

Supporting children's speech using the Nuffield Dyspraxia Programme (3rd edition)

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Outline of session

- **Introduction to the Nuffield Dyspraxia Programme 3rd edition (NDP3)**
- **Evidence base for interventions to use with children with CAS/DVD**
- **“Signposting” you around the NDP3 picture resources**
- **NDP3 therapy approach**
- **NDP3 treatment planning**

The Nuffield Centre Dyspraxia Programme (1985; 1992; 2004)

NDP3 is a published, flexible assessment and treatment package, providing:

- an assessment procedure**
- a set of therapy procedures & techniques, to plan treatment for children with DVD/CAS**
- a large resource of pictorial materials to use in delivering the treatment**

Terminology

Developmental verbal dyspraxia (UK)

**Childhood apraxia of speech (USA;
Canada; Australia)**

CAS/DVD: Presenting difficulties

- Articulating individual speech sounds
- Joining speech sounds and syllables together in words
- Using appropriate prosody
- Inconsistency
- Core impairment is in motor planning and programming

American Speech-Language-Hearing Association 2007

Royal College of Speech and Language Therapists

2011

Evidence-based practice 2018

2018 - Strongest evidence currently exists for 4 treatment approaches for DVD/CAS:

- **Dynamic Tactile & Temporal Cueing (DTTC)**
(Strand et al., 2006)
- **Integrated Phonological Awareness Approach**
(McNeill et al., 2009)
- **Nuffield Centre Dyspraxia Programme (NDP3)**
(Williams & Stephens, 2004)
- **Rapid Syllable Transition Treatment (ReST)**
(Ballard et al., 2010)

NDP3 Effectiveness

- **Case studies published in manual**
- **Anecdotal report: Saunders, 2006**
- **Unpublished student project reports: Teal, 2005; Belton, 2006; Flinders, 2009**
- **Poster/paper conference presentations: RCSLT, 2009; ASHA, 2010**
- **Results of randomised controlled trial (RCT) comparing NDP3 & ReST: Murray et al., 2015**

Randomised controlled trial: NDP3 vs. ReST treatment

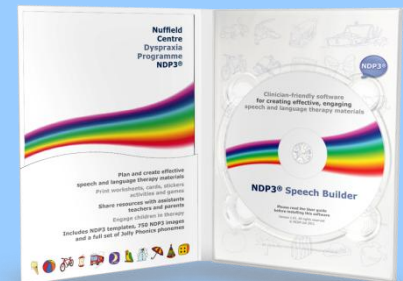
- 26 children with CAS, aged 4-12 years
- Randomly assigned to receive NDP3 or ReST
- Intensive treatment: 1 hour, 4 days, 3 weeks
- Treatment delivered by trained & supervised SLT students, at University of Sydney
- Large treatment gains were found for all children in both groups
- Significant generalization effects
- Both treatments have support for clinical use

Service delivery –direct from Speech & Language Therapist

- **4 x week for 3 weeks tested in research**
- **2 x week for 6 weeks has shown
promise in private practice (Australia)**
- **1 x week with daily home practice
matches UK practice & is advised in
NDP3 manual**
- **Need to know more about ongoing
versus intensive blocks of treatment**

NDP3 Therapy Resources

Nuffield Centre Dyspraxia Programme NDP3®



NDP3 manual-detailed information

- Treatment planning, based on assessment findings (chapter 4, p.73-92)
- Therapy approach –section by section (chapter 5, p.93-154)
- Case study examples Chapter 7, p.169-186)
- Useful appendices:
 - eliciting sounds (p.201-211); articulograms (p.197-199) tasks/games/activities (p.217-237); adapting for older/younger children (p.213-216)

Other NDP3 Resources

- **Sections: early sound making, single sounds, CV, VC, CVCV, CVC, Multisyllabics, clusters, phrases and sentences, from sentence level to connected speech**
- **Single sounds (Consonants and Vowels*): cards and sequencing activities (*personalise)**
- **Articulogram worksheets**
- **Word levels: Sets of pictures; Transitions/ blending; sequencing**
- **NDP3 Speech Builder**



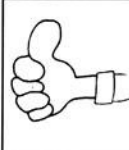

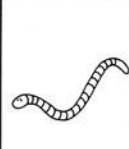






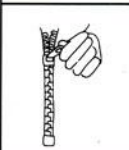



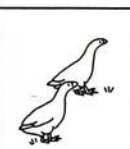
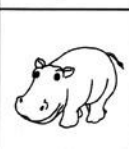


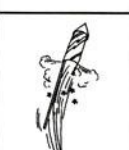
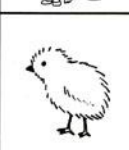
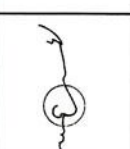
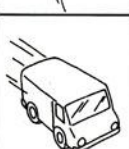

Early sound making sheets

- **Exploring sound production ...**
m b ee ah oo
- **Placement for sound production ...**
p b m t d n
- **Voice worksheets and long vowels**
- **Replaced oromotor advice sheets**

Single sounds















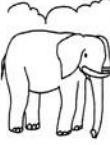



Reference grid

Consonant symbol pictures

	p		ng		th
	b		w		th
	t		l		s
	d		r		z
	c/k		y		sh
	g		h		as in measure
	m		f		ch
	n		v		j

Reference grid

Vowel symbol pictures

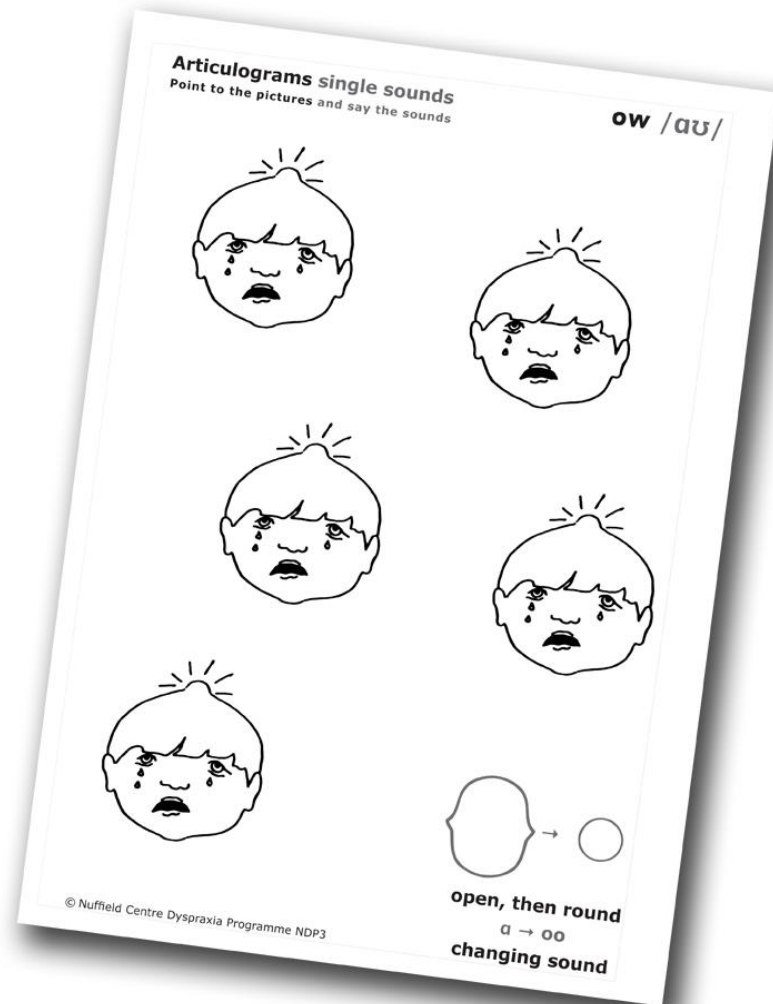
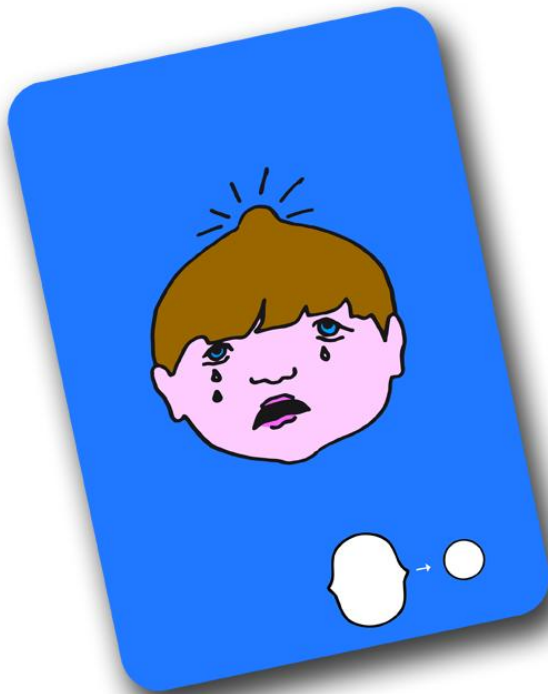
	ee		ay		a
	ah		oy		i
	oo		ow		oo (as in 'look')
	oar		oh		o
	er		air		e
	eye		ear		u



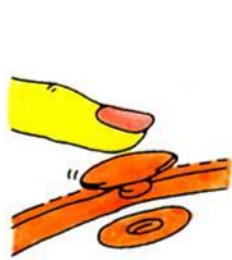
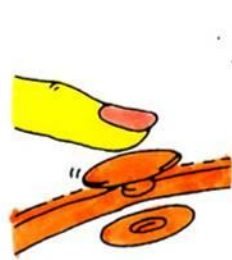




Articulograms – diagrammatic cues

- Pictures
- Letters
- Articulograms



Articulograms – single sounds

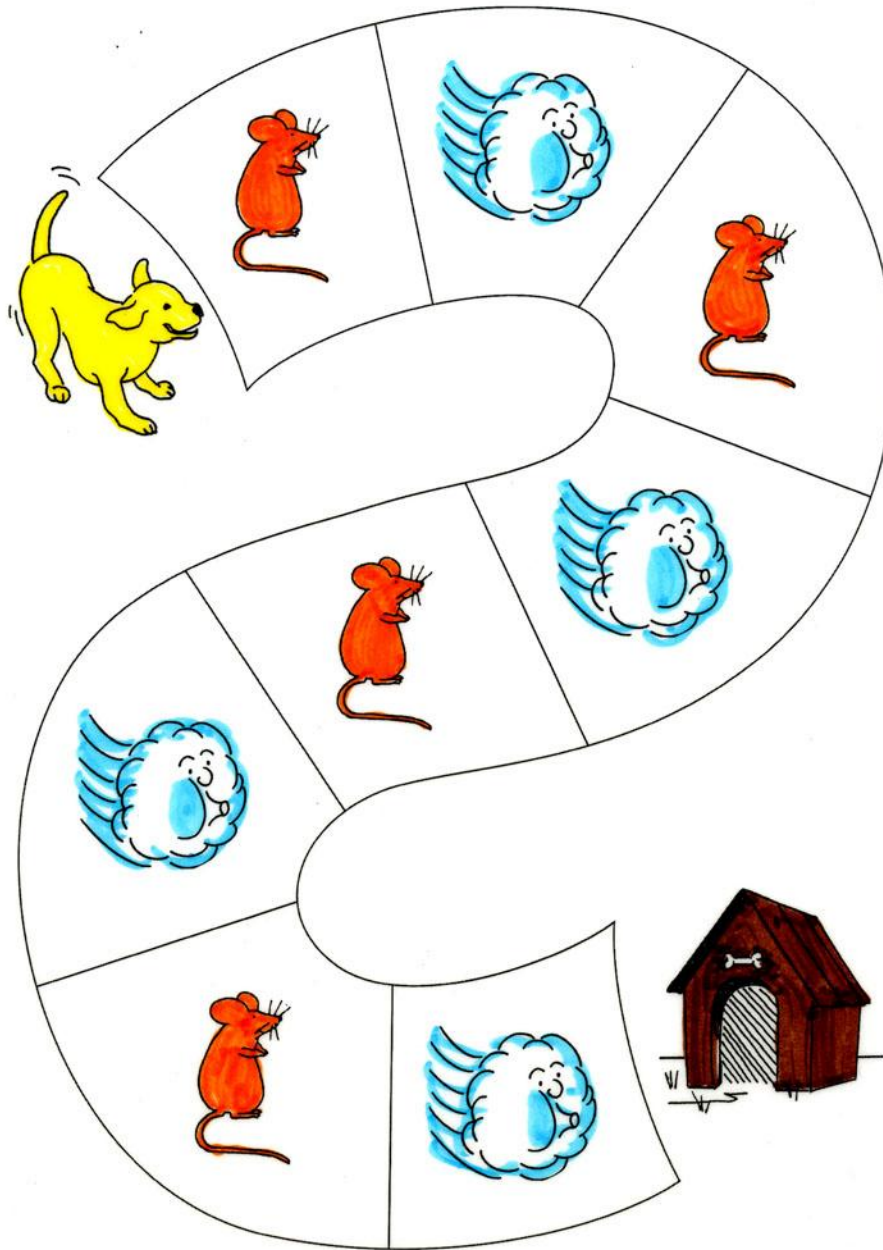


<p>© NHSC</p>  <p>p</p>	<p>© NHSC</p>  <p>p</p>	<p>© NHSC</p>  <p>p</p>	<p>© NHSC</p>  <p>p</p>
<p>© NHSC</p>  <p>b</p>	<p>© NHSC</p>  <p>b</p>	<p>© NHSC</p>  <p>b</p>	<p>© NHSC</p>  <p>b</p>

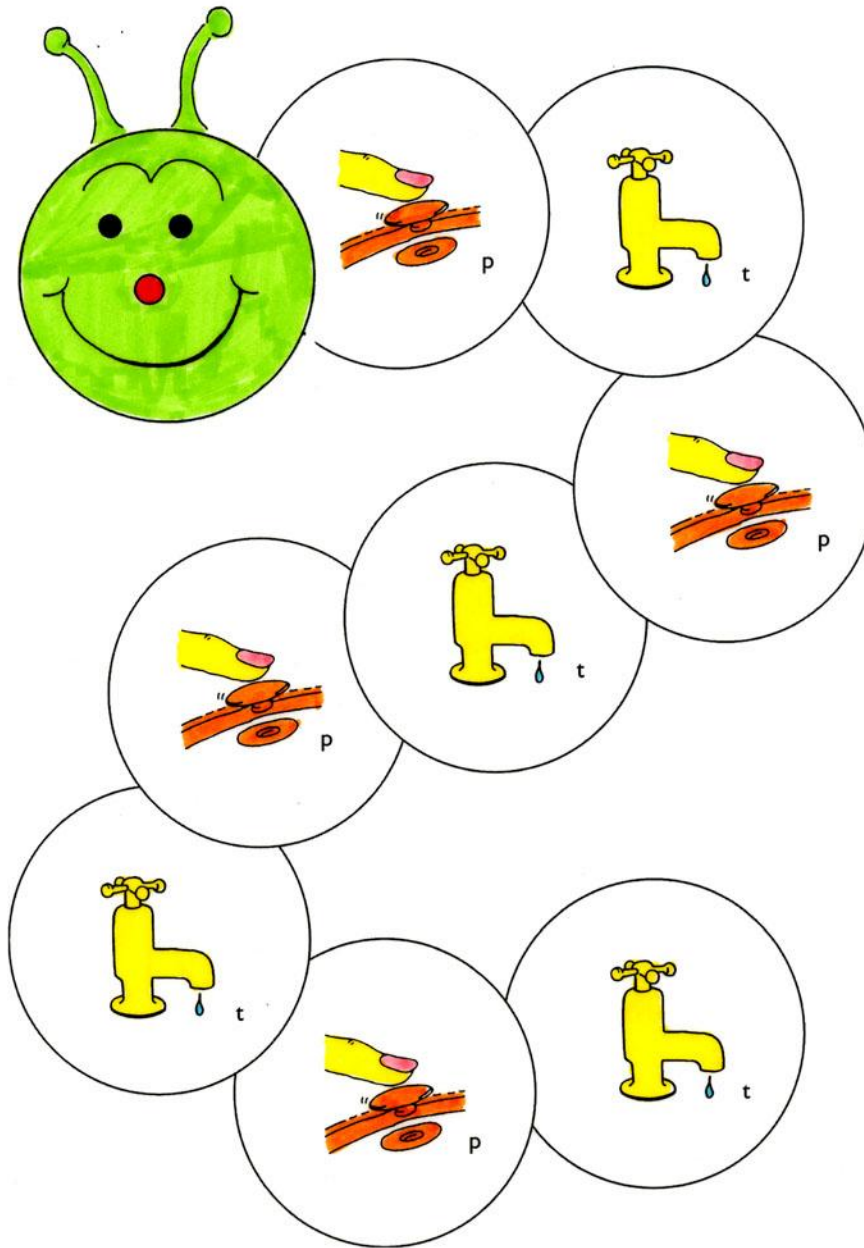


Copy, cut out, and colour in!

Single Consonant Lottos: p and b



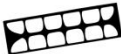
Single Consonant Sequencing: p - t



CV syllables and words

CV Babble worksheets

d /d/



~~~~~

tongue on  
your teeth  
voice on

dah  
dare  
day  
dee  
deer  
die  
doo  
door  
dough








d



~~~~~

Articulograms CV syllables
Say the sounds Say each syllable 3 times

d /d/



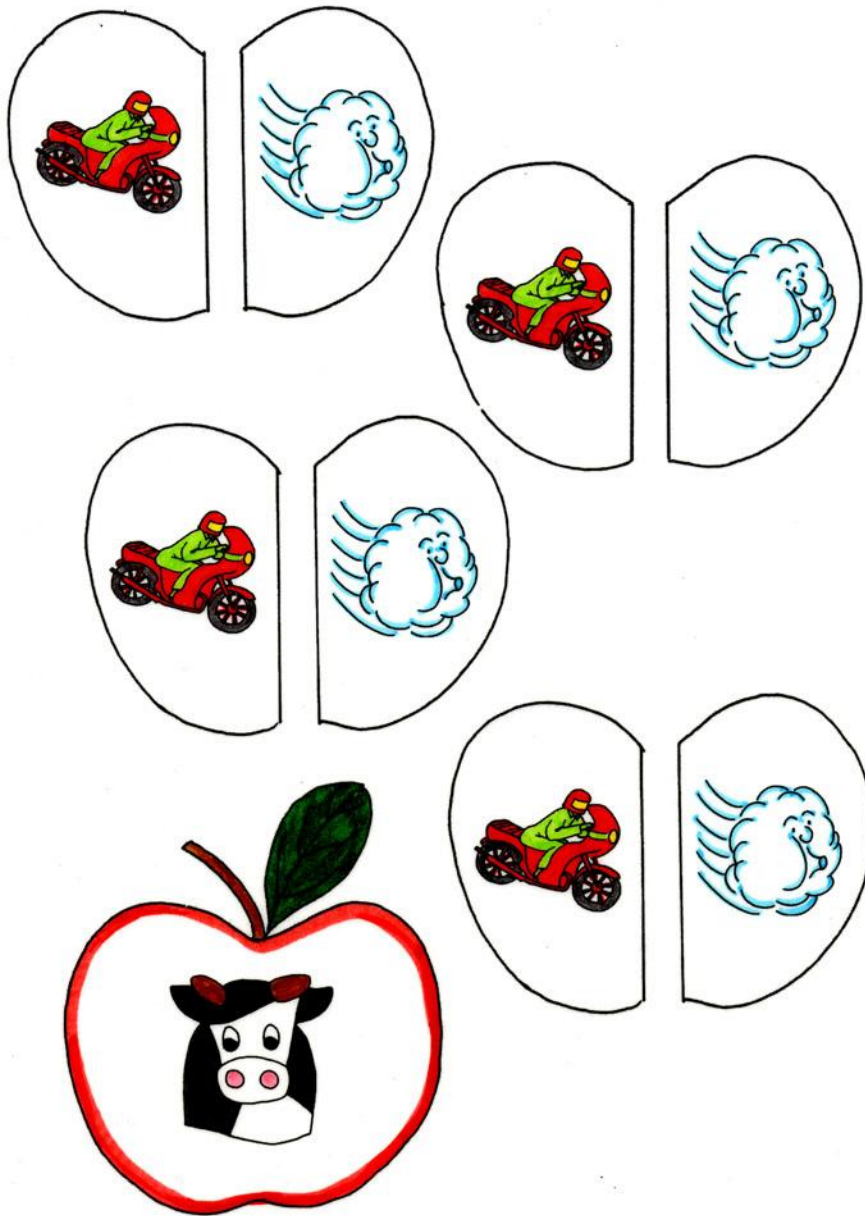
~~~~~

tongue on  
your teeth  
voice on

dah  
dare  
day  
dee  
deer  
die  
doo  
door  
dough

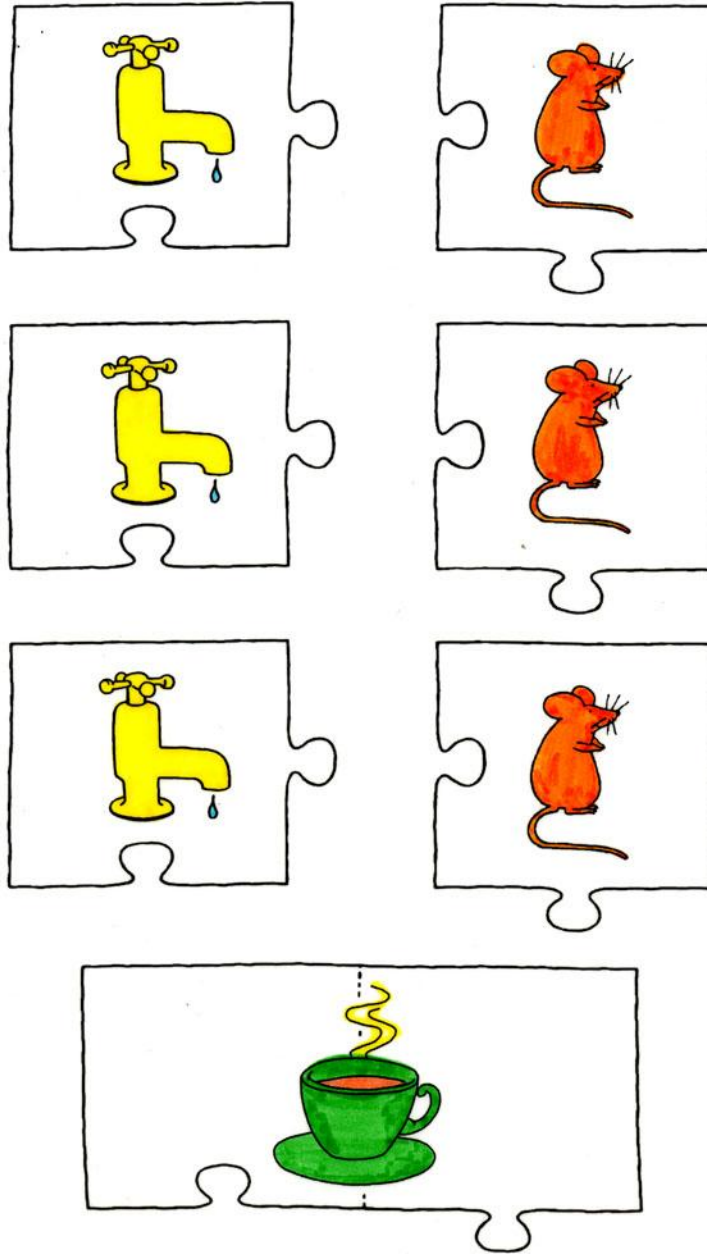
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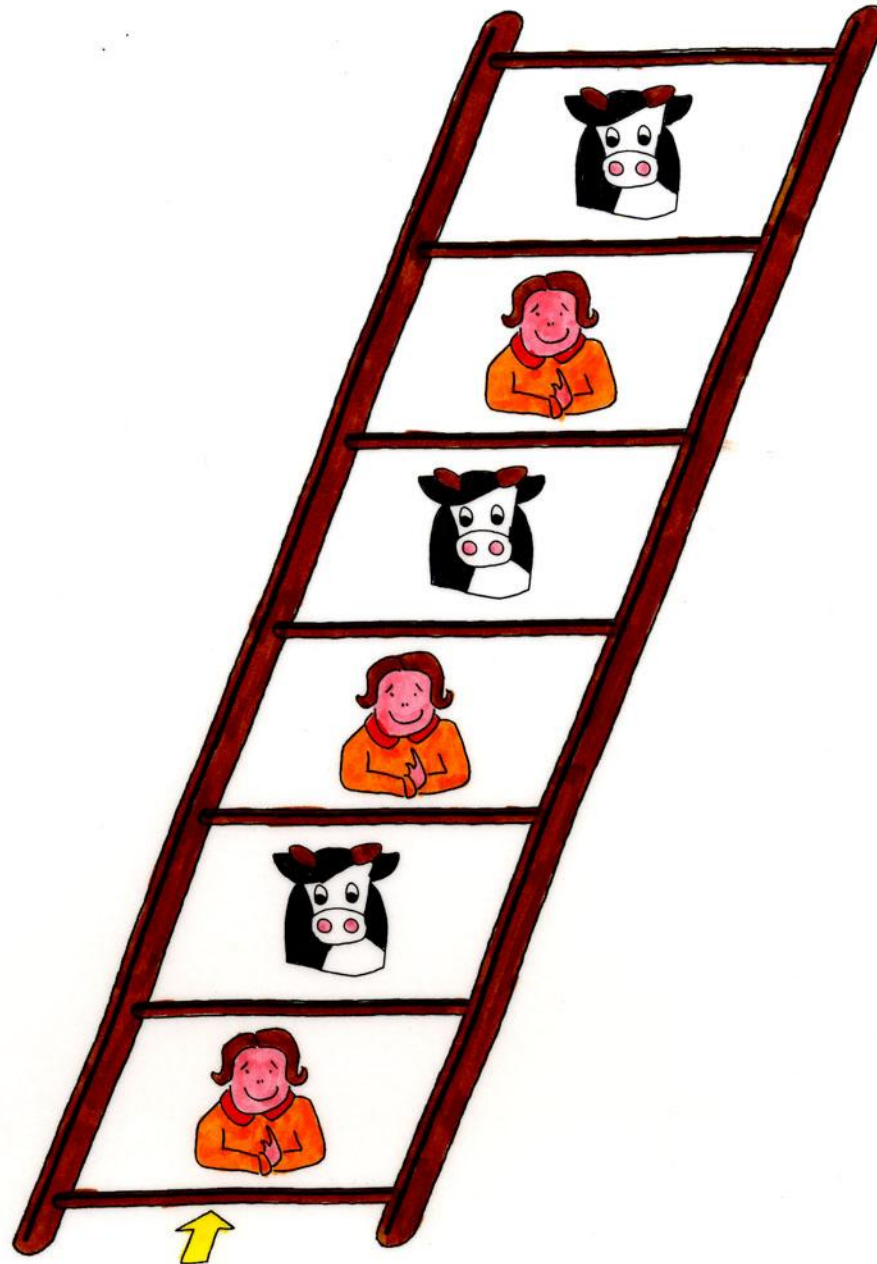
Transition stage (C+V=CV): m+u=moo

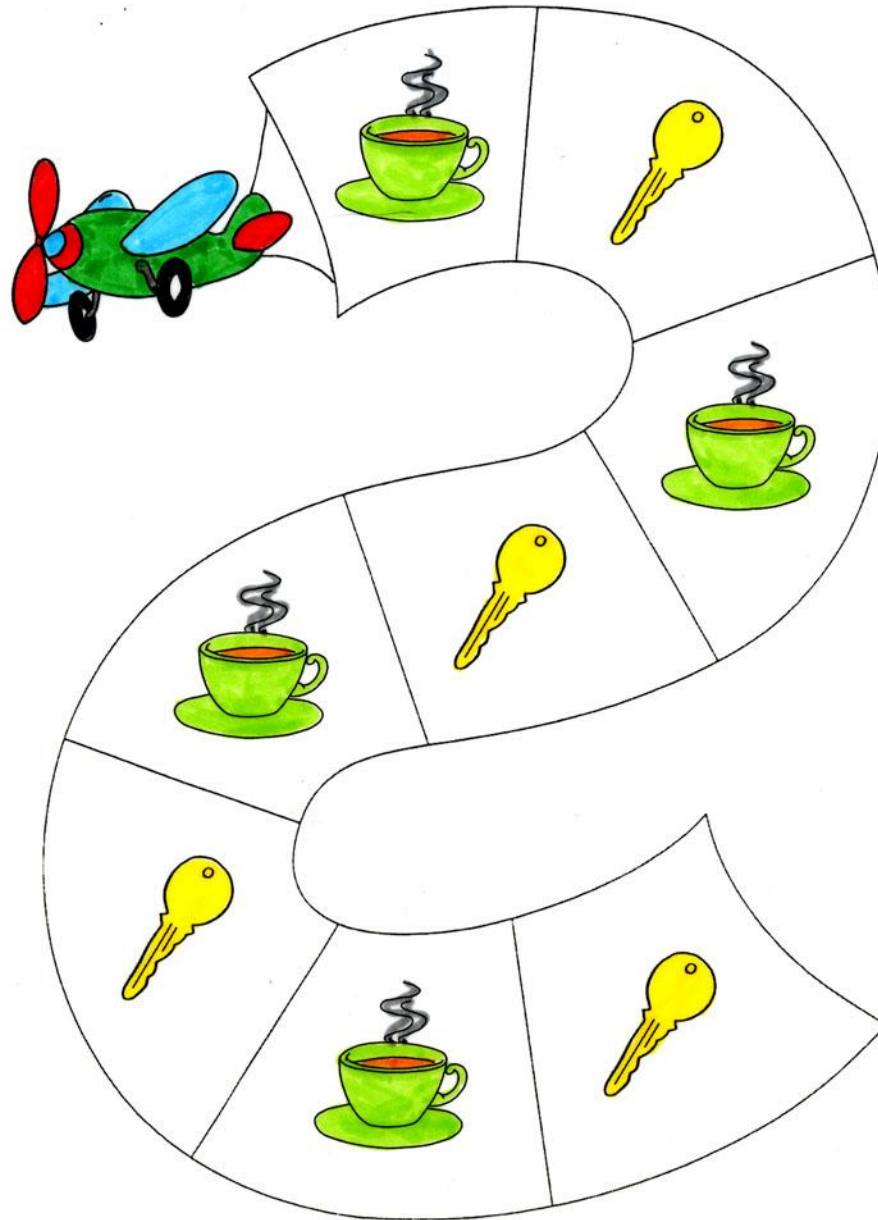




Transition stage (C+V=CV): t+i=tea

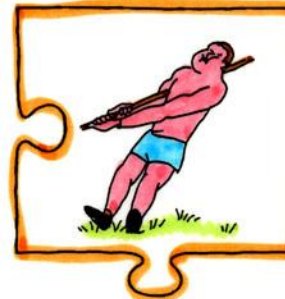
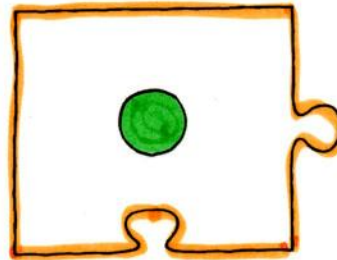
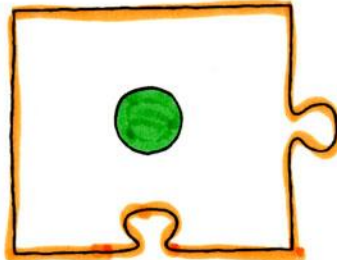
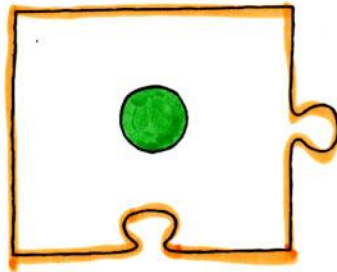





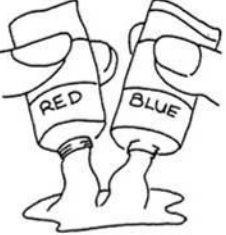








# CVCV, CVC words

Transition (CV+CV=CVCV): pea+pull=people



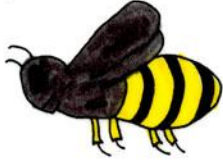

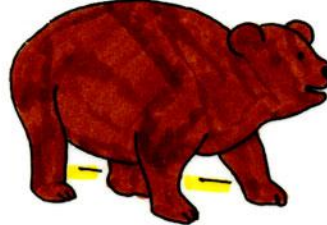





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pepper, poppy, piper, purple, paper, people, puppy, Popeye

**CVCV nouns**

# CV Phrases: Negatives

bee, no bee, bear, no bear, paw, no paw, pie, no pie

|                                                                                               |                                                                                                 |
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Copy, cut out, and colour in!



Transition (CV+C=CVC): boo+t=boot and bow+t=boat

© NHSC



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# Speech Builder: flexible use of NDP3 resources



# Search image and template database; colour, print, share

The screenshot displays the NDP3 Speech Builder software interface. The main window is titled "Add images" and features a search bar with the following options: "All image packs", "All word categories", "Words", "Sounds", "Phonetics", and "Containing". Below the search bar is a grid of 18 image categories, each with a small illustration and a label: Aeroplanes, Plane, Alligator, Ambulance, Angel, Animals, Apple, Baby, Ball, Ballerina, Banana, Bat, Bear, Bed, Bee, Bicycle, Binoculars, and Bird. The interface also includes a "Choose template" window with options like "All", "Sequencing", "Transition", "Voice", "Grids", "Cards and stickers", and "New". A "Sequencing worksheet" is visible in the background, showing a circular diagram. A "Add symbol" keyboard is also present, displaying various phonetic symbols and letters.

# NDP3 Therapy approach

# Introduction to using NDP3

- **Ideal for children 3-7 years (4-12 years shows efficacy)**
- **Need to be able to sit and attend**
- **Need to be able to attempt speech tasks and take feedback**
- **Need to be able to recognise the pictures**
- **Need to have or to be able to develop some 'meta' skills –to understand about sounds, blending and segmenting**

# NDP3

- **Based on motor learning skills approach**
- **“Building the Wall” from the bottom up**
- **Uses psycholinguistic principles (Stackhouse & Wells 1997)**
- **Multi-level, multi-target layered approach**

# A motor learning skills approach

- Working on speech (sounds & words) through a motor programming approach
- Small graded achievable steps
- Based on repetition\* and practice
- Utilises cues and feedback
- Works from child's strengths

***NDP3 research: 100 sounds/words produced over 45-60 minute session***

# Motor learning principles

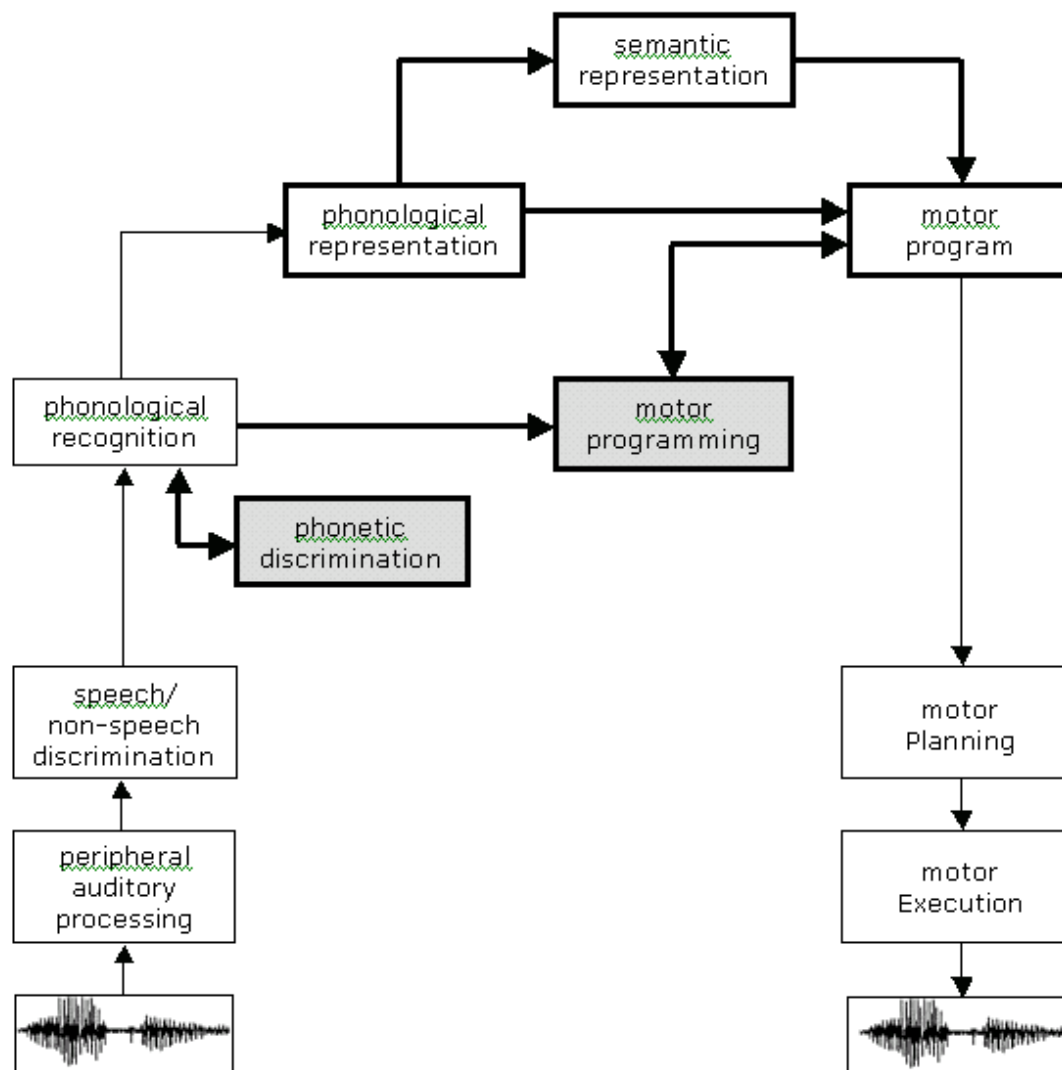
- **Two phases: pre-practice and practice**
- **Pre-practice phase is used to acquire skills e.g. by giving cues & feedback on technique**
- **Practice phase is used to develop generalisation and retention e.g. by giving feedback on outcome (right/wrong) but not on performance & cues are reduced**

# NDP3 and motor learning

- **Traditionally NDP3 involves a pre-practice phase only**
- **Researchers are currently investigating adding in a practice phase to NDP3 treatment to strengthen maintenance and generalisation effects**



# Speech Processing Model



# Motor programs and motor programming

- Motor programs are part of lexical representations
- “blueprint” of how to say a sound /word
- Inaccurate for children with speech disorders
- Motor programming is online process of creating change NB transitions/blending tasks
- Aim is to “kick out” old motor program and replace with new

**NB Some authors use *motor plan* instead of *motor program***

# Role of repetition/drilling

- **Child learns how to articulate new sound or word**
- **Accuracy is inconsistent/trial and error**
- **Repetition and sequencing allows child to develop consistent/stable production**
- **Contrastive sequencing allows child to maintain accurate production “under pressure”**
- **SLT can control this –distant -> closer contrasts**

# Contrastive sequencing- graded

- E.g. child who used to say /t/ for /k/ & has recently learnt to articulate /k/
- Repetitions: k-k-k-k
- Very distant contrast: m-k, m-k
- Less distant: b-k, b-k
- Less distant again: p-k, p-k
- Close contrast: t-k, t-k

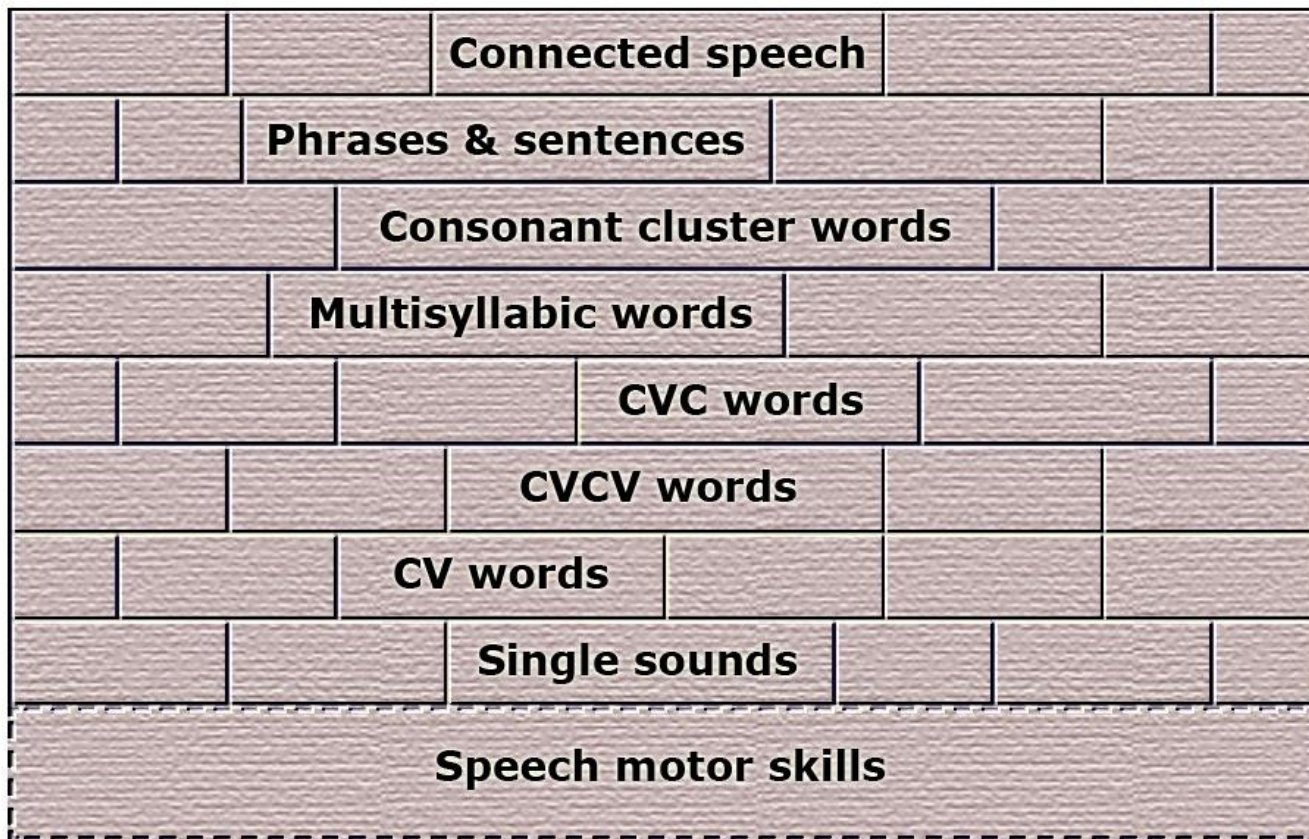
# Contrastive sequencing- graded

- E.g. child who used to say 'tea' for sea, but has recently learnt to produce 'sea'
- Repetitions: sea, sea, sea, sea
- Vowel contrast: sea-saw, sea-saw
- Distant consonant contrast: sea-bee, sea-bee
- Close consonant contrast: sea-tea

# A bottom up approach

- **The aim is to work on motor planning & programming “from the bottom up, starting from isolated speech sounds and progressing from simple to more complex syllable shapes, then to sentences and connected speech” (Williams & Stephens 2010, pp 167-8).**
- **Core “foundation” units: Single Consonant and Vowel sounds; CV syllables and words.**

# NDP – ‘Building the wall’



# Building the wall –CV level

|             |             |             |              |             |             |
|-------------|-------------|-------------|--------------|-------------|-------------|
| <b>p</b>    | <b>b</b>    | <b>t</b>    | <b>d</b>     | <b>k</b>    | <b>g</b>    |
| <b>pea</b>  | <b>baa</b>  | <b>tar</b>  | <b>do</b>    | <b>car</b>  | <b>guy</b>  |
| <b>paw</b>  | <b>bee</b>  | <b>tea</b>  | <b>dee</b>   | <b>key</b>  | <b>go</b>   |
| <b>pie</b>  | <b>boo</b>  | <b>two</b>  | <b>door</b>  | <b>coo</b>  | <b>gear</b> |
| <b>pay</b>  | <b>bye</b>  | <b>tie</b>  | <b>die</b>   | <b>core</b> |             |
| <b>Pooh</b> | <b>bay</b>  | <b>toy</b>  | <b>day</b>   | <b>kay</b>  |             |
| <b>purr</b> | <b>boy</b>  | <b>toe</b>  | <b>dough</b> | <b>cow</b>  |             |
| <b>pow</b>  | <b>bow</b>  | <b>tear</b> | <b>deer</b>  | <b>care</b> |             |
| <b>pier</b> | <b>beer</b> |             |              |             |             |



# At each level of the wall.....

- **Start from what the child can produce – identified by use of NDP3 Assessment**
- **Work on target sounds and/or words that the child cannot produce**
- **Incorporate newly learned sounds or words into framework of current sets of sounds or words**

# A multi-level, multi-target approach

- **Work on 2 or more levels at the same time, but with different targets for each level e.g. a child might be working on:**
- **Producing /l/, /f/, ‘or’ and ‘er’ at single sound level**
- **Voicing contrasts for plosives at CV level e.g. pear/bear; tie/die**
- **CVCV words involving /m b d n/ in a variety of contexts e.g. mummy, baby, daddy, nanny etc.**

# NDP3 Treatment Planning

**Where to start?**  
**How to move on?**

# NDP3 Treatment planning

- 4 stages of treatment planning are proposed (NDP3 Therapy Manual p82-3)
- Related to the wall
- Utilise NDP3 assessment findings to establish appropriate starting point for an individual child
- Select target areas at one or more stages of the hierarchy (2-4 at any one time)

# Treatment plans & therapy progression: 4 stages

- **NDP3 Therapy Manual p82-3: 4 stages**
- **Stage 4 targets all of above, with more focus on clusters, multisyllabic words, phrases/sentences**
- **Stage 3 targets all of above + multisyllabic words, clusters & some phrase level work**
- **Stage 2 targets single sounds, CV words, CVCV words & CVC words**
- **Stage 1 targets the levels on the wall of single sounds & CV words**

# Setting goals and implementing them

- **Select appropriate targets at different levels of the 'wall' –NDP3 Therapy manual p75-76 & 82-83.**
- **Identify general target area -> specific goal(s)**
- **Identify cues that will be used to support child in achieving target (e.g. NDP sound cues, letters/words, Cued articulation, verbal cues)**
- **Identify specific pictures/worksheets**
- **Choose particular games & tasks (Appendix 6 in NDP3 manual) to encourage repetition & practice**
- **Keep detailed records of achievements – see p83-88 NDP3 Therapy manual**

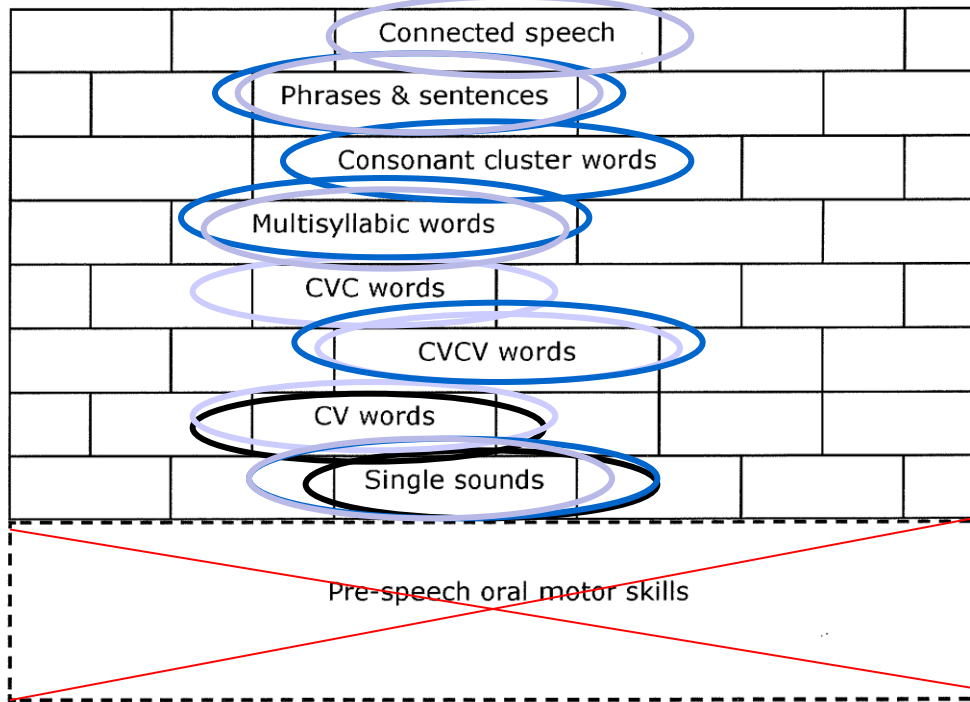
# **NDP3 Treatment hierarchies**

## **Murray et al. (2015) (1)**

- **Each child had 3 individualized speech production treatment goals, selected using the Treatment plans p.82-3 NDP Therapy manual**
- **Targets were:**
  - **single sounds, which the child couldn't articulate and/or**
  - **syllable shapes at varying levels, using sounds the child could already produce**

# NDP3 speech hierarchy:

The aim of treatment is to “build the wall”, basically bottom up.



Level 4: last developing sounds, any word gaps, sentences and conversation

Level 3: later developing sounds, 2 and 3 syllable words, clusters some phrases

Level 2: 1 and 2 syllable words

Level 1: early consonants, vowels and CV words (e.g. More)

(Williams & Stephens, 2004 section 4 pg 74.)



# NDP3 Treatment hierarchies

## Murray et al. (2015) (2)

- Five individualised stimuli were selected to address each of the 3 treatment goals.
- 18 minutes was spent working on each of the 3 goals, within game based activities.
- A child had to achieve 90% accuracy on each stimulus before moving on to others

# Stage 1 Treatment plan

**Levels to be addressed:**

- **Single sounds - including consonants & vowels**
- **CV syllables & words**

# Stage 1 Treatment plan

## Single sounds

- Establish long vowels + some diphthongs and some short vowels, as single sounds
- Work on basic pitch, volume & length control with vowels
- Establish p b m t d n k g h f s w y (sh and l), as single sounds
- Use sequencing activities to help consolidate single sound accuracy

# Teaching new sounds

- **Work on one or more sounds child cannot say – Choosing targets? Trial and error?**
- **Teach through elicitation ideas & cues and support with phonetic placement and discrimination activities**
- **Accept “approximations” and gradually refine**
- **Reinforce new sounds through games as they are learnt (+ include those already acquired)**
- **Provide opportunities for frequent, repetitive practice**

# Introducing sequencing

- **Once child has a number of sounds that he can recognise from the symbols and produce, sequencing can be introduced**
- **Repeated repetitions of a sound first and then gradually changes of sounds**
- **Consonant-Consonant, Vowel-Vowel and Consonant-Vowel sequences can be practised**
- **Contrasts should be very different at first, gradually moving to fine contrasts**
- **Incorporate rhythm, stress & pace work**

# Stage 1 Treatment plan

## CV syllables & words

- Establish a range of CV words using the single consonants & vowels the child can produce
- As new sounds (Cs & Vs) are learned as single sounds, gradually work to incorporate them into CV words
- Use sequencing activities to help consolidate accuracy of CV words
- Monitor voice & resonance

# Continuing with CV words

- Once single sounds (Cs and Vs) are established, they can be used to “build” CV (blending C+V=CV)
- Blending is easier with continuants than stops (nasals, approximants, fricatives)
- Filling the gap (puff of air/ h)
- Alternative: Nonsense babble activities
- Use NDP3 Articulogram cards & sheets

# Moving on from single sounds and CVs

- Therapy programme should still include s/sound and CV targets
- But can move forward in various ways (SLT has flexibility)
- CV+CV- $\rightarrow$  CVCV
- CV+C - $\rightarrow$  CVC
- Clusters (CCV)
- CV phrases: more, no, two, hi, bye etc.



# Moving on: CVCV, CVC....

- **See Top tips and information/guidance in individual sections for each level**
- **Examples from CVCV (p125-129)**
- **Try CVCV before CVC**
- **Try “artificial” blending 1<sup>st</sup> before making linguistic link (CV + CV)**
- **Start with voiced plosives and nasals**
- **Start with same C in both syllables**

# Moving on beyond CVCV, CVC:

- **Beyond CVCV & CVC moving on to: multisyllabic words (p134), cluster words (p136)**
- **Incorporating words into word combinations (p139) i.e. phrases and sentences**
- **Incorporating prosodic features: stress, intonation, rhythm, rate**
- **From sentence level to connected speech, see NDP3 Therapy manual, p.143-152.**

# NDP3

## Other published information

- **Williams, P & Stephens, H, (2010) The Nuffield Centre Dyspraxia Programme, (chapter 7, p.159-177). In *Williams, L, McLeod, S & McCauley R (eds.) (2010) Interventions for Speech Sound Disorders in Children. Brookes publishers.***
- **Question 46. Pam Williams & Hilary Stephens: The Nuffield Dyspraxia Programme (p.357-367) in *Bowen C (2015) Children's Speech Sound Disorders (2<sup>nd</sup> edition). Wiley-Blackwell.***
- **Murray, E. (2017) Diagnosis and intervention in childhood apraxia of speech, (chapter 7, p.115-135). In *Dodd, B. & Morgan, A. (Eds) (2017) Intervention Case Studies of Child Speech Impairment. J & R Press.***

# Conclusions

**For further information, see NDP3 Manual:  
Chapter 4: Treatment planning  
Chapter 5: Therapy approach**

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