFTA-3)		d	
tʃ	d t	t	-
dʒ	t	- d	
r	w w	w w w w w	- u a Ü o o a
k	t -	t t	-
g	d -	d -	d
ŋ		n	n
h			
st	-d		
sl	-l		
sw	-w		
gl	-l		
nt	-t		
br	bw m w		



Error Summary



Phoneme	Initial	Medial	Final
br	bw m w		
bl	-w		
fr	b-		
gr	-w		
pr	-w		
kr	-w		
tr	-w		
weak syllable deletion	wæp/ giraffe		



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1. Least Productive Phonological Knowledge
[θ, ð, k, g, s, z, ʃ, ʒ, tʃ, dʒ, r] + final consonants

2. Non-stimulable Phonemes
[k, g, s, z, ʃ, ʒ, tʃ, dʒ, r] + final consonants

3. Later Acquired Phonemes
[s, z, ʃ, ʒ, tʃ, dʒ, r] + final consonants

4. Most Linguistically Complex Phonemes
[tʃ, dʒ, r]
+ final consonants

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Maximal contrasts?

- tʃ - voiceless palatal-alveolar affricate; obstruent
- dʒ - voiced palatal-alveolar affricate; obstruent

versus

- r - voiced palatal liquid; obstruent

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1. Least Productive Phonological Knowledge
[θ, ð, k, g, s, z, ʃ, ʒ, tʃ, dʒ, r] + final consonants
2. Non-stimulable Phonemes
[k, g, s, z, ʃ, ʒ, tʃ, dʒ, r] + final consonants
3. Later Acquired Phonemes
[s, z, ʃ, ʒ, tʃ, dʒ, r] + final consonants
4. Most Linguistically Complex Phonemes
[tʃ, dʒ, r]
+ final consonants

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Summary

- The most efficacious targets are
 - phonemes about which the child has the least productive knowledge
 - phonemes that are not stimulable
 - phonemes that are later developing
 - complex phonemes (including clusters)

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Summary

- If possible, select two target phonemes that are different in place, manner and voice as well as major sound class
 - If that's not possible, select two error phonemes that have the most differences between them
 - Address deletions specifically and intensely

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