Choosing Targets using the Complexity Approach - Revised

Child's Name: ***Child's Chronological Age:***
Date:

Suitability: *4 years of age or over presenting with a moderate to severe consistent phonological impairment (where the SSD is not due to underlying physical difficulties in either physical structure or musculature). Application of the complexity principles may also be successful (when the case is selected with a good rational) for 'a range of populations and disorder types'* (Gierut 2005*, p.208). Current research into this approach has focused on singleton consonants and onset clusters to-date. Section 5 may also be used to help with target selection when a child presents with phoneme collapse and the Multiple Oppositions approach is deemed optimal. The fundamental prerequisite to completion of this flowchart is thorough assessment and analysis of the child's speech data to support differential diagnosis and clinical decision making. To support effective analysis, use the checklist for speech analysis from UK and Ireland's Child Speech Disorder Research Network's Good Practice Guidelines for the Analysis of Child Speech, (2017, p.16):*
https://www.researchgate.net/project/Child-Speech-Disorder-Research-Network-Good-Practice-Guidelines-for-Transcription-and-Analysis-of-Child-Speech

1. ***Target phonemes that exhibit either no productive phonological knowledge or are used only in one syllable position (but inconsistently)*** (Gierut *et al.* 1987)***:***

Note them here: ________________________________

2. ***Target non-stimulable phonemes over stimulable phonemes i.e., segments that the child either cannot produce or can produce in less than two syllable positions:***

Note them here: ________________________________

3. Target later developing sounds. Circle appropriate sounds:

Table 1. Early, mid and later developing sounds (Shriberg 1993)

Early-8	m n j b w d p h
Middle-8	t ŋ k g f v tʃ dʒ
Late-8	ʃ ʒ l ɹ s z θ ð and clusters

(based on the criteria that acquisition is defined as production of the target with 90% success in shorter words)

4. Target marked consonants/clusters first. Recall that presence of a more marked form will drive the system to develop less marked forms naturally depending on the relationship between elements. Circle appropriate targets and note associated implicational relationships below (see Watts and Rose 2020):

Speech Sound Class
Clusters (imply singletons) **proceed to point 6 if targeting this level**
Affricates (imply fricatives)
Fricatives (imply stops)
Velars (imply coronals)
Liquids (imply nasals)
Stops in final position (imply stops in initial position)
Consonants (imply vowels)

5. ***Target maximal phonological contrasts (when targeting singletons)*** either using: maximal oppositions (the erred target is contrasted with a maximally different sound that is used by the child e.g., ***s**ea* versus ***m**e)* or an empty set approach (two targets **not** used by the child are contrasted e.g., ***s**ew* versus ***l**ow).* The multiple oppositions approach where the erred target is contrasted with up to 4 phonemes it substitutes e.g., **l**eap vs **sh**eep, **s**eep, **w**eep does not tie in directly with the complexity approach as the first principle for target selection is based on setting up direct homonymy based on the pattern of phoneme collapse. However, multiple oppositions is mentioned here because its second principle of target selection is that the phonemes selected from the collapse should be as maximally opposed to one another in relation to place, manner and voice and as maximally distinct from the substituted sound as possible. Use the table below to help you identify maximal contrasts. *Recall that Non-major class distinctions are VPM; Major class features distinguish between major groupings of sounds in languages e.g., Cs versus Vs, glides vs Cs, obstruents (stops, fricatives, affricates) vs sonorants (nasals, liquids, glides and vowels).* ***Major class distinctions produce more widespread and generalizable effects than non-major class distinctions when selecting targets for therapy. This type of target selection increases saliency of the target and drives the child's system to fill the gaps below the levels targeted producing more widespread effects.***

Table 3. Feature Differences Between Contrasts (adapted from Bowen

<table>
<tr><th rowspan="3">CONTRASTS</th><th colspan="4">FEATURE DIFFERENCES</th></tr>
<tr><th colspan="3">Non-major Class Distinctions
Labial | Coronal | Dorsal</th><th rowspan="2">Major Class Features</th></tr>
<tr><th>PLACE</th><th>VOICE</th><th>MANNER</th></tr>
<tr><td>E.g., <sh> vs <m></td><td>✔</td><td>✔</td><td>✔</td><td>Obstruent vs sonorant YES</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
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(http://www.speech-language-therapy.com))

6. Targeting clusters:

- Highlight all onset clusters targeted in the speech sample you have collected and note the child's realisations for each. It is appropriate to select clusters to target in therapy if the child is using either no clusters or a limited range of clusters, in onset position.
- It is possible to calculate the sonority difference between segments within clusters to aid with target selection of clusters but be mindful that the elements within clusters and the frequency of cluster-type also play an important role in acquisition (Watts and Rose 2020). There is therefore not a direct relationship between targeting more marked clusters and more widespread change to the child's speech, and such relationships would be expected to change across languages (Watts and Rose 2020).
- For each onset cluster realised, calculate the sonority difference between the segments in that cluster by subtracting the sonority values for each segment as shown in table 4 below e.g., if the child produces [bwʉ] for <blue>, b=6 and w=1, 6-1=5 (aim for two samples of each sonority difference shown in table 5).

Table 4. Sonority Scale for Consonants (Steriade 1990)

Sound Class	V'less stops	Voiced stops	Voiceless fricatives	Voiced fricatives	Nasals	Liquids	Glides
Sonority Value	7	6	5	4	3	2	1

Adapted from Bowen (http://www.speech-language-therapy.com)

- What is the smallest sonority difference (minimum distance) allowed within the child's speech sound system? Note it here: ____________________

Table 5. Complexity of Cluster

Complexity – moving from most to least complex		***Clusters***	***Sonority Difference***
MOST	3-element clusters (C_1 C_2 C_3)	skw, skr, spl, spr	
↓	Voiceless fricative + nasal	sm sn	2
	Voiceless fricative + liquid	fl fr thr sl shr	3
LEAST	Voiced stop + liquid or Voiceless fricative + glide	bl br dr gl gr sw	4
	Voiceless stop + liquid	pl pr tr kl kr	5
	Voiceless stop + glide	tw kw	6

Adapted from Bowen (http://www.speech-language-therapy.com), Gierut (1999), Gierut and Champion (2001), Morrisette *et al.* (2006)

- Do not consider the adjuncts /st, sk, sp/ because they do not behave like the other 'true clusters'. They may be among the earlier acquired clusters (not as marked as other forms) and therapy that has focused on them has shown that they can result in patchy learning of clusters and overgeneralisation of /s/ in onset position (Gierut 1999 ; Gierut and Champion 2001; Morrisette *et al.* 2006).
- Do not consider /sm, sn/ because they may behave like the adjuncts /st, sp, sk/and again give patchy outcomes (Storkel 2018b).
- Do not consider consonant + /j/ clusters which also behave differently from 'true clusters' (Barlow *et al.* 2010).
- Do not include /str/ if you are considering 3-element clusters because it is difficult to interpret its sonority value due to all its segments being coronal and it is a particularly unique combination of consonants in English (Gierut and Champion 2001).
- Do select clusters to target in therapy that have less of a sonority difference than the minimal difference used by the child (and are therefore more marked). In theory, the more complex the cluster sequence worked on therapy, the more system-wide change and generalisation seen.
- If you are considering working on 3-element clusters e.g., /spl/ - C_1 C_2 C_3: (1) The phonemes in positions C_2 C_3 i.e., stops, liquids and glides, must be evident in the child's phonetic/phonemic inventories; (2) If the child has more PPK of /s/ than C_2 or C_3 i.e., uses /s/ more frequently to appropriately signal meaningful differences in speech, then choose 2-element clusters instead (Storkel 2018a); (3) ***Changes to the target should not be expected to generalise post-therapy but associated***

changes to other easier and less marked areas of phonological development are expected.

7. Contrasting singletons or cluster selected for therapy[1]: ___________________

8. Selection of type of word considering frequency and density:

While research in this area is still in the early stages, consideration of word density and word frequency is important because of the potential to increase the effectiveness and efficiency of phonological intervention (Storkel 2018b). The density of each neighbourhood refers to the number of phonetically similar words within it where words from low-density neighbourhoods have few phonetically similar words and from high-density neighbourhoods have many phonetically similar words. Storkel (2018b) recommends the following range of combinations to boost change in the phonological system: high frequency + high density; low frequency + high density; high frequency + mixed density; low frequency + later acquired; nonwords. Clearly, target selection for children who have co-morbid language difficulties (particularly impacting on vocabulary), should focus on combinations using high frequency words. Use of nonwords where you may tell a story supported by pictures to create meaning for the nonwords e.g, *Smit is a monster who likes to eat sm<u>anuu</u> and sm<u>ace</u>……..,* can also be effective at promoting generalisation as therapy focuses completely on the speech target/s to be acquired without the interference of prior lexical knowledge (but will only be appropriate if the child's general development and vocabulary acquisition are within normal limits) (e.g., Morrisette and Gierut 2002; Gierut and Morrisette 2010).

[1] For various additional guidance on how to select targets for the complexity approach see: Gierut and Hulse (2010), Barlow, Taps and Storkel (2010), Phonological Assessment & Treatment Target Selection (PATT) https://slhs.sdsu.edu/phont/the-patt/; Storkel (2018), The Complexity Approach to Phonological Treatment: How to select treatment targets https://kuscholarworks.ku.edu/handle/1808/24767

If working on **singletons**, create ***8 nonword or real word pairs where the targets are always in onset position***. If working on **clusters**, target ***one onset cluster in 15-16 words***:

Target Words for Therapy
e.g.,[ki]vs [mi]OR [blid]

9. ***Develop a probe test (with real words) for each child based on your target selection which will informally let you assess a number of possible areas of generalisation as noted below:***
   Each child will require a specific probe to be developed to meet their profile. Based on feedback from SLTs who wanted probes to have clinical practicality (Hegarty *et al.* 2021), I recommend a 20 item probe test delivered at the start of every fourth session (although Williams (2010) and others recommend using probes of ~40 words long). To attempt to obtain a representative sample with a 20 item probe combine: 15 words with the target phoneme/s in onset, coda and intervocalic positions as appropriate for the targets selected to include 6 monosyllablic, 5 disyllablic and 4 polysyllabic words. Other consonants selected for this probe (and integrated into these words) will be based on the child's phonetic inventory and PPK – i.e., those phonemes that the child has no or limited use of, and may include singletons and clusters. Five utterances dependent on the child's overall expressive language skills gathered from a range of informal/formal resources to support their elicitation should also be included if possible.

Example Scoring sheet for probes (only consonants scored):

SINGLE WORDS			
TARGET	REALISATION	A. RAW SCORE ACHIEVED	B. RAW SCORE POSSIBLE
E.g., /lɛg/	[jɛg]	1	2
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
UTTERANCES			
TARGET		ACHIEVED	POSSIBLE
16.			
17.			
18.			
19.			
20.			
TOTAL SINGLE WORDS			
TOTAL UTTERANCES			
% FOR SINGLE WORDS: A1-15/B1-15 x 100 = % FOR UTTERANCES: A16-20/B16-20 x 100 = COMBINED % =			

10. Eliciting 3-element clusters in words/nonwords during intervention:

Praise and modelling are used to support the development of 3-element clusters at the onset of target words/nonwords. Modelling for erred productions is graded to best support development of the whole 3-element cluster. The table below outlines Gierut and Champions' (2001) recommendations (where a trial is production of all 16 targets within the target words/nonwords). This process is continued until the child can produce 3 consonants in onset position regardless of accuracy (typically requiring the 7 sessions specified for that stage of the protocol). If any of the modelling techniques clearly produce optimal results for the child's productions, it would be worthwhile trialling an increase of its use in preference to the others. Always start and finish a therapy session with a trial that uses modelling emphasizing the full 3-element cluster.

Table 6. Graded modelling Process for use with the 3-element Clusters Approach

Trial One: modelling emphasizes the full 3-elements e.g., /**spl**aʃ/
Trials Two and Three: modelling emphasizes the first two consonants e.g., /**spə** laʃ/
Trials Four and Five: modelling emphasizes the second two consonants e.g., /s **pl**aʃ/
Trial Six: modelling emphasizes the full 3-elements e.g., /**spl**aʃ/

Remember that for the 3-element clusters approach changes to the target should not be expected to generalise post-therapy but associated changes to other easier and less marked areas of phonological development are expected.

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