

Current understanding of Developmental Verbal Dyspraxia

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Defining dyspraxia

'Dyspraxia, a form of developmental coordination disorder (DCD) is a common disorder affecting fine and/or gross motor coordination, in children and adults. While DCD is often regarded as an umbrella term to cover motor coordination difficulties, dyspraxia refers to those people who have additional problems planning, organising and carrying out movements in the right order in everyday situations. Dyspraxia can also affect articulation and speech, perception and thought.'

(Dyspraxia Foundation 2013)

Dyspraxia Foundation UK



Dyspraxia affecting speech

For some children, the primary difficulty is in making and co-ordinating the precise movements, which are used in the production of spoken language, which results in severe and persisting speech production difficulties. *The condition is termed developmental verbal dyspraxia: it may occur in isolation or in conjunction with general motor difficulties*

Speech dyspraxia: Historical perspective

- Muriel Morley, British Speech Therapist
- 1957 Book published
- Described a group of children as having: *Developmental articulatory dyspraxia*
- 1960s, 70s, 80s, 90s Papers published
- Further detailed descriptions
- Many referred to the controversial nature of this condition

2007: Technical report & position statement on CAS



AMERICAN
SPEECH-LANGUAGE-
HEARING
ASSOCIATION

Making effective communication, a human right,
accessible and achievable for all.

2007: Technical report & position statement on CAS

- Based on 5 year review by ad hoc committee, chaired by Lawrence Shriberg**
- Utilised peer reviewed literature in past 10 years**
- Technical report and position statement were peer reviewed by ASHA members**

ASHA 2007

- **A new name**
- **A new definition**
- **The existence of the condition is confirmed**
- **Roles & responsibilities identified**
- **Advice re: identifying features**

ASHA 2007: a new name

- **Developmental apraxia of speech (historical term)**
- **Childhood apraxia of speech (CAS) (term used since 2007)**
- **Suspected childhood apraxia of speech (term also seen in recent literature)**

Suspected CAS (sCAS) for when we are not sure....? Shriberg 1997/ASHA 2007

“Suspected CAS may provide clinicians with a functional solution to children whose profile differs from those with straightforward speech delay, who fail to progress in an expected manner and who are in some way a puzzle”.

May also be useful to describe speech of very young children & those with complex profiles

ASHA 2007: a new definition

“CAS is a neurological childhood (paediatric) speech sound disorder in which the precision and consistency of movements underlying speech are impaired in the absence of neuromuscular deficits (eg abnormal reflexes, abnormal tone)..... The core impairment in planning and/or programming spatio-temporal parameters of movement sequences results in errors in speech sound production and prosody.”

Underlying deficits in CAS

- **CAS is considered to be an impairment of speech motor control or praxis.**
- **Children with CAS have a hypothesised motor planning and/or motor programming impairment in converting abstract phonological codes into motor speech commands (Terband et al. 2009).**

ASHA 2007: Childhood apraxia of speech exists

“It is the position of ASHA that apraxia exists as

a distinct diagnostic type of childhood (paediatric) speech sound disorder that warrants research and clinical services”

ASHA 2007: Roles and Responsibilities

The diagnosis & treatment of CAS are the proper purview of certified SLPs, with specialised knowledge/skills/experience in:

- differential diagnosis of childhood motor speech disorders
- motor learning theory &
- a variety of intervention techniques, including augmentative & alternative communication (AAC) & assistive technology.

ASHA 2007: Identifying features

- **“Currently no lists of behavioural features that are validated as necessary and sufficient for the diagnosis of CAS...”.**
- **Looking for “Evidence of features consistent with deficit in planning and programming of movements for speech”**

ASHA 2007: Consensus features

Three identifying features have gained some consensus agreement amongst clinicians and researchers:

- Inconsistent errors on consonants and vowels in repeated productions
- Lengthened and disrupted co-articulatory transitions between sounds and syllables
- Inappropriate prosody, especially in the realization of lexical or phrasal stress

However, these are not the only difficulties shown by children with CAS.....

ASHA 2007: Other identifying features

- non-speech motor behaviours
- speech motor behaviours
- making speech sounds and producing words of varying syllable shapes
- prosody
- language
- metalinguistic skills /phonemic awareness
- literacy

2011: RCSLT Policy Statement on DVD



Royal College of Speech and Language Therapists 2011

- Preferred term in UK is Developmental verbal dyspraxia (DVD)
- DVD exists as a subtype of Speech impairment/speech sound disorders
- SLT is appropriate professional to diagnose DVD.
- Recognised that it may be appropriate to refer to children having 'features of DVD' and/or the 'DVD symptom cluster'

RCSLT 2011: Terminology

- **Developmental articulatory dyspraxia (historical term)**
- **Developmental verbal dyspraxia (current term)**
- **Oro-motor dyspraxia (needs to be differentiated from verbal dyspraxia)**

RCSLT 2011: Definition of DVD

“Developmental verbal dyspraxia is a condition where the child has difficulty in making and co-ordinating the precise movements which are used in the production of spoken language, although there is no damage to muscles or nerves.” (Ripley, Daines & Barrett 1997)

RCSLT 2011: Oro-motor dyspraxia

The inability to copy volitional movements of oral organs (tongue, lips, jaw, face) on command or demonstration in the absence of attempts to articulate. (Milloy 1991)

Some, but not all, children have verbal dyspraxia and oro-motor dyspraxia.....

RCSLT 2011: Co-morbidity

- **Other dyspraxic/co-ordination difficulties e.g. Oro-motor dyspraxia and/ or Developmental co-ordination disorder (DCD)**
- **Other communication difficulties e.g. language and/or fluency difficulties**
- **Other primary co-occurring conditions e.g. Down syndrome; autism spectrum disorder**
- **Dyslexia /literacy difficulties**

RCSLT 2011: Identifying features

“..there is, as yet, no agreed set of diagnostic characteristics.....there is however general agreement about the types of features which contribute to the presentation” (p3)

List of characteristics reported from the literature given in Table 1 on p7

(Similar to those reported by ASHA 2007)

Murray et al. 2015: Identifying CAS/DVD

In this study, children (aged 4-12 years) who were described as having CAS had to meet 2 sets of criteria:

- (i) 3 ASHA consensus features and
- (ii) At least 4 features from Strand's 10 point checklist

They had to show the features on at least 3 different assessment tasks

Shriberg et al. 2009: Strand's 10 point checklist

- Difficulty achieving initial articulatory configurations or transitional movement gestures
- Equal stress or lexical stress errors
- Distorted consonant or vowel substitutions
- Syllable segregation
- Groping
- Intrusive schwa
- Voicing errors
- Slow speech rate
- Slow diadochokinetic (DDK) rate
- Increased difficulty with multi-syllabic words compared to mono-syllabic words

We also need to consider developmental issues....

- **Stackhouse (1992) referred to “the unfolding and changing nature of DVD as a condition”.**
- **The range of problems experienced unfold as the child progresses and more demands are placed upon him/her.**
- **Therefore, the presentation of CAS/DVD varies with age and stage of development.**

Identifying CAS/DVD in a young or non-verbal child

- **We cannot identify speech output features to make a diagnosis until the child has some spoken output!**
- **Early identification can be challenging – especially in children with co-morbid conditions. Features may not have emerged.**
- **It can be difficult to differentiate DVD/CAS from expressive language difficulties.**

What might make us suspect CAS/DVD (red flag signs)?

- Feeding difficulties
- Drooling
- Difficulties with blowing, sucking, licking
- Delayed early speech skills eg no babbling
- More limited range of speech sounds than expected for language level
- Problems imitating oral movements /speech sounds
- Other 'dyspraxic signs'
- Family history of speech, language and/or literacy problems

Identifying CAS/DVD once child has some output to analyse

- Use the ASHA (2007) consensus features and checklists e.g. Strand's 10 point checklist to identify speech and prosodic features.
- NB you are looking for “evidence of features consistent with deficits in planning and programming of movements for speech”.
(ASHA 2007)

In addition to speech and prosodic features, also note.....

- **Voice difficulties (lack of control over volume, pitch, length, atypical quality)**
- **Resonance difficulties (hypernasality, hyponasality, mixed nasality)**

NB However, it is essential to rule out *structural* abnormalities and vocal pathology before concluding these are *functional* dyspraxic difficulties

Prevalence of Developmental verbal dyspraxia

- **Limited epidemiological data currently available**
- **Rare/occurs infrequently compared to other forms of developmental speech disorder**
- **1-2 cases per 1000 (Shriberg et al. 1997)**
- **Over-diagnosis reported in the literature**

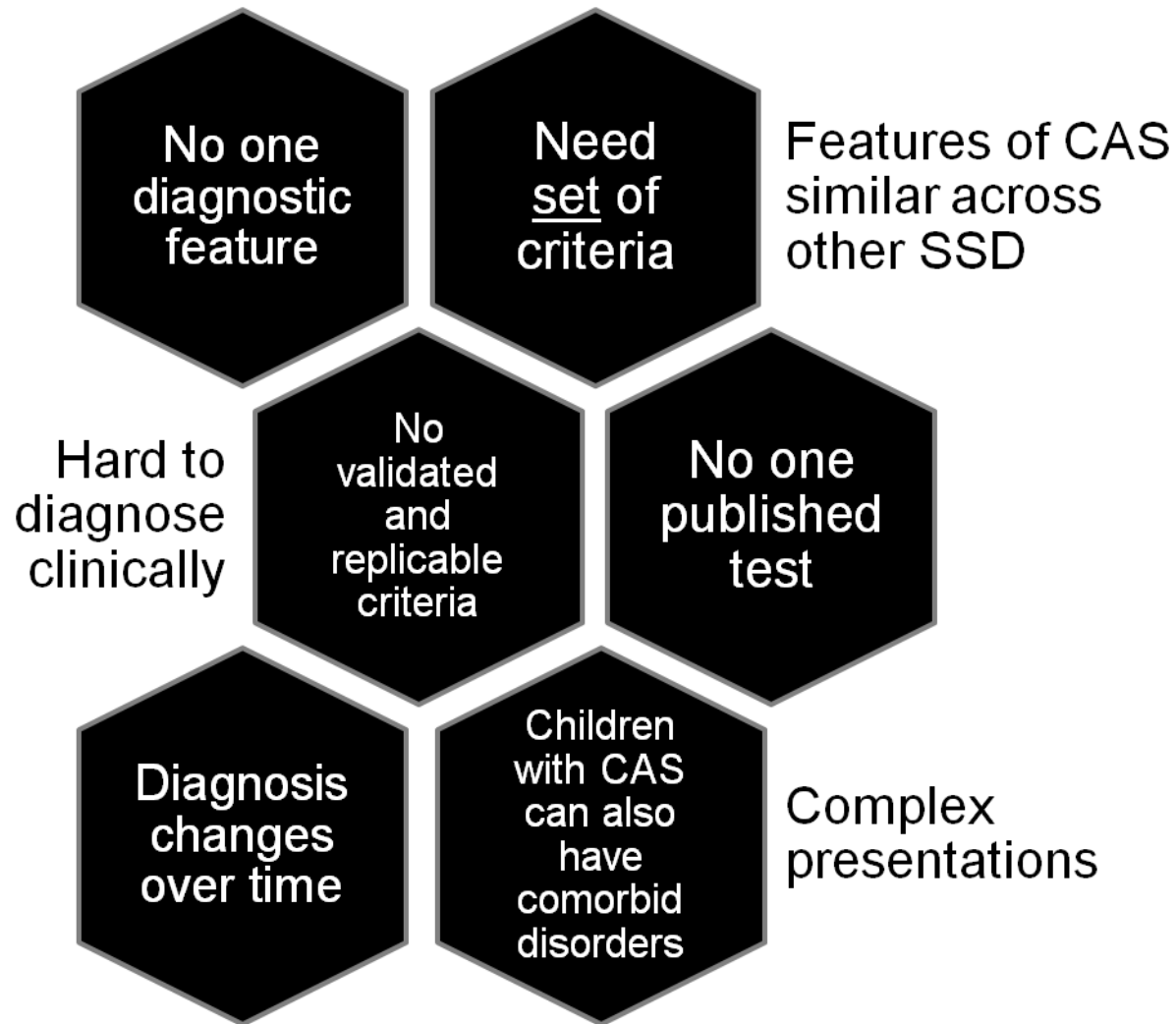
Aetiology of Developmental verbal dyspraxia

- Unknown
- Familial link reported clinically & in the literature
- Potential for heritability confirmed in one very small subgroup where CAS develops subsequent to genetic disruption of FOXP2 gene
- Children with complex neuro-behavioural & genetic disorders can present with DVD e.g. autism, epilepsy, galactosaemia, 22q11.2 microdeletion, Down syndrome

Conclusion: Theoretical issues

- **DVD/CAS has been a ‘controversial condition’**
- **ASHA & RCSLT now say it exists!**
- **However, there is still no validated list of diagnostic features (but several proposed)**
- **Therefore identification is still not straightforward**
- **Research will continue, but we need to apply current knowledge to clinical practice**

Assessment and Differential Diagnosis



Issues in diagnosing DVD/CAS....

Shriberg et al. April 2017: The Pause marker

- **Introducing an acoustic-aided perceptual sign of CAS**
- **Proposed to be a single-sign diagnostic marker which can....**
- **Discriminate early or persistent CAS from speech delay**
- **However, this is not yet a practical clinical tool....!!**

ASHA 2007: Assessment of CAS

- **...“the technical report does not include specific guidelines for the assessment of CAS primarily due to lack of research support to date...”**
- **Instead, general recommendations were made by expert clinical practitioners**

ASHA 2007 & RCSLT 2011: appropriate areas to assess

- **Case History**
- **Hearing**
- **Non-speech oral motor skills**
- **Speech production**
- **Speech perception**
- **Prosody**
- **Voice**
- **Language**
- **Metalinguistic literacy skills (older children)**

Diagnosing CAS/DVD

A reminder from theoretical update

- The current gold standard for diagnosing CAS is expert judgement of perceptual features (Murray et al. 2015, p.43)
- SLT is aiming to identify features in checklists
- The favoured approach is to state the minimum number of features which must be present for a diagnosis to be made
- Also for these features to be present over several different assessment tasks

Choosing assessment tasks to help identify features of CAS/DVD

Murray et al. 2015; Strand 2017

Examples of Assessment batteries

Murray et al. 2015

- **Case history**
- **Language assessment**
- **Oral motor examination –structure, function and DDK**
- **Inconsistency assessment (name 3x)**
- **Polysyllabic naming test (50 words)**
- **Connected speech**

Strand 2017

- **Case history**
- **Language assessment**
- **Oral motor examination –structure, function and DDK**
- **Naming tests of articulation/phonology**
- **Dynamic motor speech assessment**
- **Connected speech**

Strand et al. 2013: Speech assessment: Dynamic Evaluation of Motor Speech Skills (DEMSS) (1)

- The paper provides details of a Dynamic motor speech examination procedure.**
- It examines the child's ability to sequence movements for production of: vowels, simple & complex words, phrases & sentences.**
- It is administered through imitation.**
- Examples of stimuli are given in the paper but you can adapt for your own purposes.**

Strand et al. 2013/2017: Speech assessment: Dynamic Evaluation of Motor Speech Skills (DEMSS) (2)

- What happens when the child tries to repeat a word they don't normally say.**
- SLT/SLP is advised to support the child with cues: “watch my face”; say it with me; say it slowly with me; use of gestural cues; use of tactile cues.**
- Looking to see if this improves the child's performance**

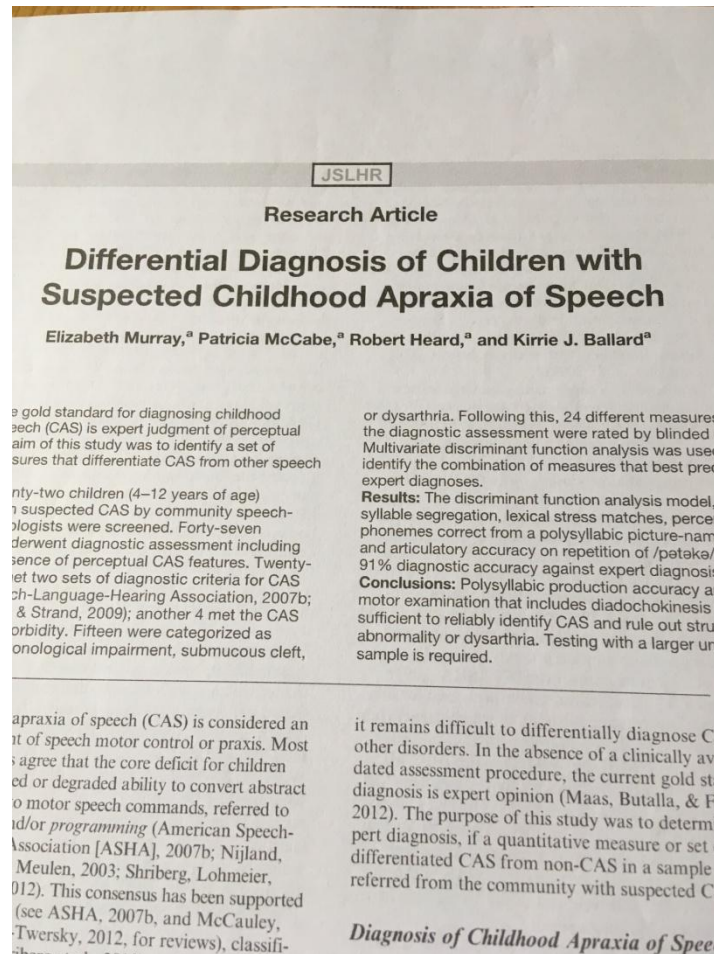
Strand 2013/17: Dynamic assessment



Murray et al. 2015: Differential Diagnosis (1)

- In the absence of a clinically available validated assessment procedure, the current gold standard for diagnosing CAS is *expert judgement* of perceptual features
- In this paper, they aimed to identify which features best differentiated CAS from other speech disorders, using statistical analysis

Murray et al.2015: Differential Diagnosis paper



Murray et al. 2015: Differential Diagnosis (2)

- 72 children with suspected CAS were referred by community SLPs**
- 47 children met the study inclusion criteria & were assessed on the assessment battery**
- 28 children were diagnosed by the first two authors as showing the presence of CAS features (ASHA consensus features + Strand features)**

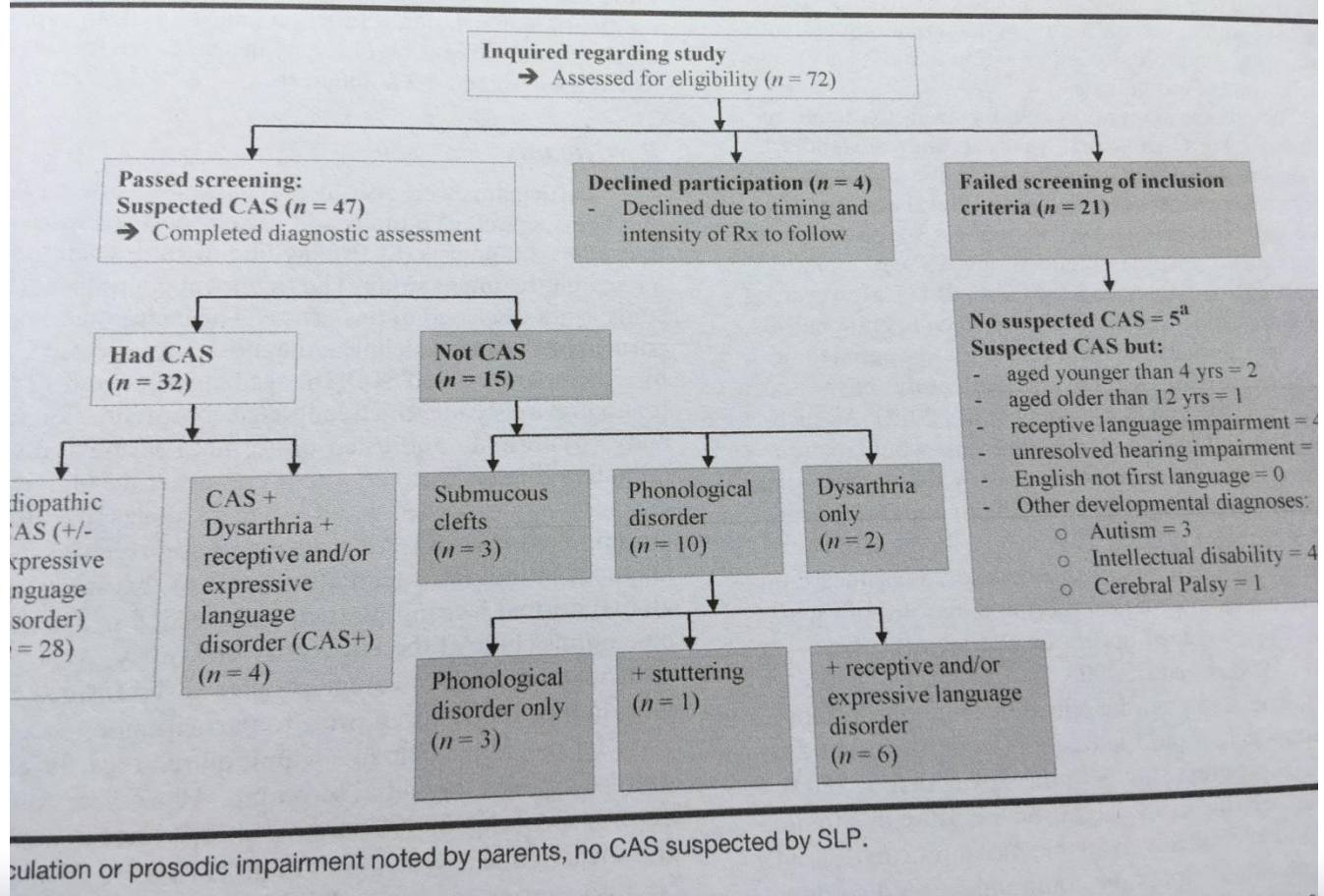
Murray et al. 2015: Differential Diagnosis (3)

15 children did not meet the criteria for a diagnosis of CAS. Of these:

- 10 were found to have a phonological impairment, but no motor disorder**
- 3 were found to have a submucous cleft palate**
- 2 were found to have dysarthria: 1 with ataxic dysarthria & 1 with flaccid dysarthria**

Murray et al. 2015 Differential Diagnosis

Figure 1. Results of differential diagnostic process. Participants with childhood apraxia of speech (CAS) shown in white, comorbid CAS in yellow and non-CAS or excluded in blue.



Murray et al. 2015:Extracted measures from assessment data

Case history

- Age in months

Oral motor examination

- Oral structure score
- Oral function score
- Maximum phonation time
- DDK accuracy on tri-syllables
- DDK rate on single & tri-syllables
- Presence of non-speech groping

Language assessment

- Receptive language score
- Expressive language score

Inconsistency assessment

- % inconsistency across three repetitions of 25 words

Polysyllabic naming test

- % consonants correct, % vowels correct, % phonemes correct
- Syllable segregation occurrences
- Lexical stress errors
- Intrusive schwa
- Voicing errors

Connected speech

- Articulation rate & groping

Murray et al. 2015: Extracted measures from assessment data

Using multivariate discriminant function statistical analysis, the best predictors of the expert diagnoses were a combination of 4 measures:

- syllable segregation**
- lexical stress matches/mismatches**
- accuracy on DDK 'pe-te-ke'**
- Percentage Phonemes Correct (PPC)**

Murray et al. 2015: Recommendations for differential diagnosis of CAS

The authors concluded that an assessment of a child's performance on:

1. A polysyllabic picture naming task and
2. An oral motor examination, which includes DDK

“may be sufficient to diagnose CAS & rule out structural abnormality or dysarthria”

Differential diagnosis: other issues

- **Children in the Murray et al. 2015 study were aged 4+ years, verbal and able to name many pictures**
- **Making a confirmed diagnosis is likely to be much more difficult in younger children & particularly if they have co-morbid conditions**
- **Remember, you can use: “features of DVD” or “suspected CAS”**

Differentiating CAS from other speech sound disorders

Developmental dysarthria

**Inconsistent Phonological
disorder**

Developmental dysarthria

“an impairment of movement and co-ordination of the muscles required for speech, due to abnormal muscle tone”

(Milloy and MorganBarry 1990)

Associated with motor disorders e.g. Cerebral palsy

Dysarthria: a motor speech disorder

Vocal tract affected including:

- **Positioning**
- **Respiration**
- **Phonation**
- **Resonance**
- **Articulation**

ASHA 2007

- **Recognised there was a significant research challenge to determine the diagnostic boundaries between CAS/DVD characteristics and developmental dysarthria.**
- **Both symptom clusters appear to co-exist in some children**
- **There can be an overlap of speech, voice and prosodic features**

Dyspraxia vs. Dysarthria

- **Prosodic difficulties**
 - **Inconsistent errors**
 - **Substitutions, omissions**
 - **Discrepancy between voluntary and involuntary on oromotor tasks**
- **Prosodic difficulties**
 - **Consistent errors**
 - **Distortions**
 - **No discrepancy between voluntary and involuntary on oromotor tasks**

Phonological disorder

“a disorder of the systematisation of meaning contrasts at word and morphemic level, dependent on a consistent inventory of consonants and phonotactic structures (ie CV, CVC, CVCV etc and a knowledge of the restrictions of their occurrence in a language” (Grunwell)

Dyspraxia vs. Phonological

Difficulties with:

- Producing sounds in isolation
- Sequencing sounds together
- With prosody (rate, rhythm, stress, intonation)
- With oro-motor skills

No significant difficulties

- Can produce most sounds in isolation
- No sequencing difficulties
- Prosody usually normal
- Oro-motor skills normal

Dodd 1995, 2002, 2005: Subgrouping Approach (1)

Identified different types of speech sound disorders:

- Phonological delay**
- Consistent phonological disorder**
- Inconsistent phonological disorder (IPD)**
- Articulation disorder**
- CAS/DVD acknowledged as a rare presentation**

Dodd 1995, 2002, 2005: Subgrouping Approach (2)

Inconsistent speech production is a feature of two different speech sound disorders

- **Childhood apraxia of speech (CAS) /developmental verbal dyspraxia (DVD)**
- **Inconsistent phonological disorder (IPD)**

So, how do they differ?.....

CAS/DVD

vs.

IPD

- Oro-motor – poor performance
- Difficulty producing sounds in isolation
- Imitation of words worse than spontaneous
- Slow laboured speech with atypical intonation patterns

- Oro-motor –within normal limits
- Able to produce most sounds in isolation
- Imitation of words better than spontaneous
- Fluent speech, normal intonation despite lack of clarity

CAS/DVD vs. IPD:

Other considerations

- **Child with IPD is usually 3-5 years old, chatty and fluent but makes inconsistent speech sound errors.**
- **Child with CAS/DVD aged 3-5 years usually has limited spoken output –small number of word attempts, with limited phonemic repertoires. Words involve many speech sound and syllable errors. Any inconsistency heard is not the main feature.**

Is there anything else we can do if CAS/DVD diagnosis is unclear?

In some situations, it can be very difficult to identify the exact nature of the child's problem. So rather than continuing to assess further, decide on one hypothesis e.g.

- this child has / does not have CAS/
features of DVD**
- this child has a phonological disorder.**

Start some therapy.....

- **Therapy can be very revealing! As you try to teach the child, you may observe difficulties not seen clearly on assessment tasks.**
- **Remember to re-evaluate your hypothesis as therapy progresses**
- **Be prepared to consider an alternative hypothesis if progress is very slow**

Concluding remarks

- **There is no clear cut approach for differentiating CAS/DVD from other speech sound disorders –but we’ve considered how we might do this.**
- **Its still important to consider developmental issues -age and stage.**
- **Also to remember the child’s overall presentation, including any co-morbid conditions.**

Intervention for DVD/CAS

NDP3 Course

ASHA, 2007; Cochrane, 2008; RCSLT, 2011: Intervention approaches for DVD/CAS

- Unable to specify due to lack of current research evidence
- Few published treatment studies had been published in peer-reviewed literature
- The few found in the literature were not of best quality (lacked experimental control)
- Well-controlled case studies were

Intervention case studies for DVD

- **Dynamic Temporal & Tactile Cueing (DTTC).** (Strand et al., 2006)
- **Intra-oral Stimulation & Electropalatography (EPG).** (Lundeborg & Mc Allister, 2007)
- **Integrated Phonological Awareness approach.** (McNeill et al., 2009)
- **Stimulability & modified Core Vocabulary.** (Iuzzini & Forrest, 2010)
- **Prompts for Restructuring Oral Muscular Phonetic Targets (PROMPT).** (Grigos et al., 2010)
- **Rapid Syllable Transition Treatment (ReST).** (Ballard et al., 2010)
- **Ultrasound Biofeedback Treatment (Preston et al., 2013)**

Evidence-based practice (1)

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

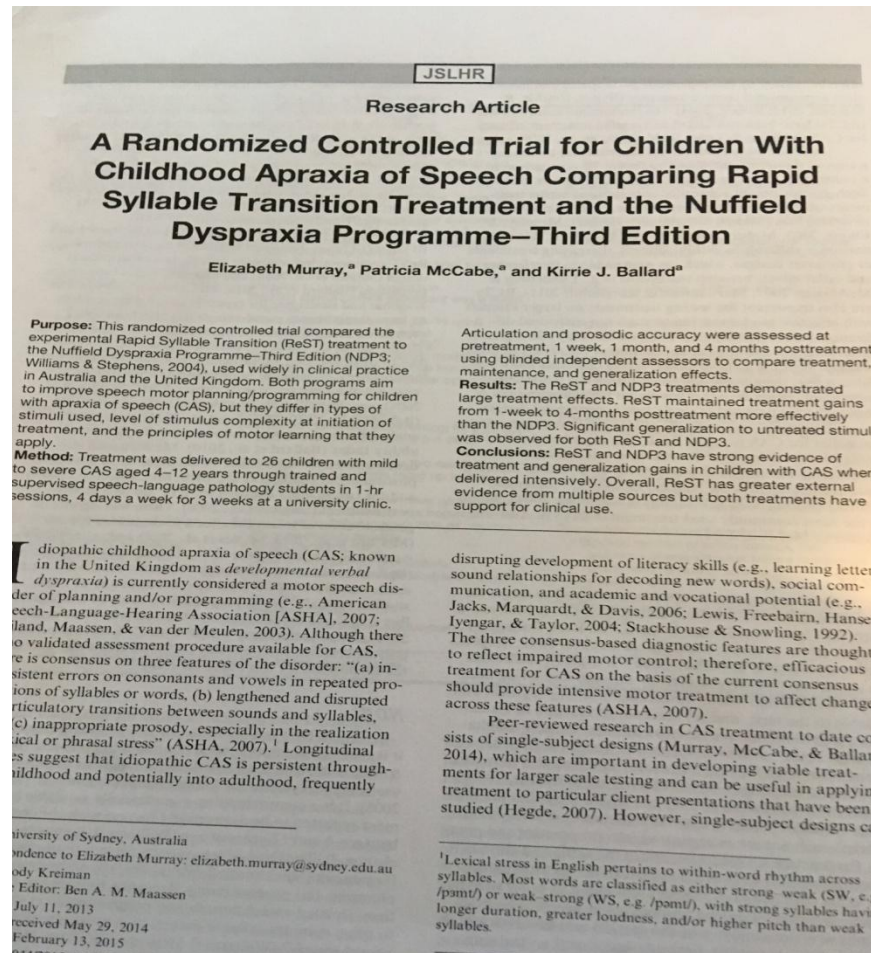
- **Dynamic Tactile & Temporal Cueing (DTTC)**
(Strand et al., 2006)
- **Integrated Phonological Awareness (McNeill, Gillon & Dodd, 2009)**
- **Rapid Syllable Transition Treatment (ReST)**
(Ballard et al., 2010)
- **Nuffield Centre Dyspraxia Programme (NDP3)**
(Williams & Stephens, 2004)

Evidence-based practice (2)

Motor based approaches:

- Stimuli are selected on the basis of motor sequencing & phonotactic structures
- Motor rather than linguistic cues are used
- Motor learning principles are applied
- Focus on high intensity practice
- NDP3 & ReST were compared in a randomised controlled trial (RCT)

Murray, McCabe & Ballard, 2015: RCT



Murray, McCabe & Ballard, 2015: NDP3 vs. ReST

- **26 children with CAS, aged 4-12 years**
- **Intensive treatment: 1 hour, 4 days, 3 weeks**
- **Treatment delivered by trained & supervised SLT students, at University of Sydney**
- **Large treatment gains for all children in both groups (measured on a 292 item probe)**
- **Significant generalization effects**
- **Varying maintenance effects**
- **Both treatments have support for clinical use.**

ReST Treatment (1)

Participants had to produce 20 pseudowords, aiming for 80% accuracy of articulation & prosody. Targets were:

- 2 syllable nonwords, 50% had strong-weak & 50% weak-strong stress**
- 3 syllable nonwords with a strong “ee” or weak “er” third syllable**
- 3 syllable pseudowords as final noun in a carrier phrase**

ReST Treatment (2)

Examples:

2 syllable: *begoo; farber*

3 syllable: *begootee; farbeger*

**3 syllable phrase: Can I have a
*begootee?***

**Consonant segments were individualised
for each child (plosives & fricatives)**

**Participants read the pseudowords aloud
or imitated an adult model**

ReST Treatment (3): Principles of Motor Learning

Pre-practice (10-15 mins)

Acquisition of skills

- Aimed to elicit at least 5 correct productions of any of the 20 stimuli
- Used: imitation, phonetic placement cues, tapping out stress, prosodic cues, segmenting/blending
- Knowledge of performance cues after each production

Practice (45-50 mins)

Maintaining/Generalising

- Worked on all the items aiming for 80% accuracy in 5 blocks of 20 trials
- No cues given
- Knowledge of results (right/wrong) feedback given 50% of time on a decreasing scale

NDP3 Treatment (1)

Each child had 3 individualized speech production treatment goals, selected using the Treatment plans p.82-3:

- single sounds, which the child couldn't articulate and/or**
- syllable shapes at varying levels, using sounds the child could already produce**
- Prosodic goals at CVCV or polysyllabic word level using the sounds the child already produced**

NDP3 Treatment & PML (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, (30-40 trials for each goal).**
- **A child had to achieve 90% accuracy on each stimulus before moving on to others**

Results of RCT

NDP3

- **Large treatment effects**
- **Maintenance: Small-moderate decrease in accuracy of treated items post treatment**
- **Generalisation of treatment effects to untreated real words – increases in accuracy**

ReST

- **Large treatment effects**
- **Small increases in accuracy of treated items post treatment (1 week, 1 month, 4 months)**
- **Generalisation of treatment effects to untreated real words – increases in accuracy**

A 2nd RCT involving NDP3

McKetchnie et al. (in preparation)

- **14 children with CAS, aged 4-12 years**
- **Intensive treatment: 1 hour, 4 days, 3 weeks**
- **Using a tablet rather than cards & worksheets**
- **Randomly assigned to receive traditional NDP3 Pre-practice only or NDP3 with a combined Pre-practice & a Practice phase**
- **Results awaited But large treatment gains were achieved for traditional NDP3**

A few more things to consider.....

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 is
often recommended in UK for children
with DVD**
- **Ongoing therapy versus blocks of
therapy –needs further evaluation**

Getting the best from the child in treatment sessions

- Sit securely with feet on floor, at table
- Reduce distractions
- Aim for steady regular pacing of speech tasks
- Help child point to pictures to regulate pace
- Provide support by saying the target sound(s)/ word(s) with the child

Giving knowledge of performance feedback-when he gets it right

- Tell him what he did right (Great! You used your / t /, so it worked well) –i.e. knowledge of performance feedback
- Plenty of positive reinforcement when he achieves

Giving knowledge of performance feedback-when he gets it wrong

- **Stop him (Whoops! Wait a minute etc.)**
- **Avoid discouraging him**
- **Get him back on track**
 - **Model correct target**
 - **Use familiar cue**
 - **Remind him of the sound he needs**
 - **Remind him to slow down a bit and think before he says the target**
- **Acknowledge that it is tricky**
- **Praise for trying (Good try – that’s a hard one isn’t it?)**

Using cues

Teaching strategies could include:

- **Verbal instructions**
- **Modelling (including simultaneous productions)**
- **Articulation cues e.g. “teeth together” for ‘s’**
- **Cued articulation/other tactile or manual cues to support**
- **Picture/visual cues e.g. Diagrammatic lip shapes or ladders for voice volume.**

Practice

- **Is absolutely crucial!**
- **100 trials per session -30-40 trials for each of 3 goals/activities**
- **Make specific recommendations for length & frequency of practice to parents**
- **Monitor this in light of child's progress/lack of progress**
- **May need to increase frequency**

Generalisation (1)

- You need to aim for generalisation as well as treatment gains
- Expect generalisation to items of similar or lesser complexity
- Praise self-correction attempts
- Plan for home practice to facilitate carryover at home.

Generalisation (2)

- **It takes a long time to get from sounds and words to spontaneous connected speech!**
- **Make sure you are being realistic before expecting generalisation**
- **Don't try to correct spontaneous speech too soon –this is motorically more difficult in terms of programming and planning.**

Thank you for listening!

Contact details for Dr Pamela Williams:
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To find out more: see reference list for papers
and visit www.ndp3.org