



## RCSLT POLICY STATEMENT

### DEVELOPMENTAL VERBAL DYSPRAXIA



Produced by The Royal College of Speech and Language Therapists

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## EXECUTIVE SUMMARY

### **Speech, language and communication skills are a basic human right<sup>1</sup>, yet speech and language difficulties are the most common developmental disability faced by children<sup>2</sup>.**

1. One in six children is referred to local Speech and Language Therapy Services<sup>3</sup> and almost 40% of these have a primary speech difficulty<sup>4</sup>, also classed as Speech Impairment<sup>5</sup>.
2. There is a wide range of developmental speech difficulties:
  - Structural difficulties such as cleft palate
  - Articulatory difficulties - incorrect placement for accurate sound production
  - Cognitive-linguistic difficulties with speech and language processing resulting in pronunciation difficulties.
3. Whilst these difficulties are classed as a developmental disability, very few presentations resolve without Speech and Language Therapy interventions<sup>6</sup>. These presentations can have long lasting impacts for people<sup>7</sup> including literacy difficulties<sup>8</sup>, language impairment<sup>9</sup>, educational achievement<sup>10</sup>, social interaction difficulties<sup>11</sup> and possible offending behaviours<sup>12</sup>.
4. One subset of Speech Impairment is the Developmental Verbal Dyspraxia (DVD) symptom cluster. This is now widely accepted<sup>13</sup> but there is, as yet, no specific definition or agreed set of diagnostic characteristics; there is, however, general agreement about the types of features which contribute to the presentation<sup>14</sup>.
5. It is clear that the symptom cluster of Developmental Verbal Dyspraxia is rare<sup>15</sup>, that there is often over-identification of the presentation<sup>16</sup> and that the DVD changes over time<sup>17</sup>, usually in response to clinical intervention.
6. It is recommended that the differential diagnosis and overall management of the Developmental Verbal Dyspraxia symptom cluster is led by a specialist Speech and Language Therapist with expertise in the field of Speech Impairment<sup>18</sup>. The management plan must include multi-agency negotiations in order that everyone involved, whether school, family, speech and language therapist or others, can support the child to reach their maximum potential. Within this document options for assessment and intervention are provided, but until further research evidence is available, no single approach can be identified as optimum.
7. This document provides a selection of single case studies and service studies as examples and exemplars of provision. It links to a range of other documents from RCSLT, together with providing a comprehensive reference list and additional bibliography.

### **PLEASE NOTE**

This document has been developed primarily for the speech and language therapy workforce. The RCSLT hopes other professional groups and organisations together with parents, families and carers will find this to be a useful, relevant and informative resource. SLT specific terminology has been used in this document and if further explanation or guidance is needed please discuss this with a speech and language therapist.

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<sup>1</sup> Bercow 2008

<sup>2</sup> Law 1992

<sup>3</sup> Broomfield & Dodd 2005

<sup>4</sup> ibid

<sup>5</sup> Royal College of Speech and Language Therapists [RCSLT] 2009a

<sup>6</sup> Broomfield & Dodd 2005, Wren & Roulstone 2008

<sup>7</sup> RCSLT 2009a, Conti-Ramsden et al 2001, Law et al 1998, Stackhouse 1992b

<sup>8</sup> Snowling & Stackhouse 1983

<sup>9</sup> Lewis et al 2004

<sup>10</sup> Teverovsky et al 2009

<sup>11</sup> Conti Ramsden et al 2001

<sup>12</sup> Snowling et al 2000

<sup>13</sup> ASHA 2007, RCSLT 2009a

<sup>14</sup> American Speech Language Hearing Association [ASHA] 2007

<sup>15</sup> Shriberg et al 1997; Broomfield & Dodd 2005

<sup>16</sup> Delaney & Kent 2004; Moriarty & Gillon 2006

<sup>17</sup> Stackhouse 1992b

<sup>18</sup> RCSLT 2006

## Introduction

8. The political and social climate for speech and language therapists (SLTs) working with children with developmental communication impairment, also known as speech, language and communication needs (SLCN) continues to change and develop at a pace. The recent Bercow report (Bercow 2008) is testament to this fact. Speech and language difficulties are the most common developmental problem faced by young children (Law 1992), and around 40% of children with such difficulties have a primary speech difficulty (Broomfield & Dodd 2005).
9. The RCSLT Resource Manual for Commissioning and Planning Services for SLCN: Speech and Language Impairment (RCSLT 2009a) refers to this generic group of children as having Speech Impairment (SI). This top level term includes all types of speech difficulty, from structural (e.g. cleft palate) and articulatory to cognitive linguistic (phonological). It is this term that is adopted throughout the current document as the term to encompass the generic group.
10. Both ASHA (2007) [at [www.asha.org/policy](http://www.asha.org/policy)] and RCSLT (2009a) [at [http://www.rcslt.org/speech\\_and\\_language\\_therapy/commissioning/resource\\_manual\\_for\\_commissioning\\_and\\_planning\\_services](http://www.rcslt.org/speech_and_language_therapy/commissioning/resource_manual_for_commissioning_and_planning_services)] acknowledge that Developmental Verbal Dyspraxia (DVD) exists as a subtype of SI. It is this specific sub-type is the focus of the current document. Varying terminology is used across the world, including Childhood Apraxia of Speech (CAS) and Developmental Apraxia of Speech (DAS), but throughout this document, the preferred term will be Developmental Verbal Dyspraxia, in accordance with other UK documentation.
11. This document draws upon published evidence and expert consensus; specific evidence based guidelines cannot be produced until more research is conducted.
12. In recent years, the field of SI is increasingly acknowledged as being a specialist clinical area for SLTs, with specialist Speech and Language Therapy (SLT) posts being developed and specialist SLT clinical advisors being appointed. Furthermore, postgraduate qualifications in the specific area exist, for example there are postgraduate qualifications, including an MSc in Speech Difficulties at the University of Sheffield, together with PhD opportunities at Universities around the UK.
13. Children who present with SI, including DVD, may be unintelligible, even to familiar listeners, so they require support in terms of their ability to communicate and interact with those around them, as well as requiring remediation of their specific difficulty. Given the known impact of speech & language difficulties on learning and literacy, support is required in educational settings as well as to the families. This group of children must be considered during SLT service planning, design and reconfiguration, regardless of the sector from which the commissioners originate. Furthermore, SI, including DVD, may continue to impact upon individuals into adulthood, hence lifelong provision and support may be required from within social care settings as well as across health, education and the voluntary and independent sectors.

## Scope and purpose

14. This document aims to offer guidance, regarding children with speech impairment, particularly those with features of DVD, to
- SLTs and SLT managers, in order to influence commissioning arrangements and plan service delivery
  - Higher education, for the purposes of SLT education and academic research
  - It is hoped that the paper will also be useful for other organisations committed to providing or determining appropriate provision and support for individuals with DVD
- It includes
- Key strategic and policy drivers that influence practice
  - Values embedded within SLT practice
  - Roles and responsibilities of SLT practice
15. This paper should be read in conjunction with other key documents from RCSLT, including
- Communicating Quality 3 [CQ3] (RCSLT 2006)
  - Supporting children with speech, language & communication needs within integrated children's services (Gascoigne 2006)
  - The Resource Manual for Commissioning & Planning Services for SLCN – Speech and Language Impairment section (RCSLT 2009a)  
[http://www.rcslt.org/speech\\_and\\_language\\_therapy/commissioning/resource\\_manual\\_for\\_commissioning\\_and\\_planning\\_services](http://www.rcslt.org/speech_and_language_therapy/commissioning/resource_manual_for_commissioning_and_planning_services)
  - The RCSLT Quality Self-Evaluation Tool: Q-SET (RCSLT 2011)  
[http://www.rcslt.org/members/qset/qset\\_main\\_page](http://www.rcslt.org/members/qset/qset_main_page)
  - RCSLT Clinical Guidelines (RCSLT 2005)
  - An Economic Evaluation of Speech and Language Therapy (Matrix Evidence and RCSLT 2010) [http://www.rcslt.org/giving\\_voice/news/matrix\\_report](http://www.rcslt.org/giving_voice/news/matrix_report)

## Process for consensus

16. This policy statement has been prepared by a project team comprising Consultant SLTs specialising in the field, having obtained consensus views from a group of SLTs who are clinical and research experts in the topic. SLTs from across the UK and beyond have contributed to this document with case studies and in response to a consultation process. The document has been quality assured by the RCSLT Professional Development and Standards Board and ratified by the RCSLT Council.

## Characteristics of Developmental Verbal Dyspraxia

17. The terminology used in the literature for SI varies according to the theoretical model. Furthermore, there has been controversy over the existence of DVD, and its features where it is acknowledged. Indeed, 'the validity of developmental apraxia of speech (DAS) (or alternative labels such as developmental verbal dyspraxia [DVD]) as a childhood speech disorder is one of the most controversial nosological [classification] issues in clinical speech pathology' (Shriberg et al 1997a, p273).
18. Despite an extensive literature review, ASHA had to conclude that there is no validated list of diagnostic features that differentiates this condition from other types of SI, including those primarily due to phonological delay or

neuromuscular disorder (dysarthria). However, they advised that three segmental and supra-segmental features have gained some consensus among clinicians and researchers working with children with DVD (ASHA 2007, p43):

- Inconsistent errors on consonants and vowels in repeated productions of syllables or words
  - Lengthened and disrupted co-articulatory transitions between sounds and syllables
  - Inappropriate prosody, especially in the realization of lexical or phrasal stress
- However, there is acknowledgement that the other features listed below (table 1) add to the picture & it may be helpful for practitioners to take note of these when considering this presentation.

19. These features reflect both segmental (e.g. sound) and supra-segmental (e.g. word and syllable) levels, indicating a deficit in the planning and programming of movements for speech. However, the ASHA ad hoc committee stressed that these were not the only signs seen. Furthermore, these characteristics are not only seen in DVD, but may be indicative of other diagnoses, hence accurate differential diagnosis is essential. A child with DVD typically presents with deficits in any or all of the following domains: non-speech motor behaviours, motor speech behaviours, speech sounds and structures (words and syllable shapes), prosody, language, meta-linguistic/phonemic awareness and literacy. It is this range of characteristics that leads authors including Hall (1992) to suggest that clinicians should perhaps be looking for 'apraxic / dyspraxic features' rather than recognising whether a child has/does not have a condition. Ozanne (2005) suggests that DVD should be considered as a symptom cluster involving elements of three output levels: phonological planning, phonetic planning and speech-motor programme implementation. Given the numerous features which can be attributed to DVD, it would seem to be most logical to adopt this approach, therefore identifying children as having features of DVD.
20. In conclusion, it seems sensible to say that a child who shows features of DVD may show signs in any of these areas, rather than to be saying that DVD itself comprises problems in all these fields, or indeed rather than specifying that the individual 'has DVD'. It is this position that is reflected throughout this paper, identifying features, symptoms or characteristics of DVD rather than identifying DVD as a condition per se.
21. A number of additional characteristic features are often mentioned in the literature, and are included below in table 1 – N.B. not all are based on direct experimental research.

**Table 1: Characteristic Features of DVD**

*Whilst it is not yet known which features are essential for the classification to be applied, the 3 elements in bold are those major features identified by ASHA (2007)*

<b>CATEGORY</b>	<b>Key characteristic identified in the literature</b>	<b>Key references, – see list at end</b>
Speech sound production – segments	Difficulty with isolated consonant production	3, 6, 10, 11, 15, 16
	Vowel distortion	3, 6, 11, 12, 15, 16
Speech sound system – supra-segmental level	<b>Inconsistent errors on consonants and vowels in repeated productions of syllables or words</b>	1, 6, 9, 11, 12, 15, 16
	Can be differentiated from Inconsistent Phonological Disorder	4
	<b>Lengthened and disrupted co-articulatory transitions between sounds and syllables</b>	2, 6, 9, 11, 12, 15, 16
	Errors increase with word length and phonological complexity	7, 8, 11
	Can be differentiated from phonological difficulty	4, 13
	Imitation worse than spontaneous output	2, 3, 6
Connected speech	<b>Inappropriate prosody, especially in lexical or phrasal stress</b>	1, 3, 6, 15, 16
	Poor intelligibility	11, 15, 16
Non-speech oromotor & related issues	Oromotor difficulties including OMD & drooling	1, 3, 6, 9, 15, 16
	Infant feeding problems which may persist	3, 6, 11, 15, 16
Speech motor issues	Slowed DDK rates & disrupted DDK* sequence	5, 7, 8
	Speech motor behaviours, including groping during sound production	1, 3, 6, 9, 12, 15
Language & literacy	Expressive and receptive language difficulties may co-occur	1, 6, 9, 11, 15, 16
	Metalinguistic difficulties	1
	Literacy issues	1, 14, 15, 16
Other	Family history of speech, language or literacy difficulties	6, 15, 16
	General motor co-ordination difficulties	3, 6, 15, 16
	Late or absent babble / late to talk	6, 9, 15, 16

*\*DDK is described as ‘the study of motor control integrity in bodily functions through performance in rapidly alternating movements, e.g. (...) side to side movements of the tongue. In speech, the term has been extended to include syllable repetition at a maximum rate of utterance’ (Fletcher 1978, p2)*

Table References:

1	ASHA 2007	9	Pollock & Hall 1991
2	Bradford & Dodd 1996	10	Ripley et al 1997
3	Davis & Velleman 2000	11	RCSLT 2009a
4	Dodd 2005	12	Shriberg et al 2003
5	Dodd et al 2002	13	Shriberg et al 1986
6	Jaffe 1984	14	Snowling & Stackhouse 1983
7	Ozanne 1995	15	Stackhouse 1992a
8	Ozanne 2005	16	Williams & Stephens 2004

### Change over time

22. It is recognised that the symptom clusters of DVD often change over time. For an example, see the case study of a boy with 'DVD' over time (Stackhouse 1992b), summarised in Snowling & Stackhouse (2006). This change occurs in relation to the characteristic presenting features, and also to the severity, which tends to reduce over time in response to intervention.
23. RCSLT (2009a) states that '(features of) DVD can manifest itself in early infancy with difficulty with feeding, sucking, chewing, followed by a delay in expressive language, difficulty in producing speech, reduced intelligibility of speech and inconsistent production of sounds in familiar words' (p4). Studies show that the condition has long lasting sequelae (RCSLT 2009a, Conti-Ramsden et al 2001, Law et al 1998, Stackhouse 1992b).
24. Furthermore, it is recognised that the reported signs of DVD change in their relative frequencies of occurrence with task complexity, severity of involvement and age. For example, ASHA (2007) state that the complex behavioural features reportedly associated with CAS [DVD] place a child at increased risk for early and persistent problems in speech, expressive language and the phonological foundations for literacy, with the possible need for augmentative and alternative communication and assistive technology.
25. DVD features can be present to any degree from mild to severe, and have increasing impact on individuals as the demands of communication increase. As its presentation may change over time, additional challenges may arise. It may be that those progressing from a severe to a mild difficulty are those who have responded to therapy input; unfortunately there is insufficient data to determine this at the current time.

### Terminology issues

26. Although Developmental Verbal Dyspraxia (DVD) has been the favoured term in UK for the past 20 years or more, the condition has until recently been known in US as Developmental Apraxia of Speech (DAS). However, following the position statement and technical report produced by ASHA in 2007, it was recommended that the terminology in the US should be changed to Childhood Apraxia of Speech (CAS) and the condition defined as follows: 'Childhood Apraxia of Speech is a childhood neurological speech sound disorder in which the precision and consistency of movements underlying speech are impaired in the absence of neuromuscular deficits (e.g. abnormal reflexes, abnormal tone). The core impairment in planning and/or programming the spatio-temporal

parameters of movement sequences results in errors in speech sound production and prosody' (ASHA 2007). Ripley et al (1997) identify this core impairment as follows: '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' (p43). As stated above, RCSLT (2009a) describes (features of) DVD as having an underlying deficit in motor planning.

27. The US terminology, as defined by ASHA (2007) report, recognises that apraxia of speech can occur in 3 clinical contexts:
- (i) It is associated causally with known neurological aetiologies such as intruterine stroke, infections, trauma\*  
*\*NB acquired apraxia in adults may originate from neurological aetiologies including stroke, infections and trauma*
  - (ii) It occurs as a primary or secondary sign in children with complex neuro-behavioural disorders (e.g. Down syndrome, autism, epilepsy, galactosaemia)
  - (iii) It occurs as an idiopathic neurogenic speech sound disorder, in the absence of any known neurological or complex neuro-behavioural disorder
28. In contrast, the UK classification of 'characteristics or features of Developmental Verbal Dyspraxia' is used for the 2nd and 3rd of the above circumstances, but tends not to be applied to the acquired conditions in ASHA's 1st context. It therefore seems that the two key terms, CAS and (features of) DVD, apply to different populations, in that the ASHA term includes the acquired condition, which is typically omitted from the UK description and UK use of the classification. In view of this discrepancy, the RCSLT preference is that the term 'characteristics / features of DVD' is used in the UK context.
29. When considering the developmental presentation, i.e. contexts 2 & 3 above, the terminology in the literature appears to be interchangeable, and the reader is referred to both terms (CAS and DVD) when looking for clinical evidence.

Table 2 summarises the different rationales for the terminology used.

**Table 2: Differences in preferred terminology**

US	Rationale / Argument	UK & other English Speaking Countries	Rationale / Argument
Childhood	Regardless of time of onset, whether congenital or acquired, or specific aetiology	Developmental	Congenital rather than acquired, the latter having different presentation & label. However, it must be clarified that this does not mean that children will 'grow out of' the presentation
Apraxia	The distinction between 'a' (total) and 'dys' (partial absence/lack of function) is problematic when applied to CAS since although the child with suspected CAS may have very limited speech, there is rarely a complete absence of speech	Dyspraxia	'Dys' is used in many other conditions, both communication & medical, & is used to mean partial absence / partial lack of function, whereas in the UK, the prefix 'a' is often, although not always, used for total loss or absence
Of Speech	Implies a shared core of speech and prosodic features	Verbal	Reflects the impact not only on speech & prosody, but considers the potential impact on language & other communicative elements

## Aetiology

30. This remains unknown, but descriptions of DVD features have universally ascribed their origin to neurological deficits. In the acquired condition, included by the term CAS but not DVD, apraxia is associated with lesions in Broca's area and the sensori-motor cortex. In contrast, it has been difficult to find evidence of 'hard' neurological aetiology in the developmental symptom cluster. There have been differing viewpoints with respect to specific circuits and neuro-anatomical sites. Possible brain sites which may be implicated include the posterior parietal cortex, the corpus callosum (Rapin 1982) and the caudate nucleus (Fisher et al 1998).

31. There is also genetic evidence, with strong family histories reported (Lewis et al 2004). The potential for heritability has been confirmed in one very small subgroup, where the DVD symptom cluster develops subsequent to genetic

disruption of the FOXP2 gene (Belton et al 2003). It should be noted that FOXP2 is also associated with other speech & language difficulties.

### **Incidence and prevalence of DVD**

32. There has been relatively little research into the features of DVD, and minimal focus on incidence or prevalence in relation to the condition. Attempts to establish incidence and prevalence have been hampered by lack of definition of children included in the estimates and the presence of co-morbidities. There are, however, a few studies which have proposed estimates.
33. Shriberg et al (1997) estimated that CAS [DVD features] may occur in 1-2 children per 1000 (0.1 – 0.2%), based solely on clinical referral data. Delaney & Kent (2004) reported a study of 12,000 to 15,000 children with speech delay of unknown origin from 1998-2004, from which 516 children (3.4-4.3%) were identified as having suspected, but not confirmed, CAS [DVD features] – their estimates are greater than others, perhaps because many of those suspected perhaps would not be identified as having features of DVD. Law et al (2007) carried out a review of referrals for (features of) DVD and developmental / acquired dysarthria (DAD) in the London area; their findings indicated that these are low incidence conditions with combined occurrence of approximately 0.03%.
34. Over-identification is a factor that arises in much of the literature. Several papers, including Delaney & Kent (2004), show that clinicians identify a number of children as having suspected DVD features, who when assessed by researchers or clinical experts the potential diagnosis is rejected. Moriarty & Gillon (2006) confirmed the diagnosis in only three out of 10 referred children; McNeill et al (2009a) confirmed 12 out of 44 suspected cases; and Davis et al (1998) identified 4 out of 22 potential cases. Stringer & Nicholson (2011) found that only 1 of 7 of cases with DVD characteristics identified by SLTs actually had a confirmed presentation of a DVD symptom cluster.
35. It would appear then that there is a tendency of clinicians to over-identify this symptom cluster as being characteristic of DVD. This may in part be due to the lack of agreement over the primary cluster of symptoms, leading to different clinicians using different sets of criteria. In addition, none of the three key characteristics cited by ASHA (2007) (table 1) are specifically and solely associated with the symptom cluster of DVD. For example, inconsistent speech is the primary feature of Inconsistent Phonological Disorder (IPD; Dodd 2005) as well as being a key feature of DVD, and the two presentations may be confused in clinical contexts. Similarly, disrupted co-articulatory transitions and sequencing difficulties may be attributed to particular phonological difficulties. Inappropriate prosody may be a symptom of semantic or phonological difficulties (Constable et al 1997).
36. Broomfield & Dodd (2005) found that, of 936 children referred to and attending assessment at a UK SLT service, 320 had a primary speech difficulty (SI), but none of those were identified as having characteristics of DVD. The authors acknowledge that any young child with DVD characteristics may have been assigned to the severe expressive language delay category due to the

limited verbal output being used; this identifies a potential 2 children of the 936 cohort, equating to 0.2% referral incidence.

37. Given that the presentation of the symptom cluster changes over time, and that the features may unfold as a child develops, there are challenges about early identification of the symptom cluster as being features of DVD. However, it is essential that timely and accurate differentiation is made, in order that the appropriate intervention may be provided at the earliest opportunity.
38. Whilst each of the cited studies is based on clinical referral data, it must be remembered that features of DVD are usually identified as a severe presentation – it is unlikely that these children will not be referred to SLT services for assessment. However it should be noted that there is a range of severity, particularly changing over time, and that the less severe presentations may not be referred to services until later in their school lives. Typical features may be difficult to recognise in very young children as they have not yet emerged. They may also be difficult to identify in older children, as they may have learned to control the impact in simple communicative tasks, and only emerge in complex activities or in new contexts such as learning new vocabulary.
39. It can therefore be concluded, from the above studies, that the DVD symptom cluster is a rare presentation. However, its occurrence may be a warning sign of the likelihood of persisting speech difficulties, being identified in 0.2% of the referred population, i.e. 1 in every 500 children referred. The level of severity of the subjects in the above studies is not clear, and this may affect the prevalence calculations. Given that 1 in every 6 children are referred to SLT services (Law et al 2000), if every child with features of DVD is referred, this estimate extrapolates to around 1 in 3,000 children presenting with the DVD symptom cluster in the general population.

### **Co-morbidity**

40. There are four possible difficulties which can co-occur with the DVD presentation, either solely or in conjunction with each other, and each are explained below. These are:
  - a. Other dyspraxic / coordination difficulties e.g. oromotor, gross motor
  - b. Other communication difficulties e.g. expressive language difficulty
  - c. Other primary co-occurring conditions e.g. Down syndrome or Fragile X
  - d. Dyslexia / literacy difficulties
41. Children with characteristics of DVD may also have oromotor dyspraxia (OMD), which affects their ability to make and co-ordinate the movements of the larynx, lips, tongue and palate for activities other than sound production such as blowing, sucking and licking. Furthermore, they may also have limb or generalised dyspraxia which affects control over gross and fine body movements; these latter movement difficulties may be described as Developmental Co-ordination Disorder (DCD) by some professionals, particularly physiotherapists and paediatricians. The presence of OMD and/or DCD in a child suspected to present with characteristics of DVD is likely to give support for the classification. However, caution is advised when considering identification of this symptom cluster in young, particularly pre-lingual children.

42. ASHA (2007) recognised there was a significant research challenge to determine the diagnostic boundaries between DVD characteristics and developmental dysarthria. They suggest that the two symptom clusters appear to co-exist in some children and there can be an overlap of speech, voice and prosodic features. Children presenting with DVD features may also have phonological processing difficulties – all will have phonological output difficulties, and there is some evidence that they may also have difficulties with input processing and phonological representations (Stackhouse & Snowling 1992a; Bridgeman & Snowling 1988). Furthermore, children with DVD features may have co-occurring primary communication difficulties such as language or fluency difficulties.
43. A number of studies have identified DVD features in children with known neuro-behavioural disorders, including Down syndrome (Kumin 2006; van Bysterveldt et al 2010) autism (Page & Boucher 1998; Boyar et al 2001), epilepsy (Scheffer et al 1995), Fragile X (Roberts et al 2003) and the metabolic disorder, galactosaemia (Webb et al 2003; Shriberg et al 2011). It has also been found in particular chromosomal conditions such as velo-cardio-facial syndrome [22q11.2 microdeletion syndrome] (Mills et al 2006, Kummer et al 2007), 7q11 23 duplication syndrome (Velleman et al 2010) and FOXP2 mutation (Belton et al 2003).
44. Although not yet well documented in the literature, anecdotal clinical reports indicate subgroups of deaf children and of children with learning disabilities who also present with DVD features. It would appear, then, that features of DVD may co-occur with a range of other primary conditions, as well as a symptom cluster in the absence of any other difficulties.

### **The nature – nurture argument**

45. The DVD symptom cluster is present across all strata of society, regardless of socio-economic status, maternal education and other similar impacting factors of the nurture argument. There are early signs that there may be a neurological and/or genetic element to the condition, which confirms its nature status. Whilst there is often a familial connection, this is not always the case, and there are no reports of children with DVD features changing their presentation due to a change in environmental circumstance. The implications of this are that children presenting with characteristics of DVD require direct work on their speech production if their presentation is to improve, as well as targeting any other deficit areas.
46. However, those children who do have a disadvantaged environment leading to a delay in communication skills (Locke et al 2002), or those who have an additional primary disability (RCSLT 2006), are presented with a significant double disadvantage should DVD characteristics co-occur, given the lifelong impact of the latter condition (Hartshorne 2006).
47. It is therefore crucial to note that these children need a specific intervention programme, planned and led by a specialist SLT. Environmental enrichment is a beneficial intervention to support every child's linguistic development, but is

insufficient to facilitate change in the DVD symptom cluster, as with other types of speech impairment.

## **Vision and Values**

48. The ability to communicate is 'an essential life skill for children and young people, and underpins a child's social, emotional and educational development' (Bercow 2008 p6). It is this statement that forms the basis for the vision and values for the management of those presenting with characteristics of DVD, in which we aim to maximise each individual's potential by optimal management of their presenting communication disability.
49. The specific objective of Speech and Language Therapy for this population is to meet the individual's needs in an appropriate and timely manner. This will include
- Accurate identification of the nature of the presenting difficulty, its impact on the child's development e.g. literacy & psychosocial functioning, and its impact on the individual and those caring for them
  - Provision of the relevant amount and duration of direct SLT intervention, planned, at times undertaken by, and at all times coordinated by a specialist SLT. This need will vary over time and between individual children, and the nature and intensity of provision should be adapted to meet these varying needs and the growing evidence base
  - Monitoring progress and adjusting provision accordingly
  - Intention to provide an equitable service, based on robust current evidence where available
  - Collaborative working with all those involved with the individual, including the family and educators
50. In addition, timely and appropriate discharge is essential. It is important that this discharge is preceded with the relevant level of assessment, e.g. non-word repetition assesses the ability to process new material (see Stackhouse et al 2007, 222-224 for a detailed description of specification of discharge criteria). Individual SLT services may develop their own discharge criteria, such as Kent Community Health NHS Trust's criteria as follows:
- No further therapy required
  - Residual mild speech difficulty
  - Speech errors resolved
  - Client and/or parents satisfied with level of progress
  - Limited parental/school involvement to support the programme on a regular basis, e.g. daily practice of specific activities
  - Maximum potential achieved at the time of the decision
  - Other therapy package is more appropriate to meet the child's need e.g. Augmentative Alternative Communication (AAC) – which would lead to the end of the DVD features care pathway and care episode, but SLT intervention would continue as appropriate. It should be noted that individuals may return to a DVD pathway at future points in their development, as appropriate.
51. The wider impact of SLT must consider quality of life and maximising access to life opportunities for these individuals.

52. It may be that different models of service delivery are appropriate, depending on local context and circumstance, but the underlying principles will be the same
53. Research into this symptom cluster, its aetiology, identification and assessment, intervention options and quality of life issues must be supported and encouraged, in order to guide future service delivery and development

### **External drivers**

54. There are a wide range of potential commissioners/contracting organisations and providers of services, and both these and the legislative & organisational contexts vary from country to country across the UK. The changes to the manner in which health services will be delivered and commissioned have a differing focus brought about by the advent of a changed set of political priorities in health, education and social care.
55. In England, the Primary Care Trusts (PCTs) were previously responsible for commissioning services in England and for performance managing the outcomes of the contracts they agreed. The Health Bill (2011) will change the commissioning arrangements significantly with a National Commissioning Board overseeing the commissioning of specifically identified 'low incidence' conditions and needs and local commissioning structures emerging to take responsibility for the majority of services within a geographical area. At the time of going to press, the newly emerging Health and Wellbeing Boards will be the bodies to whom clinicians in England will be accountable; they will hold the purse strings. The combination of these new arrangements will ensure greater patient focus and involvement, increased participation in local decision making; there will be a national accountability through the Secretary of State for Health.
56. The establishment of commissioning guidance for services in England is clear - commissioning and contracting arrangements are undertaken in an open and transparent manner at all times with any willing qualified provider being able to enter into arrangements with commissioners. The rules of engagement are such that, in terms of compliance for the new regulations (Revision to the Operating Framework for the NHS in England 2010/11<sup>19</sup>), a number of criteria exist to ensure any willing partner may avail themselves of the opportunity as it arises: tendered services require a Pre-Qualification Question (PQQ), an Invitation to Tender (ITT) and a process to award and agree the contractual arrangement being entered into. The revised criteria for any reconfiguration have four critical tests for England: firstly to ensure support from GPs, secondly a strengthened public and patient engagement, thirdly clarity on clinical evidence base and finally there must be a consistency with current and prospective patient choice.
57. In Wales, there are seven health boards which receive their health allocation budget from the government and these health boards are integrated planners and providers (the word commissioning is not used in Wales). Uniquely, Wales has executive board members of therapies and health sciences. These new roles have varied responsibilities at the moment but at a minimum professional accountability for therapy services.

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<sup>19</sup> Accessed via [www.dh.gov.uk](http://www.dh.gov.uk)

58. In Northern Ireland, five local commissioning groups have been formed to provide commissioning guidance to the Health and Social Care Board (HSCB). These local commissioning groups are comprised of local councillors, GPs and others, and one AHP commissioner. THE HSCB also has responsibility for commissioning regional services.
59. In Scotland there are 14 Local Health Boards (LHB) and 32 Local Education Authorities obtaining their budget from the Scottish government. The budgets of the LHBs are based on local need. There are three to four community health and care partnerships per LHB, providing information on need. SLTs are employed by LHBs.
60. In addition, there have recently been significant economic efficiencies created so that both social care and the third sector are experiencing similar drivers to perform more efficiently.

### **Internal drivers**

61. Current reforms across health, education and social care include greater focus both on clinical outcomes and on service user preference and choice. The NHS White Paper, Equity and excellence: Liberating the NHS sets out the Government's long-term vision for the future of the NHS. It reiterates the need to put patients at the heart of everything the NHS does, to focus on continuously improving those things that really matter to patients - the outcome of their healthcare and empower and liberate clinicians to innovate, with the freedom to focus on improving healthcare services. Readers are referred to the work being undertaken by RCSLT in relation to the NHS Outcomes Framework, and in identification of appropriate measure for the profession.
62. There are several important documents recently produce by RCSLT which impact on the provision of services and on their delivery. These include CQ3 (RCSLT 2006), RCSLT Clinical Guidelines (RCSLT 2005), RCSLT Resource Manual for Commissioning and Planning Services for SLCN (RCSLT 2009a), Supporting children with speech, language and communication needs within integrated children's services: RCSLT Position Paper (Gascoigne 2006), The RCSLT Quality Self-Evaluation Tool: Q-SET (RCSLT 2011) and the An economic evaluation of speech and language therapy, December 2010 Matrix Evidence and RCSLT. These are intended to guide commissioners and managers of services, in particular, in identification of service standards, delivery models, economic analysis and specifications. Readers are also referred to the Commissioning Support guidance, produced in 2011, on SLCN which provides a set of documents designed to explore ways of improving speech, language and communication outcomes for children and young people.  
<http://www.commissioningsupport.org.uk/the-commissioners-kitbag/in-depth-publications.aspx>
63. The other key focus in current reforms is the requirement of evidence based practice. The RCSLT Research Strategy (RCSLT 2009b) positions the profession in this regard, and demonstrates the profession's commitment to building and implementing the evidence base.

## SLT roles and responsibilities

64. ASHA (2007) advised that it is the speech and language pathologist [SLT] who is responsible for making the primary diagnosis of CAS [DVD] and for designing and implementing the appropriate individualised speech-language treatment program. They concluded: 'a SLP [SLT] with specific experience in pediatric speech sound disorders, including motor speech disorders, is the appropriate professional to assess and diagnose CAS [DVD]' p38.
65. With regard to UK practice, RCSLT (2006), in CQ3 advises that SLTs working with children with SI (which includes children with features of DVD) have a responsibility 'to identify, assess, diagnose and to investigate and/or treat all aspects of complex speech disorders: consonant production, vowels, voice, nasality, prosody, rate, volume, inconsistency, connected speech and intelligibility' (Howard 2004, CQ3 p374). Furthermore, they have a responsibility: 'to ensure that therapy approaches are appropriate and targeted to the nature of the underlying deficits and strengths' and 'to ensure that intervention for speech disorders is based on appropriate theoretical models and current evidence' (Baker & McLeod 2004, CQ3 p374).
66. RCSLT (2006), in CQ3, advised that 'intervention for these children should be provided primarily by an SLT with developed expertise in complex and severe speech disorder. Follow-up activities may be continued by an SLT assistant or a teaching assistant in school but demonstration of specific techniques with frequent reminders of the technique by the SLT, or the use of video therapy, is essential' (p373).
67. RCSLT (2006) provides advice for the management of children with SI (which includes those with DVD). It advises that these children need direct input from SLT in order to progress (Law et al, 2000). Furthermore, therapy programmes need to be tailored to the unique needs of the individual with a complex and severe speech disorder. Intervention may be provided individually, in pairs or in small groups. There is evidence that few children with SI improve beyond age-commensurate progress [i.e. 6 months progress without intervention over a 6-month period] (Broomfield & Dodd 2005). Again, due to the heterogeneity of the group it is difficult to predict outcome overall, but it seems that there is more likelihood of those with a delayed system to have more spontaneous recovery than those who have a disordered system, including DVD. However, there is emerging evidence that some children with SI change without intervention (Wren & Roulstone 2008).
68. ASHA (2007) gave some advice with regards to treatment delivery, based on 'expert clinical opinion'. Since children with DVD need repetitive planning, programming and production practice, they suggested that children need:
- Individual (rather than group treatment)
  - Delivered intensively (i.e. 3-5 treatment sessions per week with SLT)
  - More frequent short sessions are preferred to less frequent longer sessions
  - Practice at home, between sessions, is essential
  - Practice should be in addition to, not instead of, sessions with the SLT

Clinical experts in the UK have added the following clarifications to the above list:

- Group therapy can be successful, so long as each individual has an individually tailored programme
- Some UK SLT services favour 'blocks and breaks' of therapy, e.g. 6 weeks therapy followed by 6 weeks consolidation period; others favour a consultative or advisory provision – this is contrary to the recommendations listed above which are upheld by RCSLT as there is no robust evidence for these models of delivery at the time of going to press
- Liaison with educational providers is essential, in order that a comprehensive service is provided to support children in all contexts
- It may be that specific educational placements, which have access to intensive specialist SLT for these children, such as language resource bases or speech and language units, may be appropriate provision for varying periods of time

Whilst the evidence for intervention for this group of children is limited, it is beginning to emerge

69. There are implications for training and maintenance of specialist skills in the SLT workforce, in accordance with the registration requirement that all SLTs maintain their knowledge and skills through CPD. The reader is referred to the RCSLT CPD framework [at [http://www.rcslt.org/members/cpd/cpd\\_framework](http://www.rcslt.org/members/cpd/cpd_framework)] for further detail and guidance.
70. There is currently variation of access to specialist SLTs across the UK. In some areas, an SLT who has significant experience and some post-graduate training in SI provides advice and guidance as well as second opinions for less experienced and generalist SLTs. They also lead the management of these complex cases. In other areas, no such specialist exists. The only national specialist centre specifically specialising in children presenting with the DVD symptom cluster is the Nuffield Hearing & Speech Centre, RNTNE Hospital in London; other local services may provide specialist provision for their caseloads of individuals with SI, which may include input into educational placements specifically providing for children with severe/specific speech/language impairment. The service at RNTNE provides second opinion assessments as well as some time-limited treatment for children referred by local professionals, in addition to providing support and training for SLTs working with this caseload.
71. Furthermore, Special Interest Groups for clinicians working with children with speech disorder create a forum for clinical supervision alongside specific CPD relating to the topic. In addition, post-graduate short courses in SI are available in some HEIs, and the University of Sheffield offers an MSc course in Speech Impairment.
72. When children present with suspected DVD features in complex neuro-behavioural conditions or co-morbid presentations, there is likely to be a multi-disciplinary team involved, including medical practitioners, teaching staff, psychologists, physiotherapists, occupational therapists and audiologists alongside SLTs.

73. Regardless of the educational placement of the children, it is essential that there is coordination between the SLTs, the family and teaching staff, in order that the educational impact of the difficulty can be minimised. This is particularly the case for the development of literacy skills and differentiated access to the curriculum.

### **Assessment and Development of Differentially Diagnostic Profiles**

74. RCSLT's CQ3 (2006) includes a section on Speech Impairment (SI), and reference is made to responsibilities concerning assessment. In particular, the assessment will inform the differential profiling of the difficulty (ibid, p201). ASHA (2007) were unable to make specific recommendations with regards to assessment guidelines due to the limited research evidence available. However, they advised that assessment of the symptom cluster should include measures from the following domains: non-speech oral-motor, speech production, prosody, voice, speech perception, language and meta-linguistic e.g. phonological awareness skills such as initial sound identification (tacit to explicit skills across the age range) and literacy skills (older children).
75. It should be noted that caution has been advised in identification of features of DVD in very young children (Davis & Velleman 2000). Furthermore, it must be remembered that, as DVD is typically identified by speech output characteristics, it cannot be identified with confidence until the child has some spoken output and the SLT can find evidence of indicative speech and prosodic features. The presence of early 'red flag signs' such as feeding difficulties, drooling, oromotor dyspraxia, developmental coordination disorder, limited vocalisations and babbling may result in DVD characteristics being suspected. However, the profile cannot be confirmed until the child has some attempts at words. Furthermore, many of these 'red flag' symptoms are also potentially indicative of other conditions e.g. dysarthria, speech delay, expressive language delay or disorder as well as other SI subtypes.
76. With regard to speech, assessment should include performance in multiple contexts e.g. spontaneous production, elicited production and imitation of syllables, single words – familiar, unfamiliar and non-words -, phrases, sentences and discourse. Furthermore, ASHA (2007) reported that clinically experienced researchers stress the diagnostic importance of certain key contrasts: automatic versus volitional actions, single versus sequences of postures, simple versus more complex contexts, repetitions of the same stimuli versus varying stimuli, sequential versus alternating motion rates and tasks involving different combinations of visual, auditory and tactile cues. They advise that it is also a requirement to consider assessing both single word naming and continuous speech assessment, since these may demonstrate different clusters of symptoms; indeed, older or less severe children may show characteristics of DVD in connected speech and non-word repetition, but have appropriate performance on single word naming, particularly if those words have a simple structure.
77. Stackhouse & Wells (1997) recommend assessment at all stages of psycholinguistic processing, profiling strengths and weaknesses relating to speech input (e.g. auditory discrimination), lexical representations (e.g. how

speech information is stored) and speech output (e.g. programming of articulators) in order to identify the focus of intervention.

78. In addition, Dodd (2005) advises an assessment of consistency, and to compare imitation with spontaneous production (particularly in older children), to enable distinction between DVD and Inconsistent Phonological Disorder (IPD). This is important as there is a growing body of evidence showing the effectiveness of Core Vocabulary Therapy (e.g. Dodd et al 2004; Dodd 2005; Dodd et al 2006; Dodd & Bradford 2000 & 2002) for IPD. Clinical evidence from expert SLTs suggests that there is frequent confusion of these two conditions; the implications of this are inappropriate discussions with families & service providers, as well as inappropriate intervention which will prolong the existence of the condition.
79. It is acknowledged that there are a range of options, both theoretical and clinical, in terms of describing and profiling the presenting SI. Each is likely to impact on the chosen intervention approach.
80. There is a need to differentiate between young children presenting with features of DVD from those presenting with an expressive language difficulty, particularly when these children are at a pre-verbal stage. This challenge was identified by Broomfield & Dodd (2005), where two 'pre-verbally expressive' children were classed as having a language difficulty when they may have emerged as having characteristics of DVD. The opposite situation is also possible, with children being identified as having features of DVD when, in fact, they have an expressive language difficulty such as word finding difficulties. In addition, some children may have comorbid expressive language difficulties alongside DVD features.
81. Finally, caution should be applied when children presenting with speech difficulties are resistant to change, particularly in response to therapy over a period of time. Anecdotally, some of these children are diagnosed as having DVD as a default position as a result of lack of change. It is acknowledged that for many children with features of DVD, progress is likely to be slow, even in response to therapy, due to the complex nature of the difficulty. However, the identification of DVD as the presentation cannot be made based on only one characteristic e.g. resistance to change in therapy. Clearly there needs to be much more evidence to support such a classification, and in such cases, the accuracy of the diagnosis and the appropriacy of the intervention should be examined and discussed with a clinician with expertise in the area of SI.
82. A range of formal assessments of SI are available. These include
- Nuffield Dyspraxia Programme Assessment (in Nuffield Dyspraxia Programme [NDP] Williams & Stephens 2004) assesses production of consonants and vowels in isolation, single words of different phonotactic structures, and phrases and sentences. Oromotor skills and diadochokinetic skills (DDK) are also assessed. The assessment allows for the identification of segmental and supra-segmental features of the DVD symptom cluster, thereby assisting in diagnosis. The profile of skills demonstrated at different levels of phonotactic

structure can be used to plan intervention, and links into resources in the NDP (Williams & Stephens 2004, 2010).

- Compendium of Auditory and Speech Tasks (Stackhouse et al 2007) provides the psycholinguistic framework and assessments needed to draw up a child's speech processing profile as a basis for intervention and prediction of possible outcomes. These tasks include auditory discrimination of real and non-words and words in sentences; mispronunciation detection tasks to investigate lexical representations; speech production of real and non-words in naming and repetition tasks; connected speech assessment; and diadochokinetic tasks. Data from typical children aged 3-7 years are included for comparison and a CD Rom provides the picture stimuli needed.
- Diagnostic Evaluation of Articulation and Phonology [DEAP] (Dodd et al 2002) is a standardised assessment that provides a range of sub-tests which not only allows phonological analysis to be undertaken, but also supports differential diagnosis of output phonological processing difficulties. The assessment begins with a brief screen, incorporating naming of 10 single word pictures, imitating all sounds produced in error, and re-naming the 10 pictures; this then allows a mini-analysis of the difficulty and the clinician is then directed to the relevant detailed sub-tests, which incorporate an articulation assessment (picture naming, sound and syllable imitation), oromotor and DDK assessment (movement and sound production and sequencing), phonology assessment (picture naming at single word and sentence levels, supported by phonological analysis and PCC standardised scoring) and inconsistency assessment (25 pictures to be named 3 times each).

83. In the field of SI, UK clinical practice has been influenced by two differing approaches to assessment and management over the past 15-20 years, mentioned above but described in more detail as follows.

### **Theoretical understanding**

84. Historically, the debate over the core deficits seen in the DVD symptom cluster has involved linguistic, psycholinguistic and motor perspectives. Currently, the debate is over motor & linguistic perspectives versus motor only perspectives. Deficits in the planning, programming and execution of speech motor events have each been proposed as a core deficit in the DVD symptom cluster. However, most authors have placed the source of the speech production difficulties as 'upstream' of the actual execution of the motor plan (ASHA 2007). There is also debate about causes and consequences of DVD features, and it is generally acknowledged that there is an interaction.

85. RCSLT (2009a) suggest that those children with (features of) DVD have 'a speech disorder resulting from an impairment of motor planning ... there is an impairment or immaturity in organisation of movement related to motor planning' (p4). It must be remembered that changes over time may lead to a persistent long term need, but that the severity may reduce over time in response to intervention.

## **Psycholinguistic approaches**

86. In psycholinguistic approaches (Stackhouse & Wells 1997; Hewlett 1990), children's speech difficulties are seen as being derived from a breakdown in the speech processing chain at one or more levels of input, stored linguistic knowledge and output. These approaches rely on the use of speech processing models and hypothesis testing, with the aim of allowing clinicians to go beyond description to potential explanation of children's speech difficulties.
87. A psycholinguistic approach does not aim to differentiate between diagnostic labels as such, but first identifies a child's speech processing strengths and weaknesses as a basis for planning intervention. Key features of the psycholinguistic approach developed by Stackhouse and Wells (1997) is the integration of input/output skills, speech and phonological awareness skills, and the relationship between spoken and written language development.
88. A number of case studies have been written, showing the application of this approach to children with SI including those presenting with features of DVD. For example, Stackhouse & Snowling (1992b) provide a detailed description of speech input and output skills of two school age children with DVD features; Stackhouse & Wells (1997) provide a longitudinal case study of girl from age 3 to 10 which shows the importance of systematic assessment of auditory discrimination, speech, and spelling skills, and Stackhouse et al (2007) detail a longitudinal group study of children with persisting speech difficulties. Stackhouse & Wells (2001) and Pascoe et al (2006) focus on intervention case studies.
89. Historically, children thought to have features of DVD have been reported to have output difficulties primarily and therefore there have been few studies of speech perception. However, a small number of studies have investigated auditory discrimination in children with features of DVD. Bridgeman & Snowling (1988) reported that children with features of DVD had more difficulty discriminating between cluster sound sequences (e.g. 'ts' & 'st'), compared to typically-developing controls. This difficulty was significantly more pronounced when the stimuli presented were unfamiliar (i.e. non-words vs real words). Maassen et al (2003) reported that children with features of DVD had more difficulties in discriminating vowels compared to typically-developing controls. Such findings give support for the need to carry out speech input tasks as part of routine speech assessments.

## **Sub-grouping of SI presentation**

90. Barbara Dodd has become widely known for her work in sub-grouping of children's speech difficulties. Four subgroups of children who have SI of unknown origin have been identified: articulation disorder, phonological delay, consistent phonological disorder and inconsistent phonological disorder; in addition, the presence of features of DVD is acknowledged as a rare presentation. Each subtype is associated with a particular pattern of performance and is purported to arise from a different underlying deficit (Ozanne 2005, pp71-82). These subtypes have been identified in a range of different cultures and languages (Holm & Dodd 1999a, 1999b, 2001; Holm et al

1999c; Zhu & Dodd 2000a, 2000b; Fox & Dodd 2001; Dodd 2005; So & Dodd 2007).

91. This theoretical standpoint has led to the development of the DEAP standardised assessment (see above; Dodd et al 2002) which is normed on a number of English speaking populations. Differential treatment approaches have been advised for each subtype and there is a growing body of research evidence demonstrating the effectiveness of these (Holm & Dodd 1999b; Dodd & Bradford 2002; Dodd 2005; Broomfield & Dodd 2005; Crosbie et al 2005; Holm et al 2005; Crosbie et al 2006; McIntosh & Dodd 2008). The focus of this approach is on the processing and output of speech, rather than input, but does not preclude additional probing of this area when deemed appropriate.
92. With regards to features of DVD, Bradford & Dodd (1996) included a subgroup of children with DVD characteristics, along with groups presenting with phonological delay, phonological disorder and typically-developing controls in a study investigating motor deficits. Group assignment was carried out by two experienced SLTs on the basis of the children's speech profile on single word and connected speech tests and performance on oral and speech motor tasks. The findings showed different patterns of performance for each group, suggesting that the groups were distinct and distinguishable from one another. The results supported the notion of the DVD symptom cluster as a multi-deficit presentation (Ozanne 1995) which includes difficulties with oro-motor planning and in implementing fine motor actions, in addition to a distinctive pattern of speech errors.

## **Intervention**

93. ASHA (2007) reported there had been few treatment studies of CAS [features of DVD] published in the peer-reviewed literature. They were only able to identify four, none of which met the highest level of evidence. These were Powell (1996), Strand & Debertine (2000), Bahr et al (1999) and Gibbon et al (1999).
94. A similar situation was found by Morgan & Vogel (2008) who carried out a Cochrane review of interventions for the DVD symptom cluster. They concluded there was 'a critical lack of well controlled treatment studies ...making it impossible to draw conclusions about which interventions are most effective.' However, it is important to remember that Cochrane reviews only include RCTs, hence do not consider all available evidence. They did cite the following examples of well-controlled single subject designs: Strand et al (2006) and Lundeborg & McAllister (2007). Morgan & Vogel (2008) recommended that the way forward in building the evidence base for intervention of features of DVD was to produce well-controlled case studies. In recent years, this evidence has begun to emerge.
95. It should be noted that there has been a recent increase in the number of intervention studies undertaken, and that these are in the process of being published. A number are summarised below, together with key earlier studies.

## **Intervention studies for children with features of DVD**

96. Moriarty & Gillon (2006) reported three case studies of children with features of DVD, aged 6.3 - 7.3 years. They used an integrated phoneme awareness approach, along with speech production work intensively (three times each week) for three weeks and reported some changes to speech, phonological awareness and decoding.
97. McNeill et al (2009a) reported 12 single subject case studies of children aged 4 - 7 years. They also used an integrated phonological awareness approach along with speech sound targets. The children received two blocks of twice weekly sessions for six weeks (separated by six weeks of no therapy). The authors reported that nine of the 12 children made significant gains in production of target speech sounds and transfer of skills to connected speech for at least one speech target. In addition, eight of the 12 children showed gains in at least one target phoneme awareness skill. Overall the group showed improvements in phonological awareness, letter knowledge, word decoding and spelling.
98. Strand et al (2006) report four case studies of children with severe features of DVD. Each received treatment involving Dynamic Temporal and Tactile Cueing (DTTC) twice daily for five days (30 minutes at a time) over 4-6 weeks from SLT. In addition, the parents were asked to practice twice daily for five minutes at a time. At the end of the study, three of the four had improved with articulatory accuracy and verbal communication.
99. Lundeborg & McAllister (2007) reported a case study of a 5 year old who received treatment over an 11 month period, using a combination of intraoral sensory stimulation and electropalatography. They reported gains in percentage consonants, phonemes and words correct and improved intelligibility ratings.
100. Iuzzini & Forrest (2010) reported four case studies of children with features of DVD, aged 3.7 - 6.10 years. They used a combined treatment approach, involving stimulability (designed to develop each child's phonetic repertoire) and a modified Core Vocabulary approach (Dodd et al 2004, designed to develop consistency of production). Each child received 20 treatment sessions, delivered twice weekly. The authors reported expansion of phonetic inventories, increased percentage consonants correct and improvements in consistency of production.
101. Grigos et al (2010) reported a single case study of a child aged 3.7 years at the start of treatment. He received PROMPT (Prompts for Restructuring Oral Motor Phonetic Targets) therapy twice weekly for eight weeks. The authors reported changes in articulator movement and segmental accuracy on treated and untreated words, following the intervention.
102. Ballard et al (2010) reported the results of a single subject study for treating dys-prosody in three children (aged 7 - 10 years) with CAS [features of DVD]. Over a three week period of intensive treatment, the children improved on their production of lexical stress in nonsense words, as well as showing improvements in control of loudness and pitch.

103. Martikainen & Korpilahti (2011) reported a single subject case study of a 4 year old child. A combined approach involving melodic intonation therapy and touch-cue therapy was used. The authors reported a decrease in speech sound errors and an increase in sequencing abilities and whole word production following intervention.
104. Edeal & Gildersleeve-Neumann (2011) reported the results of a small scale study, which supports the need for frequent repetitive practice in treatment sessions with this client group. Two children with CAS [DVD features] received intensive therapy using the DTTC approach but the production frequency of targets was varied during therapy sessions. Both children improved following intervention. However, the child required to produce the greater number of repetitions per 15 minute period (100 vs 30-40 repetitions), made more rapid gains.
105. Bratsou & Madeira (2010) reported the use of different treatment approaches in their specialist service for children with features of DVD including: traditional phonological and articulation therapy, Nuffield Dyspraxia Programme (NDP), Core vocabulary, Dynamic Temporal Tactile Cueing (DTTC), MORE (Suck, swallow, breath synchrony) and Electropalatography (EPG). Treatments are selected to suit the needs of individual children and furthermore are eclectic in using combinations of approaches, as required. 24 cases were seen for twice weekly therapy and of these, 10 are now closed. Only 25% of cases did not achieve 100% of their therapy outcomes, measured on a three monthly basis using the East Kent Outcome System [EKOS] (Johnson & Elias 2002).
106. Joffe & Pring (2008) reported on UK SLT practice with regards to intervention approaches. They described the NDP (Williams & Stephens 2004) as a popular, but optional therapy (meaning that 50% of respondents used it sometimes). No studies have yet appeared in the peer-reviewed literature concerning this treatment approach. However, a paper was presented at RCSLT's 2009 scientific conference (Pagnamenta & Williams 2009) and a poster was presented at ASHA (2010) convention (Williams 2010). Both concerned case studies (4 and 2 respectively) who received treatment using NDP.
107. The reader is directed to two additional publications, each of which features a wide range of intervention approaches for SI. Firstly, the Australian Journal, *Advances in Speech-Language Pathology*, published a special edition featuring 'Jarrod' (2006, 8, 3). In this edition, a case presentation is provided to experts around the world; each then has written a chapter describing how their theoretical model can be applied to this particular case in order to improve his significant speech difficulties; the edition ends with a summary of the intervention which was provided together with outcomes. It should be noted that the two key theoretical approaches discussed above are discussed in further detail in this edition (Crosbie et al 2006; Stackhouse & Pascoe 2006). Secondly, a recently published book, 'Interventions for Speech Sound Disorders in Children', edited by Williams, McLeod & McCauley (2010) has the primary purpose of this book is to describe and critically analyse a wide range of intervention approaches used for speech sound disorders in children. It comprises

chapters on 23 different intervention approaches, written by authors from around the world (USA, UK, Ireland, Canada and Australia). Each individual chapter was written using the same template, with prescribed headings and expected content. The interventions were selected by the editors based on their empirical evidence or potential efficacy, as well as their widespread use across ages, severity levels and populations. They include approaches that focus on sound production accuracy, system-wide restructuring of the child's phonology, motor speech and perceptual training, as well as computer-based interventions and family-focused interventions. An accompanying DVD of video clips provides a demonstration of the interventions described in the chapters.

Table 3 summarises the above studies

**Table 3: summary of intervention studies detailed above**

Author	Number	Ages	Sessions	Therapy focus
Moriarty & Gillon 2006	3	6.3 – 7.3	9	Integrated phoneme awareness
McNeill et al 2009a	12	4 - 7	6, break, 6	Phonological awareness & speech sounds
Strand et al 2006	4		40 - 60	DTTC
Lundeborg & McAllister 2007	1	5	11 months	Intraoral stimulation & EPG
Iuzzini & Forrest 2010	4	3.7 – 6.10	20	Stimulability & modified core vocabulary
Grigos et al 2010	1	3y7	16	PROMPT
Ballard et al 2010	3	7 - 10	3 weeks	Treating dys-prosody
Martikainen & Korpilahti 2011	1	4	?	MIT & touch cue
Edeal & Gildersleeve-Neumann 2011	2	?	intensive	DTTC
Bratsou & Madeira 2010	24	?	?	Mixed

108. In summary, no specific treatment approach for management of children with features of DVD has been identified to date as being the optimum effective approach, and further research is required. This probably reflects the individual variation and heterogeneity of children presenting with features of DVD, the uncertainty about the symptom cluster, and the changing picture across the age range. However, there is a growing body of clinical expertise in this area, and emerging evidence for approaches that focus on the following aspects:

- Expansion of phonetic inventory, e.g.
  - Stimulability: Iuzzini & Forrest 2010
  - Nuffield Dyspraxia Programme (NDP): Williams & Stephens 2004
  - Electropalatography: Lundeborg & McAllister 2007
- Tactile cueing approaches to develop sounds, syllables and words e.g.
  - PROMPT: Grigos et al 2010
  - DTTC: Strand et al 2006
  - Touch-cue: Martikainen & Korpilahti 2011
  - Melodic Intonation Therapy: Martikainen & Korpilahti 2011

- Consistency of word production e.g.
  - Dodd 2005
  - Iuzzini & Forrest 2010
- Frequent repetitive practice e.g.
  - Edeal & Gildersleeve-Neumann 2011
  - NDP: Williams & Stephens 2004
- Speech production work which incorporates teaching of phonological awareness e.g.
  - McNeill et al 2009b
- Prosodic aspects of speech e.g.
  - Ballard et al 2010

## **Early intervention**

109. Law et al (2007) reported that there is a consensus amongst practitioners and parents that early intensive intervention is important for children with features of DVD, given the nature and severity of the children's difficulties. Although not specifically referring to features of DVD, the importance of early intervention was a strong theme in the Bercow report (Bercow 2008) recommendations. RCSLT (2006) advises children with speech impairment (including those with features of DVD) require early intensive and differential intervention to prevent stabilisation of (or to destabilise) atypical simplification error patterns and their phonological sequellae. It seems logical to suggest that such direct intervention on speech needs to take place when children are developmentally and cognitively ready to cope with motor planning drills and the like.
110. In the earlier stages of intervention, SLT support may be more about establishing communication systems and helping the parents and other practitioners involved with the child begin to understand the nature and long term implications of the classification once its presence is confirmed.
111. However, given that the DVD presentation is a lifelong condition which changes in presentation with increasing age, it seems logical to conclude that intervention is also required beyond this early stage. So, intervention should begin early, with one particular focus, but the focus will change as other skills emerge. For example, the focus may move from communication strategies, communication pre-cursors (e.g. attention & turn-taking) and vocalisation to motor planning drills, phonological awareness or literacy, as the child develops.

## **Changing presentation**

112. From the reports available, it is apparent that the speech and prosodic difficulties of children with features of DVD are likely to persist past the developmental period, unlike speech delay (Lewis et al 2004). However, over time, their speech becomes less disordered with improvements in speech accuracy. Some children will become largely intelligible, although 'residual dyspraxic features' may exist (Corrin 2001). RCSLT (2009a) cites several studies that have shown that 'speech impairments involving phonological impairments and (features of) developmental verbal dyspraxia have long lasting sequellae'. Other difficulties may take over as the main area of concern e.g. literacy difficulties. For some children, many years of treatment are required (Shriberg

et al 1997; Stackhouse & Snowling 1992b; Marquardt et al 2004; Davis et al 2005; Jacks et al 2006).

113. Lewis et al (2004) reported on 3 groups of children: suspected features of DVD (n=10), SI (n=15) and combined speech & language difficulties (n=14). The children were tested at two time points, at 4-6 years (T1) and at 8-10 years (T2), on measures including articulation, DDK, language, reading and spelling. For the children suspected to have features of DVD, they found 8/10 improved on articulation from T1 to T2. However all 10 continued to have difficulties with syllable sequencing, non-word repetition, language and had reading & spelling difficulties.
114. The effect of increased performance load on the frequency of errors is indicated by a greater number of errors in polysyllabic words and in connected speech samples with varying length phrase and sentence segments compared to single word samples. The increased demand on the child's phonological system caused by longer, more complex words, or using words in longer phrases is a threat to the stability of word production leading to inconsistent realisation of words even within the same utterance. These children form a subgroup of children with inconsistent speech disorders indicative of a phonological planning deficit. The second subgroup is of children who have inconsistent speech in the absence of increased demand. On its own, inconsistent speech is not an indicator of DVD (Ozanne 1995)

### **Non-speech oro-motor exercises (NSOMEs)**

115. ASHA (2007) reported 'a consensus opinion among investigators is that non-speech oromotor therapy is not necessary or sufficient for improved speech production'. Subsequently McCauley et al (2009) published the results of an evidence-based systematic review for ASHA, which investigated the effects of non-speech oral motor exercises (NSOMEs) on speech. They concluded that 'the existing research literature provides insufficient evidence to support or refute the use of NSOMEs' (ibid, p353). Similarly, Lass & Pannbacker (2008) reviewing similar data concluded that NSOMEs 'should be excluded from use as a mainstream treatment until there are further data'. Several other authors including Forrest (2002), Lof (2008, 2009, 2010), Lof & Watson (2008, 2010) and Davis & Velleman (2000) have written papers on the subject, and in the main they also conclude that there is little if any evidence for the impact of NSOMEs on speech production. The authors of the current document are aware that a Cochrane review of this issue is currently being undertaken, and its publication may help further inform this debate.
116. It has also been found that speech production requires finer levels of coordination (Green et al 2002) but lower levels of strength (Forrest 2002) than are available for other oromotor activities; this would further support the findings above.
117. In view of these findings, it must be the recommendation of RCSLT that SLT practitioners apply caution before using non-speech oro-motor activities as a means of intervention for SI, including children with features of DVD, until and unless evidence to the contrary emerges.

118. It must be noted that these NSOMEs must be differentiated from speech-motor e.g. phonetic placement activities, and that specific speech-motor activities are to be encouraged, in accordance with evidence cited earlier.
119. This document does not include discussion of interventions for OMD, drooling or feeding difficulties.

### **Augmentative and alternative communication**

120. Many SLTs in the UK encourage the use of low tech augmentative communication systems to support children with (suspected) features of DVD in the early stages, such as signing (e.g. Makaton [www.makaton.org], Signalong [www.signalong.org.uk]) or the use of symbols (e.g. PECS symbols [Bondy & Frost 1998], Rebus writing with symbols [www.widget.com], Blissymbolics [www.blissymbolics.org] or Boardmaker [www.mayer-johnson.co.uk]). This usually helps to reduce the children's frustration as it provides them with an alternate means of communicating whilst their speech is unintelligible. Whilst many children will revert to speech as their primary mode of communication as soon as they are able, those with the most severe difficulties may require long term support, and use of communication aids should be considered. (Cumley & Swanson, 1999). SLTs have an important role in training and mentoring education staff to scaffold children's learning and socialisation through visual support (Wellington & Stackhouse, 2011).

### **Impact of the features of DVD on education and quality of life.**

121. Law et al (2007) reported the views from parent groups. Typically, parents described the frustration that both they and their children experienced when the children were identified with features of DVD. Parents also reported difficulties in all aspects of the children's access to education, difficulties with the child's behaviour and potential social isolation, both at home and within the school setting. From the parents' perspective, there was often a lack of professional knowledge, leading to difficulties reaching a diagnosis, and they commonly reported being falsely reassured by families, friends and professionals - "don't worry he'll grow out of it". Furthermore, McCormack et al (2009) carried out a systematic review of 57 papers and reported that children with speech impairment of unknown origin (which could include children with features of DVD), can have a range of activity limitations and participation restrictions across the lifespan, including difficulties with forming relationships with peers, friends, parents and teachers.
- 122.** There has been increasing recognition that children with speech difficulties, including those with features of DVD, are at risk of having poor self-esteem, lack of confidence, poor motivation, awareness, anxiety and/or frustration, which can lead to emotional & behavioural difficulties (Nash & Stengelhofen 2002; Hartshorne 2006; Bercow 2008). It is also recognised that socialisation and literacy skills, i.e. reading, writing and spelling, may be compromised without active therapy prior to school entry (Nathan et al 2004; Nathan & Simpson 2001)
- 123.** Children whose speech difficulties persist beyond the age of 5y 6m are at risk for persisting speech difficulties and literacy problems. This risk increases where there are associated speech input and language difficulties (Nathan et al 2004).

As well as needing age appropriate comprehension and expressive language skills to develop literacy, it is important that children are able to apply their speech processing skills (speech input, representations, and output) to develop phonological and phoneme awareness. This ability to “reflect on the sound structure of words as distinct from their meaning” is key to literacy development in an alphabetic language such as English and is often assessed through tasks of e.g. rhyme detection or production, phoneme identification, spoonerisms. However, phonological awareness is compromised by inconsistent speech output. Consistent speech rehearsal is necessary to hold words in memory, particularly if unfamiliar, and to segment them into the correct sequence of sounds in order to make decisions such as if they rhyme or not, or what they begin and end with. This skill is crucial for deciding what sequence of letters to produce when spelling a word (e.g. child hears word “fish”, segments into sounds: ‘f-i-sh’; maps letters onto sounds to write <fish>). Children with inconsistent speech, such as in the DVD symptom cluster, can therefore have associated literacy problems particularly when dealing with longer words, e.g. ‘hippopotamus’, which they may produce differently each time they say them. Even children who appear to have resolved their speech difficulties can persist in having subtle speech difficulties and perform less well on national assessments of spelling skills (Nathan et al 2004).

- 124.** Difficulty with discriminating or producing words can also interfere with ability to learn new words in school and at home. A typical strategy when learning a new word is to rehearse it verbally until it is ‘lodged’ in the word store. Inconsistent speech rehearsal results in ‘fuzzy’ representations in this store which holds information for future speech productions and spellings. In short, compared to their peers, children with features of DVD are at risk of falling behind in the classroom if not supported with both their spoken and written language skills. Collaborative working between SLT and education staff is essential if children with DVD are to realise their full academic and social potential (see programme devised for Luke, a boy with features of DVD and associated dyslexia, described by Nathan & Simpson, 2001).
125. In order to maximise the effectiveness of SLT intervention and support children with features of DVD to reach their full potential, it is essential that there is collaboration between SLT and education services once children reach school entry age. Such collaborative provision will often be available within a child’s local school supported by their local SLT service, but in some cases a more specialist educational and SLT provision may be required, in a specific unit focussing on children with severe speech and language impairment, whether locally, regionally or nationally; recommendation for such provision will be made following multi-agency assessment including school, educational psychology and SLT expertise.
126. Although few studies have directly investigated the educational consequences of the features of DVD, there is growing evidence that those affected are likely to experience poor academic outcomes. The successful attainment of literacy skills is fundamental to accessing all subject areas within any education curriculum. It is thus concerning that children with DVD have been shown to experience severe and persistent literacy impairment underpinned by difficulties in phonological awareness (Marquardt et al 2002; McNeill et al 2009b), language

impairment (Lewis et al 2004) and phonological and working memory (Zaretsky et al 2010). In particular, spelling development appears to be particularly disrupted in children with DVD (Lewis et al 2004; Snowling & Stackhouse 1983). Preliminary intervention studies have shown that the reading and spelling skills of children with DVD may be improved by focused intervention (McNeill et al 2009a), although continued intensive support may be necessary to ensure long-term accelerated growth in literacy skills (McNeill et al 2010; Zaretsky et al 2010).

127. Evaluation of the functional outcomes of children with DVD also suggests wider difficulties in skills underlying educational achievement (Teverovsky et al 2009). This study, using parental report of 201 children with identified features of DVD, showed that children were likely to experience cognitive and learning problems including literacy, calculation and memory deficits, social communication difficulties and behavioural dys-regulation. It is important that factors obstructing educational attainment are addressed in therapy management plans for children with DVD.
128. Poor performance at school and lack of employment are both risk factors for becoming involved in the criminal justice system. Within Feltham Young Offenders Institute, the percentage of young people, aged 15 to 21 years, with persisting speech difficulties – which could include some with the DVD symptom cluster – on the SLT caseload is generally between 20% and 30% (personal correspondence from Kim Turner). There are a number of references discussing young offenders and speech difficulties (Olson Wagner et al 1983; Snowling et al 2000).

### **Other issues**

129. For information relating to outcomes and outcome measurement, cost effectiveness, service delivery and children's services, the reader is guided to the associated RCSLT documentation (see Appendix for references).

### **Conclusions**

130. This paper demonstrates the complexity of arguments and evidence around the DVD symptom cluster, where it sits in the spectrum of Speech Impairment and how best to meet the needs of children and young people presenting with this low incidence pattern of high clinical need.
131. Much of the debate has, understandably, focused on the very specific nature of the difficulties. The key issue for parents of children with features of DVD is securing the most effective support for their child. However, this presentation impacts on children not only in terms of primary communication difficulties but also in terms of learning and interaction. In this respect, it should be seen as part of a continuum of Speech, Language and Communication Needs and not in isolation.
132. The challenge for 'commissioners', whether at the level of the National Commissioning Board, a local commissioning structure or indeed a school or individual parent, is how secure support that dovetails and works with and within the wider system.

133. In this sense, RCSLT must ensure that specific guidance in this area promotes the commissioning and provision of highly specialist expertise within a framework which acknowledges that the highly specialist expertise must operate in conjunction with less specialist targeted and universal support for SLCN.
134. The desirable outcomes for individuals with features of DVD include:
- Access to the appropriate assessment and diagnosis by an appropriately experienced SLT in order that the appropriate intervention is identified
  - Access to the appropriate specialist intervention, focussing on each individual's specific speech impairment, and varying in intensity according to changing need, in order to maximise the individual's potential for functional intelligible speech, language and communication
  - Embedding this specific intervention within a multi-agency holistic framework, in order that the impact of the difficulties on issues such as learning, literacy and psychosocial elements is minimised and managed, and optimum quality of life and achievement can be promoted. Whilst the majority of these children can be managed within local community SLT services and schools, with support and/or direct input of varying intensity from a specialist SLT with specific experience in SI including the DVD symptom cluster, there are occasionally children who require a more specialist provision, both clinically from SLT services and educationally from specialist placements, either locally, regionally or nationally, dependant on availability or the expertise.
135. The challenge for providers, funders and 'commissioners' in the widest sense lies in the reality that the means of achieving these outcomes will appropriately vary from one area to another, influenced by factors such as geography, demographics and the maturity of the wider system in supporting SLCN in general.

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## REFERENCES

- Advances in Speech Language Pathology (2006), 8, 3
- An economic evaluation of speech and language therapy, December 2010 Matrix Evidence and RCSLT (15, 62)
- ASHA (2007) *Childhood Apraxia of Speech [Position Statement and Technical Report]*. Available online at: [www.asha.org/policy](http://www.asha.org/policy)
- Bahr RH, Velleman SL & Ziegler MA (1999) Meeting the challenge of suspected developmental apraxia of speech through inclusion. *Topics in Language Disorders*, 19, 19–35.
- Ballard KJ, Robin DA, McCabe P & McDonald J (2010) A treatment for dysprosody in childhood apraxia of speech. *Journal of Speech Language and Hearing Research*, 53, 1227-1245.
- Belton E, Salmond CH, Watkins KE, Vargha-Khadem F. & Gadian DG (2003) Bilateral brain abnormalities associated with dominantly inherited verbal and orofacial dyspraxia. *Human Brain Mapping*, 18, 194-200.
- Bercow J (2008) *The Bercow Report: A review of services for children and young people (0-19) with speech, language and communication needs*. Nottingham: DCSF.
- Bondy A & Frost L (1998). The Picture Exchange Communication System. *Seminars in Speech and Language*. 19, 4, 373-388
- Boyar FZ, Whitney MM, Lossie AC, Gray BA, Keller K & Stalker HJ (2001) A family with a grand-maternally derived interstitial duplication of proximal 15q. *Clinical Genetics*, 60, 421-430.
- Bradford A & Dodd B (1996) Do all speech disordered children have motor deficits. *Clinical Linguistics and Phonetics* 10, 2, 77-101.
- Bratsou ML & Madeira C (December 2010) Developmental Verbal Dyspraxia Service Evaluation report, Eastern & Coastal Kent Community Services (now Kent Community Health NHS Trust)
- Bridgeman E & Snowling M (1988) The perception of phoneme sequence: A comparison of dyspraxic and normal children. *British Journal of Disorders of Communication*, 23, 245-252.
- Broomfield J & Dodd B (2005) Clinical effectiveness. In B Dodd (Ed) *Differential Diagnosis and Treatment of Children with Speech Disorder, 2<sup>nd</sup> Edition*. London: Whurr.
- Constable A, Stackhouse J & Wells B (1997) Developmental word finding and phonological processing: the case of the missing handcuffs. *Applied Psycholinguistics*, 18, 4, 507-536.

- Conti-Ramsden G, Botting N, Simkin Z & Knox E (2001) Follow-up of children attending infant language units: Outcomes at 11 years of age. *International Journal of Language and Communication Disorders*, 36, 207-219.
- Corrin J (2001) From profile to programme: steps 1-2, & From profile to programme: steps 3-6. In J Stackhouse & B Wells (Eds) *Children's Speech and Literacy Difficulties: Book 2, Identification and Intervention*. London: Whurr.
- Crosbie S, Holm A & Dodd B (2005) Intervention for children with severe speech disorder: a comparison of two approaches. *International Journal of Language and Communication Disorders*, 40, 4, 467-91.
- Crosbie S, Pine C, Holm A & Dodd B (2006) Treating Jarrod: A core vocabulary approach. *Advances in Speech Language Pathology*, 8, 3, 316-321.
- Cumley GD & Swanson S (1999) Augmentative and alternative communication options for children with developmental apraxia of speech: Three case studies. *Augmentative and Alternative Communication*, 15, 110-125.
- Davis B, Jacks A & Marquardt T (2005) Vowel patterns in developmental apraxia of speech: three longitudinal case studies. *Clinical Linguistics and Phonetics*, 19, 4, 249-274.
- Davis B & Velleman S (2000) Differential diagnosis and treatment of developmental apraxia of speech in infants and toddlers. *Infant Toddler Intervention: The Trans-disciplinary Journal*, 10, 177-192.
- Davis B, Jakielski KJ & Marquardt TP (1998) Developmental apraxia of speech: determiners of differential diagnosis. *Clinical Linguistics and Phonetics*, 12, 1, 25-46.
- Delaney AL & Kent RD (2004) *Developmental profiles of children diagnosed with apraxia of speech*. Poster session presented at the annual convention of the American Speech Language Hearing Association, Philadelphia.
- Department of Health, Health and Social Care Bill 2011 (55)
- <http://www.dh.gov.uk/en/Publicationsandstatistics/Legislation/Actsandbills/HealthandSocialCareBill2011/index.htm>
- Dodd B & Bradford A (2000) A comparison of three therapy methods for children with different types of developmental phonological disorders. *International Journal of Language and Communication Disorders*, 35(2), 189-209.
- Dodd B & Bradford A (2002) A comparison of three therapy methods for children with different types of developmental phonological disorder. *International Journal of Language and Communication Disorders*, 35, 2, 189-209.
- Dodd B, Hua Z, Crosbie S, Holm A & Ozanne A (2002) *Diagnostic Evaluation of Articulation and Phonology*. London: Harcourt Assessment.
- Dodd B, Crosbie S & Holm A (2004) *Core Vocabulary Therapy: An intervention for children with inconsistent speech disorder*. Brisbane: University of Queensland.

Dodd B (2005) Children with speech disorder: defining the problem. In B Dodd (Ed) *Differential Diagnosis and Treatment of Children with Speech Disorder, 2nd Edition*. London: Whurr.

Dodd B, Holm A, Crosbie S & McIntosh B (2006) A core vocabulary approach for management of inconsistent speech disorder. *International Journal of Speech Language Pathology*, 8, 3, 220-230.

Edeal DM & Gildersleeve-Neumann CE (2011) The importance of production frequency in therapy for childhood apraxia of speech. *American Journal of Speech Language Pathology*, 20, 2, 95-110.

Fisher S, Vargha-Khadem F, Watkins K, Monaco A & Pembrey M (1998) Localisation of a gene implicated in a severe speech and language disorder. *Nature: Genetics*, 18.

Forrest K (2002) Are oral-motor exercises useful in the treatment of phonological/articulatory disorders? *Seminars in Speech and Language*, 23, 15-26.

Fox A & Dodd B (2001) Phonologically disordered German-speaking children. *American Journal of Speech Language Pathology*, 10, 291-307.

Gascoigne M (2006) *Supporting children with speech, language & communication needs within integrated children's services: RCSLT Position Paper*. London: RCSLT

Gibbon F, Stewart F, Hardcastle WJ & Crampin L (1999) Widening access to electropalatography for children with persistent sound system disorders. *American Journal of Speech Language Pathology*, 8, 319-334.

Green JR, Moore CA & Reilly KJ (2002) The physiologic development of speech motor control: Lip and jaw coordination. *Journal of Speech Language and Hearing Research*, 45, 66-79.

Grigos MI, Hayden D & Eigen J (2010) Perceptual & articulatory changes in speech production following PROMPT treatment. *Journal of Medical Speech Language Pathology*, 18, 4, 46-53.

Hall P (1992) At the center of controversy: developmental apraxia. *American Journal of Speech Language Pathology*, 1, 23-25.

Hartshorne M (2006) The cost to the nation of children's poor communication. In A KerwinNye (Ed) *ICAN Talk*. London: ICAN.

Hewlett N (1990) Processes of development and production. In P Grunwell (Ed). *Developmental Speech Disorders*. London: Whurr.

Holm A & Dodd B (1999a) An intervention case study of a bilingual child with phonological disorder. *Child Language Teaching and Therapy*, 15, 139-158.

Holm A & Dodd B (1999b) Differential diagnosis of phonological disorder in two bilingual children acquiring Italian and English. *Clinical Linguistics and Phonetics*, 13, 113-129.

- Holm A, Dodd B, Stow C & Pert S (1999c) Identification and differential diagnosis of phonological disorder in bilingual children. *Language Testing*, 16, 271-292.
- Holm A & Dodd B (2001) Comparison of cross language generalisation following speech therapy. *Folia Phoniatica et Logopaedica*, 53, 166-172.
- Holm A, Crosbie S & Dodd B (2005) Treating inconsistent speech disorders. In B Dodd (Ed) *Differential Diagnosis and Treatment of Children with Speech Disorders, 2nd Edition*. London: Whurr
- Iuzzini J & Forrest K (2010) Evaluation of a combined treatment approach for childhood apraxia of speech. *Clinical Linguistics and Phonetics*, 24, 4-5, 335-345
- Jacks A, Marquardt T & Davis B (2006) Consonant and syllable structure patterns in childhood apraxia of speech: Developmental change in three children. *Journal of Communication Disorders*, 39, 424-441.
- Jaffe M (1984) Neurological impairment of speech production: Assessment & treatment. In J Costello (Ed) *Speech Disorders in Children*. San Diego: College-Hill.
- Joffe V & Pring T (2008) Children with phonological problems: a survey of clinical practice. *International Journal of Language & Communication Disorders*, 43, 2, 154-164.
- Johnson M & Elias A (2002) *East Kent Outcome System for Speech and Language Therapy*. East Kent: East Kent Primary Care Trust.
- Kumin L (2006) Speech intelligibility and childhood verbal apraxia in children with Down syndrome. *Down Syndrome Research and Practice*, 10, 1, 10-22.
- Kummer A, Lee L, Stutz L, Maroney A & Brandt J (2007) The prevalence of apraxia characteristics in patients with Velocardiofacial Syndrome as compared with other cleft populations. *Cleft Palate Craniofacial Journal*, 44, 2, 175-180.
- Lass N & Pannbacker M (2008) The application of evidence based practice to non-speech oral motor treatments. *Language Speech and Hearing Services in Schools*, 39, 408-421.
- Law J (1992) *The Early Identification of Language Impairment in Children*. London: Chapman Hall.
- Law, J., Boyle, J., Harris, F., Harkness, A. & Nye, C. (1998) Screening for speech and language therapy delay; a systematic review of the literature. *Health Technology Assessment*, 2, 9.
- Law J, Boyle J, Harris F, Harkness A & Nye C (2000) Prevalence and natural history of primary speech and language delay: Findings from a systematic review of the literature. *International Journal of Language and Communication Disorders*, 35, 165-188.
- Law J, Gadhok K & Lascelles L (2007) *Nuffield Speech and Language Unit Pre-commissioning Report and Options Appraisal*. Report submitted to Ealing PCT.

Available from The Centre for Integrated Healthcare Research, Queen Margaret University, Edinburgh EH21 6UU

Lewis B, Freebairn L, Hansen A, Iyengar S & Taylor H (2004) School-age follow-up of children with childhood apraxia of speech. *Language, Speech and Hearing Services in Schools*, 35, 2, 122-140.

Locke A, Ginsborg J & Peers I (2002) Development and disadvantage: implications for the early years and beyond. *International Journal of Language and Communication Disorders*, 37, 1, 3-15.

Lof GL (2008) Introduction to the controversies about the use of non-speech oral motor exercises for childhood speech disorders. *Seminars in Speech and Language*, 29, 4, 253-256.

Lof GL & Watson MM (2008) A nationwide survey of non-speech oral motor exercise use: Implications for evidence-based practice. *Language Speech and Hearing Services in Schools*, 39, 3, 392-407.

Lof GL (2009) The non-speech-oral motor exercise phenomenon in speech pathology practice. In C Bowen (Ed) *Children's Speech Sound Disorders*. Oxford: Wiley-Blackwell.

Lof GL (2010) Science-based practice and the speech-language pathologist. *International Journal of Speech Language Pathology*, 13, 3, 189-196.

Lof GL & Watson MM (2010) Five reasons why non-speech oral-motor exercises do not work. *Perspectives in Language and Learning*, 11, 109-117.

Lundeborg I & McAllister A (2007) Treatment with a combination of intra-oral sensory stimulation & electropalatography in a child with severe developmental dyspraxia. *Logopedics Phoniatrics Vocology*, 32, 71-79.

Maassen B, Groenen P & Crul T (2003) Auditory and phonetic perception of vowels in children with apraxic speech disorders. *Clinical Linguistics and Phonetics*, 17, 447-467.

Marquardt TP, Sussman HM, Snow T & Jacks A (2002) The integrity of the syllable in developmental apraxia of speech. *Journal of Communication Disorders*, 35, 31-49.

Marquardt TP, Jacks A & Davis B (2004) Token-to-token variability in developmental apraxia of speech: Three longitudinal case studies. *Clinical Linguistics and Phonetics*, 18, 2, 127-144.

Martikainen A & Korpilahti P (2011) Intervention for childhood apraxia of speech: a single case study. *Child Language Teaching and Therapy*, 27, 9-20.

McCauley R, Strand E, Lof G, Schooling T & Frymark T (2009) Evidence based systematic review: Effects of non-speech oral motor exercises on speech. *American Journal of Speech Language Pathology*, 18, 343-360.

- McCormack J, McLeod S, McAllister L & Harrison L (2009) A systematic review of the association between childhood speech impairment and participation across the lifespan. *International Journal of Speech Language Pathology*, 11, 2, 155-170.
- McIntosh B & Dodd B (2008) Evaluation of core vocabulary intervention for treatment of inconsistent phonological disorder: three treatment case studies. *Child Language Teaching and Therapy*, 24, 3, 307-327.
- McNeill BC, Gillon GT & Dodd B (2009a) Effectiveness of an integrated phonological awareness approach for children with childhood apraxia of speech. *Child Language Teaching and Therapy*, 25, 341-366.
- McNeill BC, Gillon GT & Dodd B (2009b) Phonological awareness and early reading development in childhood apraxia of speech. *International Journal of Language and Communication Disorders*, 44, 175-192.
- McNeill BC, Gillon GT & Dodd B (2010) The longer term effects of an integrated phonological awareness intervention for children with childhood apraxia of speech. *Asia Pacific Journal of Speech Language and Hearing*, 13, 145-161.
- Mills L, Gosling A & Sell D (2006) Extending the communication phenotype associated with 22q11.2 Microdeletion Syndrome. *Advances in Speech Language Pathology*, 8, 1, 17-27.
- Morgan AT & Vogel AP (2008) Intervention for childhood apraxia of speech. *Cochrane Database of Systematic Reviews* (3). Available at <http://www.mrw.interscience.wiley.com/cochrane/clsysrev/articles/CD006278/frame.html>
- Moriarty B & Gillon G (2006) Phonological awareness intervention for children with childhood apraxia of speech. *International Journal of Language and Communication Disorders*, 41, 6, 713-734.
- Nash P & Stengelhofen J (2002) Positive Action. *Therapy Weekly*, July 11, 4.
- Nathan L & Simpson S (2001) Designing a literacy programme for a child with a history of speech difficulties. In J Stackhouse and B Wells (Eds) *Children's Speech and Literacy Difficulties 2: Identification and Intervention*. London: Whurr.
- Nathan L, Stackhouse J, Goulandris N & Snowling M (2004) Educational consequences of developmental speech disorder: Key Stage 1 National Curriculum assessment results in English and mathematics. *British Journal of Educational Psychology* 74, 173-186.
- Olson Wagner C, Gray LL & Potter RE (1983) Communicative disorders in a group of adult female offenders. *Journal of Communication Disorders*, 16, 269-277.
- Ozanne A (1995) The search for developmental verbal dyspraxia. In B Dodd (Ed) *Differential Diagnosis and Treatment of Children with Speech Disorders*. London: Whurr.

- Ozanne A (2005) Childhood apraxia of speech. In B Dodd (Ed) *Differential Diagnosis and Treatment of Children with Speech Disorder*, 2<sup>nd</sup> edition. London: Whurr.
- Page J & Boucher J (1998) Motor impairments in children with autistic spectrum disorder. *Child Language Teaching and Therapy*, 14, 233-259.
- Pagnamenta E & Williams P (2009) *Evaluation of the Effectiveness of Nuffield Centre Dyspraxia Programme in Treating Two Children with Severe Speech Disorders*. Paper presented at RCSLT Scientific conference.
- Pascoe M, Stackhouse J & Wells B (2006) *Children with Persisting Speech Difficulties Children's Speech and Literacy Difficulties 3*. Chichester: Wiley
- Pollock K & Hall K (1991) An analysis of the vowel mis-articulations of five children with developmental apraxia of speech. *Clinical Linguistics and Phonetics*, 5, 207-224.
- Powell TW (1996) Stimulability considerations in the phonological treatment of a child with a persistent disorder of speech-sound production. *Journal of Communication Disorders*, 29, 315–333.
- Rapin I (1982) *Children with Brain Dysfunction*. New York: Raven.
- Ripley K, Daines B, & Barrett J (1997) *Dyspraxia: A Guide for Teachers and Parents*. London: Fulton.
- Roberts J, Hennon EA & Anderson K (2003). Fragile X Syndrome and speech and language. *The ASHA Leader*, 8, 19, 6-7
- RCSLT (2005) *Clinical Guidelines*. Bicester: Speechmark
- RCSLT (2006) *Communicating Quality 3 [CQ3]: RCSLT's Guidance on Best Practice in Service Organisation and Provision*. London: RCSLT
- RCSLT (2010) *CPD framework*: [http://www.rcslt.org/members/cpd/cpd\\_framework](http://www.rcslt.org/members/cpd/cpd_framework) (69)
- RCSLT (2009a) *The Resource Manual for Commissioning and Planning Services for SLCN*  
[http://www.rcslt.org/speech\\_and\\_language\\_therapy/commissioning/resource\\_manual\\_for\\_commissioning\\_and\\_planning\\_services](http://www.rcslt.org/speech_and_language_therapy/commissioning/resource_manual_for_commissioning_and_planning_services)
- RCSLT (2009b) *Research Strategy*:  
[http://www.rcslt.org/members/research/RCSLT\\_research\\_strategy](http://www.rcslt.org/members/research/RCSLT_research_strategy) (63)
- RCSLT (2011) *The RCSLT Quality Self-Evaluation Tool: Q-SET*  
[http://www.rcslt.org/members/qset/qset\\_main\\_page](http://www.rcslt.org/members/qset/qset_main_page)
- Scheffer IE, Jones L, Pozzebon M, Howell RA, Saling MM & Berkovic SF (1995) Autosomal dominant rolandic epilepsy and speech dyspraxia: A new syndrome with anticipation. *Annals of Neurology*, 38, 633-642.

Shriberg LD, Kwiatkowski J, Best S, Hengst J & Terselic-Weber B (1986) Characteristics of children with phonological disorders of unknown origin. *Journal of Speech and Hearing Disorders*, 51, 140-161.

Shriberg LD, Aram DM & Kwiatkowski J (1997) (a) Developmental Apraxia of Speech: I. Descriptive & Theoretical Perspectives (b) Developmental Apraxia of Speech: II. Towards a Diagnostic Marker (c) Developmental Apraxia of Speech: III. A Subtype marked by inappropriate stress. *Journal of Speech Language and Hearing Research*, 40, 273-337.

Shriberg LD, Campbell TF, Karlson HB, Brown RL, McSweeney JL & Nadler CJ (2003) A diagnostic marker for childhood apraxia of speech: the lexical stress ratio. *Clinical Linguistics and Phonetics*, 17, 7, 549-574.

Shriberg LD, Potter NL & Strand EA (2011) Prevalence and phenotype of childhood apraxia of speech in youth with galactosemia. *Journal of Speech Language and Hearing Research*, 54, 487-519.

Signalong, available at [www.signalong.org.uk/about/what.htm](http://www.signalong.org.uk/about/what.htm)

Snowling M & Stackhouse J (1983) Spelling performance of children with developmental verbal dyspraxia. *Developmental Medicine and Neurology*, 25, 430-437.

Snowling MJ, Bishop DVM & Stothard SE (2000) Is preschool language impairment a risk factor for dyslexia in adolescence? *Journal of Child Psychology and Psychiatry*, 41, 587-600.

Snowling M & Stackhouse J (2006) *Dyslexia, Speech and Language: A Practitioners Handbook*. London: Whurr

So L & Dodd B (2007) Phonological awareness abilities of Cantonese speaking children with phonological disorder. *Asia Pacific Journal of Speech Language and Hearing*, 10, 189-204.

Stackhouse J (1992a) Developmental verbal dyspraxia I: A review and critique. *European Journal of Disorders of Communication*, 27, 1, 19-34.

Stackhouse J (1992b) Developmental verbal dyspraxia: a longitudinal case study. In R Campbell (Ed) *Mental Lives: Case Studies in Cognition*. Oxford: Blackwell.

Stackhouse J & Snowling M (1992a) Barriers to literacy development in two cases of developmental verbal dyspraxia. *Cognitive Neuropsychology* 9, 4, 272-299.

Stackhouse J & Snowling M (1992b) Developmental verbal dyspraxia II: A developmental perspective on two case studies. *European Journal of Disorders of Communication*, 27, 1, 35-54.

Stackhouse J & Wells B (1997) *Children's Speech and Literacy Difficulties: A Psycholinguistic Framework*. London: Whurr.

Stackhouse J & Wells B (Eds) (2001) *Children's Speech and Literacy Difficulties: Book 2: Identification & Intervention*. London: Whurr.

- Stackhouse J & Pascoe M (2006) Intervention for a child with persisting speech and literacy difficulties: A psycholinguistic approach. *Advances in Speech-Language Pathology*, 8, 3, 231-244.
- Stackhouse J, Pascoe M, Vance M & Wells B (2007) Compendium of Auditory and Speech Tasks. *Children's Speech and Literacy Difficulties 4*. Chichester: Wiley.
- Strand E & Debertine P (2000). The efficacy of integral stimulation intervention with developmental apraxia of speech. *Journal of Medical Speech Language Pathology*, 8, 295–300.
- Strand E, Stoeckel R & Baas B (2006) Treatment of severe childhood apraxia of speech: A treatment efficacy study. *Journal of Medical Speech Language Pathology*, 14, 4, 297-307.
- Stringer H & Nicholson D (2011) Assessing developmental speech disorders: what do assessments tell us? *Proceedings of Child Language Seminar, Newcastle*.
- Teverovsky EG, Bickel JO & Feldman HM (2009) Functional characteristics of children diagnosed with childhood apraxia of speech. *Disability and Rehabilitation*, 31, 94-102.
- van Bysterveldt AK, Gillon G & Foster-Cohen S (2010) Integrated speech and phonological awareness intervention for pre-school children with Down syndrome. *International Journal of Language and Communication Disorders*, 45, 3, 320-335.
- Velleman SL, Andrianopoulos MV, Boucher MJ, Perkins JJ, Averback KE & Currier AR (2010) Motor speech disorders in children with autism. In R Paul & P. Flipsen (Eds), *Speech Sound Disorders in Children*. San Diego: Plural
- Webb AL, Singh RH, Kennedy MJ & Elsas LJ (2003) Verbal dyspraxia and galactosemia. *Pediatric Research*, 53, 396-402.
- Wellington W & Stackhouse J (2011) Using visual support for language and learning in children with SLCN: A training programme for teachers and teaching assistants. *Child Language Teaching and Therapy*, 27, 2, 183-201
- Williams LA, McLeod S & McCauley R (Eds) (2010) *Interventions for Speech Sound Disorders*. Maryland: Brookes.
- Williams P & Stephens H (2004) *Nuffield Dyspraxia Programme, 3rd Edition*. London: The Miracle Factory. Available at [www.ndp3.org](http://www.ndp3.org)
- Williams P (2010) Preliminary case study evidence for the Nuffield Centre Dyspraxia Programme. Poster session presented at the annual convention of the American-Speech-Language-Hearing Association, Philadelphia.
- Williams P & Stephens H (2010) The Nuffield centre dyspraxia programme. In: LA Williams, S McLeod & R McCauley (Eds) *Interventions for Speech Sound Disorders*. Maryland: Brookes.
- Wren Y & Roulstone S (2008) A comparison of computer and table top therapy. *International Journal of Speech and Language Pathology*, 10, 5, 346-363.

Zaretsky E, Velleman SL & Curro K (2010) Through the magnifying glass: Underlying literacy deficits and remediation potential in childhood apraxia of speech. *International Journal of Speech Language Pathology*, 12, 58-68.

Zhu H & Dodd B (2000a) Putonghua (modern standard Chinese) speaking children with speech disorder. *Clinical Linguistics and Phonetics*, 14, 165-191.

Zhu H & Dodd B (2000b) Development and change in the phonology of Putonghua-speaking children with speech difficulties. *Clinical Linguistics and Phonetics*, 14, 351-368.

## **ADDITIONAL READING**

Baker E & McLeod S (2004) Evidence-based management of phonological impairment in children. *Child Language Teaching and Therapy* 20, 3, 261-285.

Blakely R (2001) *Screening Test for Developmental Apraxia of Speech* (2nd edition; STDAS-2). Austin: Pro-Ed.

Campbell T (1999) Functional treatment outcomes in young children with motor speech disorders. In A Caruso & E Strand (Eds) *Clinical Management of Motor Speech Disorders in Children*. New York: Thieme.

Crary MA (1984) A neuro-linguistic perspective on developmental verbal dyspraxia. *Journal of Communication Disorders*, 9, 3, 33-48.

Forrest K (2003) Diagnostic criteria of developmental apraxia of speech used by clinical speech-language pathologists. *American Journal of Speech Language Pathology*, 12, 376-380.

Hayden D & Square P (1999) *Verbal Motor Production Assessment for Children*. San Antonio, Psychological Corporation.

Hickman L (1997) *Apraxia Profile*. San Antonio, Communication Skill Builders

Howard S (2004) Connected speech processes in developmental speech impairment: observations from an electropalatographic perspective. *Clinical Linguistics and Phonetics*, 18, 6-8, 405-417

McCabe P, Rosenthal JB & McLeod S (1998) Features of developmental dyspraxia in the general speech impaired population. *Clinical Linguistics and Phonetics*, 12, 2, 105-126.

McCauley R & Strand E (2008) Treatment of childhood apraxia of speech: Clinical decision making in the use of non-speech oral motor exercises. *Seminars in Speech and Language*, 29, 4, 284-293.

McNeill B, Gillon G & Dodd B (2010) A longitudinal case study of the effects of an integrated phonological awareness programme for identical twin boys with childhood apraxia of speech (CAS). *International Journal of Language and Communication Disorders*, 44, 175-192.

Morgan AT & Vogel AP (2009) A Cochrane review of treatment for childhood apraxia of speech. *European Journal of Physical and Rehabilitation Medicine*, 45, 1, 103-110.

Stackhouse J & Pascoe M (2010) Psycholinguistic intervention. In L Williams, S Mcleod & R McCauley (Eds) *Treatment of Speech Sound Disorders*. Maryland: Brookes.

Stackhouse J & Wells B (1992) Psycholinguistic assessment of developmental speech disorders. *European Journal of Disorders of Communication*, 28, 331-348.

Wells B (1994) Junction in developmental speech disorder: A case study. *Clinical Linguistics and Phonetics*, 8, 1-25.

Williams P & Corrin J (1998) Developmental verbal dyspraxia. *Praxis Makes Perfect II*. London; The Dyspraxia Foundation.

Williams P & Stackhouse J (1998) Diadochokinetic skills: normal and atypical performance in children aged 3-5 years. *International Journal of Language and Communication Disorders*, 33, 481-486.

Williams P & Stackhouse J (2000) Rate, accuracy and consistency: Diadochokinetic performance in young normally developing children: *Clinical Linguistics and Phonetics*, 14, 4, 267-293.

Williams P (2002) Developmental verbal dyspraxia - a review. *Dyspraxia Foundation Professional Journal*, 1.

Readers are also referred to the Commissioning Support guidance on SLCN which provides a set of documents designed to explore ways of improving speech, language and communication outcomes for children and young people  
<http://www.commissioningsupport.org.uk/the-commissioners-kitbag/in-depth-publications.aspx>

### **Useful websites**

[www.apraxia-kids.org](http://www.apraxia-kids.org)

[www.blissymbolics.org](http://www.blissymbolics.org)

[www.makaton.org](http://www.makaton.org)

[www.mayer-johnson.co.uk](http://www.mayer-johnson.co.uk)

[www.signalong.org.uk](http://www.signalong.org.uk)

[www.widgit.com](http://www.widgit.com)

## Appendix 1: Single case studies & key messages

### Appendix 1a

**Key message: Whilst this child presented at a very early age with very limited expressive language, time was taken before the specialist SLT gave a diagnosis of 'DVD' (features of DVD) based on a differentially diagnostic profile. Thereafter, frequent ongoing specialist SLT intervention, supported by home and school, led to a positive outcome.**

Age at identification	2 years 3 months
Gender	F
Relevant history	No concerns
Co-morbid difficulties	'Late talker'; reluctant communicator & very anxious when communicating or performing verbally Increased awareness of her difficulties & low self-esteem At initial assessment was talking only in single words.
Nature of assessment/s undertaken at diagnosis	Nuffield Dyspraxia Programmes (NDP) Assessment Diagnostic Evaluation of Articulation and Phonology (DEAP) Assessment
Diagnostic profile	Developmental Verbal Dyspraxia diagnosis given aged 4years 6months. Diagnosis given using service entry criteria to differentially diagnose. Restricted repertoire of consonants Favourite articulation of 'd' Some difficulties with prosody Assessment indicated her speech to be 60% inconsistent Mostly unintelligible to both familiar and unfamiliar listeners Reluctant speaker but using sentences – no concerns regarding language at 4 years 6 months.
Who gave diagnosis	Specialist speech and language therapist.
Direct intervention	She received a block of language group (4 sessions) targeting her use of language. Review assessment at 3 years 1 month indicated speech disorder and since then she received 4 more individual therapy blocks (once weekly for 6 weeks) targeting her speech. At 4 years and 6 months, following DVD diagnosis, she was seen in school twice per week for 20-30 minutes by Specialist SLT following NDP approach as well as targeting whole words to ensure functional communication was successful. Therapy continued in school holiday time at home or in clinic. This input continued until 5 years 4 months.
Indirect intervention	Daily home and school carryover of activities provided by Speech and Language Therapist implemented daily by school Learning Support Assistant (LSA) and parents. This was monitored by using an individualised folder owned by the child which included intervention worksheets and activities currently used and a 'case-note section' which is updated after each therapy session by the person delivering the therapy i.e. SLT, parents, school staff.
Parental engagement	Mother attended one of the SLT sessions per week. Parents carried over work at home on a daily basis (5/7 days)
School engagement	Designated LSA carried over work on a daily basis at school (usually 4/5 days) term time only.
Outcomes	This child was initially a very reluctant speaker and there were concerns that a referral would need to be made to child psychology or Child and Adolescent Mental Health Services (CAMHS) due to child's level of anxiety. She now is able to have conversations with peers and unfamiliar adults using clear, intelligible speech. She plays well with the other children in her class and will raise her hand and answer questions or give comments confidently in classroom discussions. This communicative confidence appeared aged 5 years and 2 months. At the age of 5 years 4 months, case was discharged despite residual prosodic difficulties as parents and child were happy with progress made.

## Appendix 1b

**Key message: This child presented at an early age with significant social communication difficulties, later diagnosed as having Autistic Spectrum Disorder (ASD). Time was taken before the specialist SLT gave a diagnosis of 'DVD' (features of DVD) based on a differentially diagnostic profile. Thereafter, frequent ongoing specialist SLT intervention, supported by home and school, led to a positive outcome.**

Age at identification	2 years 11 months
Gender	M
Relevant medical history	Diagnosis of Autism Spectrum Disorder given at 3 years 11 months by Paediatrician
Co-morbid difficulties	Communication profile reflects that of a child functioning on the Autistic Spectrum. At time of diagnosis of ASD he had echolalic language during play; inability to understand non-verbal communication; poor listening and attention skills; poor verbal reasoning skills; difficulty understanding abstract concepts; receptive language was assessed as age-appropriate.
Nature of assessment/s undertaken at diagnosis	Nuffield Dyspraxia Programme (NDP) assessment Diagnostic Evaluation of Articulation and Phonology (DEAP)
Diagnostic profile	Developmental Verbal Dyspraxia diagnosis given aged 4 years 4 months Speech characterised by vowel errors; glottal insertions and replacements; final consonant deletion; inconsistent productions; difficulties with prosody; and substitution of 'j' for several sounds. Unintelligible to unfamiliar listeners within and out of context.
Who gave diagnosis	Specialist speech and language therapist.
Direct intervention	-From 2 years 11 months to 4 years 4 months, he received 3 blocks of individual therapy focusing on speech sound development (where each block was once per week for 6 weeks). -Parents attended Early Bird Plus programme – parent programme providing advice and support in managing difficulties associated with ASD - Following DVD diagnosis at aged 4 years and 4 months, he was seen initially at nursery and home twice per week for 20-30 minutes by Specialist SLT following NDP approach as well as targeting whole words to ensure functional communication was successful. When he started school aged 4 years 10 months he was seen at school twice weekly. During school/nursery holidays he was seen either at home or in clinic.
Indirect intervention	Daily home and school/pre-school carryover of activities provided by Speech and Language Therapist implemented daily by nursery key worker/school LSA and home (parents). This was monitored by using an individualised folder the child owned which included intervention worksheets and activities currently used and a 'case-note section' which is updated after each therapy session by the person delivering the therapy i.e. SLT, parents, nursery/school staff.
Parental engagement	Mother attended one of the SLT sessions per week. Parents carried over work at home on a daily basis.
School engagement	When at preschool limited carryover as only attended twice per week. At school designated LSA carried over work on a daily basis during term time.
Outcomes	This child was initially very difficult to understand within context and completely unintelligible out of context. He has worked with great enthusiasm and motivation to improve his speech and has benefited from the structure the programme provides, considering his other needs. He continues to present with residual prosodic difficulties but these are felt to be associated with his ASD diagnosis rather than a primary speech disorder. His increased intelligibility has meant that his peer group now understand him and he is attempting more interactions with them. He is now aged 5 years and 6 months (having received 14 months of twice weekly therapy), and he is awaiting a review with view to be discharged. He continues to present with prosodic difficulties; however parents and child are happy with progress made.

## Appendix 1c

**Key message: Intensive intervention, even at 9yrs, has significantly enhanced progress.**

Age at identification	First seen by SLT at 3 years in locality Referred to specialist centre at 9 years
Gender	M
Relevant medical history	Intermittent nocturnal enuresis during term time, since starting school - suspected to be due to anxiety.
Other relevant case history factors	Late acquisition of early speech & language milestones: babbling at 12/12, 1 <sup>st</sup> words at 16/12, word joining at 2.6 yr. Strong family history – Father had SLT as a child & still has some language & memory difficulties; younger sibling, aged 6yrs, attends for local SLT Fine motor co-ordination difficulties (seen OT) & constantly moving
Comorbid difficulties	Some persisting grammatical immaturities Some pragmatic difficulties Some literacy difficulties e.g. affecting hand writing and spelling
Nature of assessment/s undertaken at diagnosis	NDP assessment; Oro-motor examination; Imitation of single consonants and vowels; Connected speech assessment
Diagnostic label / summary of diagnostic profile given	Severe Speech disorder with features of both Oro-motor Dyspraxia (OMD) DVD Restricted repertoire of consonants and vowels Significant number of vowel & consonant errors, combinations of C+V errors in single words; prosodic issues affecting rate & rhythm in particular Speech unintelligible much of the time at age 9 years
Who gave diagnosis	Experienced specialist SLT (speech impairment/dyspraxia) and consultant paediatrician
Direct intervention	Weekly SLT in his locality for 6m aged 3.6 years. When he started school, input was 1 termly visit from SLT who set a programme for TA to deliver. Since referral to specialist centre at 9 years, he has received 21 sessions SLT on a 2-3 weekly basis in term time over a 16 month period NDP therapy approach has been followed: Single sounds: expansion of single consonant & vowel inventories (very restricted ranges at outset of intervention; effortful, groping postures seen) Expansion of single consonant and vowel repertoires (all diphthong vowels, y, sh, ch, j, r) Establishing newly acquired sounds into all positions in words Consolidating other sounds in singleton and clusters within words Maintaining accurate production in connected speech Motor programming/drill activities Strategies for clear speech (pacing, sounding out final sounds in 'small words', using intonation etc)
Indirect intervention	Treatment sessions supported at home, with parents practising targets as often as possible Daily practice of speech targets in school with TA TA attends SLT sessions intermittently at specialist centre
Parental engagement	Very motivated to engage with the therapeutic process; Father particularly empathises. Have to travel a long distance to attend specialist centre
School engagement	Statement of SEN & receives 17 ½ hours of TA support per week; the S&L advisory teacher visits.
Outcomes	LH has become increasingly intelligible over the intervention period. However, communication breakdown can still occur. He has expanded his range of consonant and vowel sounds in isolation and is establishing them in simple and complex words He is thinking more and more about his strategies for clear speech – including more awareness of the listener's perspective He is pleased with his progress and aware that he is improving; motivated as he approaches secondary school transfer.

## Appendix 1d

**Key message: Although progress was made, infrequent and limited number of therapy sessions is insufficient to make significant gains in intelligibility.**

Age at identification	First seen by SLT at 3 years in locality Referred to specialist centre at 5.6 years for a 2 <sup>nd</sup> opinion.
Gender	M
Relevant case history factors	No babbling; 1 <sup>st</sup> recognisable words at 4 years; messy eater; had to be taught to suck. Poor intelligibility- parents only understand 60% of what he says out of context. This causes parental distress.
Co-morbid difficulties	Expressive language delay.
Nature of assessment/s undertaken at diagnosis	Nuffield Dyspraxia Assessment was used for the Initial Assessment.
Diagnostic label / summary of diagnostic profile given	Developmental Verbal Dyspraxia/Childhood Apraxia of Speech. J's speech was characterised by a mildly hoarse voice, dysrhythmic utterances, especially in DDK, restricted phonetic inventory for vowels and consonants, restricted range of word structures, severe sound sequencing difficulties, pervasive final consonant deletion, fronting [k, g] word initially, use of preferred sound [j] word medially in CVCV words, cluster reduction and reduced intelligibility.
Who gave diagnosis	Experienced specialist SLT (speech impairment/dyspraxia) and consultant paediatrician
Direct intervention	2 courses PCI in locality between 3.0 and 3.6 years. 2 courses weekly phonology groups in locality. Between 4.0 and 5.0 years received a total of 8 sessions of phonology group therapy. 1 course 5 individual, daily sessions of 50 minutes duration, in a school holiday, at specialist centre aged, 5.9yrs. Focus of therapy was on speech production and articulation. Targets included: phonetic placements for vowels, reduction of FCD, sequencing tasks for CV/CVC, establishing CVC words in short phrases.
Indirect intervention	Teaching assistant (TA) had been given worksheets to practise targets from phonology group, in locality. Liaison between SLT at specialist centre & local SLT after intensive
Parental engagement	Parents observed therapy sessions and practised activities at home
School engagement	Support from TA in school, trained by local SLT
Outcomes	At review 3m after holiday course: He had made progress in use of final sounds Gaps in his phonetic inventory remained – no new sounds acquired He remains a sociable, chatty child. However, his speech remains unintelligible much of the time and parents continue to be concerned.

## Appendix 1e

**Key message: Specific intervention, supported on a regular basis by those around the individual, can have impact at an age when the individual has motivation to change**

Age at identification	Referred to specialist centre at 11 years.
Gender	M
Relevant case history factors	Limited SLT input previously due to parental preference. Above average academic skills. Older brother also had severe speech difficulties.
Co-morbid difficulties	Mild unilateral hearing loss.
Nature of assessment	NDP assessment.
Diagnostic label / summary of diagnostic profile given	Severe/persisting speech disorder with features of DVD. Marked difficulties in modifying speech production. Good range of single sounds. Place and voicing contrasts inconsistent at CV level. No fricatives at CV level. Many sounds replaced by / d / or a glottal stop Some vowel distortions. Unintelligible connected speech. Limited awareness/denial of problem.
Who gave diagnosis	Experienced specialist SLT (speech impairment/dyspraxia) and consultant paediatrician.
Direct intervention	Monthly sessions at specialist centre with specialist SLT. Weekly sessions in school with experienced SLTA. Oversight and troubleshooting by local senior SLT. Intervention based on NDP.
Indirect intervention	3 x week practice with TA in school, supported by SLTA. Practice at home, supported by specialist centre.
Parental engagement	Most of time - good attendance but reported difficulty with practice at home.
School engagement	Most of time.
Outcomes	After 2 years intervention (13 years): Clusters and complex words still inconsistent. Tends to omit final / s / and / s / clusters in connected speech. Able to make himself understood, sometimes rephrasing and having another go. Confident communicator.

## Appendix 1f

### Key message: Intervention can improve speech skills for children with comorbid learning difficulties

Age at identification	First seen by SLT at 2 years. Diagnosed as oral and features of verbal dyspraxia at 3 years. Attended specialist school for speech and language disorders and learning difficulties from 6 – 11 years. Re-referred to specialist centre at 12 years.
Gender	M
Relevant case history	History of hearing loss with grommets from 2-4 years. Generalised dyspraxia and sensory processing issues.
Co-morbid difficulties	Receptive/expressive language impairment. Severe learning difficulties.
Nature of assessment	Parts of NDP assessment; Oro-motor examination; Imitation of single sounds
Diagnostic label / summary of diagnostic profile given	Very severe speech disorder with features of OMD and DVD. Very limited vowel differentiation in words. Struggled to imitate / ee ah oo / at single sound level. Included initial medial and final consonants in short words. Added schwa to final consonants, disrupting rhythm of speech. Omitted syllables in multisyllabic words. Connected speech consisted of a series of consonant + schwa syllables, and was unintelligible. Limited awareness of poor intelligibility.
Who gave diagnosis	Experienced specialist SLT and consultant paediatrician.
Direct intervention	12 – 13 years: regular therapy at specialist centre. 13 – 14 years: no direct SLT input. 14 years onwards: transferred to new school. Weekly SLT sessions in school Intervention based on NDP.
Indirect intervention	12 – 14 years: largely supported at home, with parents practicing on a daily basis. 14 years onwards: daily practice by TA, supported by school therapist. Practice at home, supported by school therapist. Monthly/termly joint sessions with local SLT and specialist SLT, plus telephone/email support.
Parental engagement	All the time.
School engagement	Some in previous school. All the time in new school.
Outcomes	Now using a limited range of vowels. No longer adds schwa at word level. Improved intelligibility. Continues to progress slowly. Increased confidence as a communicator.

## Appendix 1g

**Key message: On-going intervention may be required over an extensive period of time; specialist provision should be considered if the impact of the difficulty persists**

Age at identification	2.10: initial assessment indicating delayed speech and language skills 5.4: diagnosis of features of DVD by specialist SLT					
Gender	F					
Relevant case history	Strong family history of speech, communication and learning difficulties-all of siblings and parents have communication or learning difficulty					
Co-morbid communication difficulties	<p>Severe receptive language disorder, assessed at 7y 5m:</p> <ul style="list-style-type: none"> <li>• TROG-2: percentile rank &lt;1. Uneven profile: Understanding of complex structures such as passive sentences but difficulties with understanding of earlier-acquired structures, for example plurals, pronouns</li> <li>• Bracken Basic Concept Scale: percentile rank 9</li> <li>• Difficulties understanding wh-questions (who, when, where)</li> <li>• Verbal reasoning limitations: difficulties linking events in a story, drawing inferences</li> <li>• Functional understanding in class: uses visual aids (pictures, written text) to support understanding</li> <li>• Good decoding skills in literacy but understanding limitations affect reading comprehension</li> </ul> <p>Severe expressive language disorder:</p> <ul style="list-style-type: none"> <li>• Weak vocabulary and semantic categorization skills, word-finding errors</li> <li>• Omission of grammatical elements, e.g. possessive –s, plural –s, 3<sup>rd</sup> person singular -s, copula, auxiliaries, regular past tense –ed, pronouns</li> <li>• Restricted sentence structure (most sentences are basic subject-verb-object)</li> <li>• Atypical/disordered features: word order error: ‘that has my name in’ vs ‘my name has that in’, ‘monkey put pineapple in his beak to don’t talk’.</li> <li>• Narrative skills developing and overall a strength</li> </ul>					
Co-morbid primary difficulties	Mild learning difficulty, processing difficulties (weak auditory short-term memory). Significant discrepancy between verbal and non-verbal measures on Educational Psychologists’ cognitive assessment					
Nature of assessment	Formal: Nuffield Centre Dyspraxia Assessment					
Diagnostic label	Profoundly disordered speech sound system with features of DVD					
Who gave diagnosis	Diagnosis at 5.4y: specialist in speech and language disorders					
Direct intervention	From diagnosis until 7.5yrs, direct intervention comprising of clinic-based sessions and mainstream school support; SLTs followed NDP. TA support in school 7.6 – 9.0 (current), direct intervention at language base with therapy working on speech (including NDP) & language, followed-up by specialist TA					
Indirect intervention	-Adult-child interaction workshop, delivered by SLT					
Parental engagement	some of the time for parent workshop / none for school intervention					
School engagement	-some of the time for mainstream intervention, not always consistent (see above) -consistent at language base					
Outcomes	NDP assessment percentages (ages)	<b>Mainstream support</b>		<b>Language base support</b>		
		6.0	6.8	7.10	8.1	8.4
	Single sounds	64	80	98		
	CV/VC	50	60	90		
	CVCV	20	10	85		
	CVC	0	0	95		95
	Multisyllabic	0	5	30	55	85
	Clusters	5	5	45		80
	Phrases / sentences	0	36	23	52	67.5
	-intelligibility improved significantly (profoundly disordered speech: currently moderately disordered speech)					
	-Confidence and functioning in class have increased. Child contributes to class discussions and initiates conversation with adults. Peer relationships continue to require support					

## Appendix 1h

**Key message: It may be important for therapy focus to move to comorbid communication difficulties e.g. language, in order for holistic progress to be made. Intervention may need to be long term for best outcomes.**

Age at identification	1;11
Gender	F
Relevant case history	History of middle ear infections starting at 8 months. Had been seen by audiology (reduced hearing in right ear but no fluid in middle ears) and ENT. Close family friend had a child already in language classes so parents knew what they wanted from education and SLT input from a very early stage.
Co-morbid difficulties	Expressive language difficulty Diagnosed with Developmental co-ordination disorder by O.T. at age 7.0. At 7yrs was given an additional diagnosis of dyslexia.
Nature of assessment	Second opinion sought at 3;1 from speech/language disorder specialist SLT
Diagnostic label / summary of diagnostic profile given	3;1 - Identified possible DVD features and some language delay.
Who gave diagnosis?	SLT - Specialist in Speech and Language Disorders.
Direct intervention	<ul style="list-style-type: none"> <li>- 2;4 attended a language group 6/6</li> <li>- 2;10 Block of individual intervention, targeting production of speech sounds</li> <li>- 3;1 Support sought from Specialist in borough.</li> <li>- 3;5 Block of individual intervention, targeting production of speech sounds</li> <li>- Intermittent support provided re statementing process.</li> <li>- 3;10 transferred into a language class. Specialist SLT present in class for 2 days per week. Involved in whole class lessons, withdrawn groups, 1:1 sessions and planning with the teacher for rest of week. Input pertaining directly to her features of DVD is as follows. <ul style="list-style-type: none"> <li>o daily input using a motor programming approach (2x SLT, 3x TA),</li> <li>o From Y3 (7y) focus moved to more general linguistic functioning</li> <li>o Returned to mainstream school in Y5 (9yr), targeting independent management of her production. Input initially 3-4 times per week with SLT or TA, but increasingly relied on child led home and school practise, to increase independence. Words checked and updated with SLT weekly.</li> </ul> </li> </ul>
Indirect intervention	<p>Educational placement within language classes.</p> <ul style="list-style-type: none"> <li>- Small class size (8-12),</li> <li>- experienced teachers, nursery nurses and teaching assistants,</li> <li>- joint lesson planning with SLT</li> <li>- support for successful communication throughout school day. Pictures, signs and gestures all used routinely in class to assist her ability to successfully communicate her ideas and demonstrate her learning and knowledge.</li> <li>- joint setting of targets with SLT</li> </ul> <p>From Year 4 was included in Mainstream class for P.E, music and maths lessons. No support regards her communication was needed or provided in these lessons.</p>
Parental engagement	All the time
School engagement	All the time – specialist provision
Outcomes	Speech is clear and intelligible.

## Appendix 1i

**Key message: Severe speech sound difficulties can impact on literacy and social integration, but the appropriate SLT can alleviate these issues and prevent their long term persistence**

Age at identification	2.11, with primary speech difficulty identified at 5.1
Gender	M
Relevant case history	Speech sound difficulties were not identified as primary difficulty when initially presenting for SLT intervention – although speech sound production difficulties and some unintelligibility noted. Was first identified as having a primary speech sound production difficulty at 5.1. Became a school-refuser by end of year 1, when he would not read or write, was socially withdrawn and struggling to build friendships & not participating in class. His social difficulties seemed to develop due to his inability to communicate with peers who didn't understand him & bullied him. His literacy difficulties were deemed to be secondary to his speech production difficulties as they resolved quickly once his speech became intelligible. At the end of Year 3 his writing was phonetically accurate and readable, but his knowledge of spelling patterns remained delayed.
Co-morbid difficulties	Original referral was for stammer, which resolved. Referred to O.T. for poor fine motor co-ordination difficulties, which were confirmed.
Nature of assessment	Nuffield Dyspraxia Program Assessment, & informal assessment.
Diagnostic label	At 6.3, diagnosed with severe speech sound production difficulties with dyspraxic features, co-occurring with articulation problems and phonological disorder
Who gave diagnosis	SLT - Specialist in Specific Speech and Language Disorders.
Direct intervention	<ul style="list-style-type: none"> <li>- 4;1 Language group @ nursery, generalist</li> <li>- Input from independent SLT (no details available)</li> <li>- 5;1 Block of intervention on speech sound production – school based SLT</li> <li>- 5;10 Block of intervention on speech sound production – school based SLT.</li> <li>- 6;3 Support sought from SSLD Specialist in borough. (Lack of progress, and increasing implications on his social interactions and literacy development instigated a second opinion)</li> <li>- 6;8 transferred into a language class – Specialist SLT in class for 2 days/week. Involved in whole class lessons, withdrawn groups, 1:1 sessions and planning with the teacher for rest of week. Input pertaining directly to his DVD features as follows. <ul style="list-style-type: none"> <li>o daily input using a motor programming approach; 2x SLT; 3x TA; Y2&amp;3</li> <li>o from mid Y3 the focus moved to phonological and articulation intervention, as it was felt that his residual difficulties were more of this nature. Input on his production of multi-syllabic topic related vocabulary, and some on-going motor programming intervention continued alongside.</li> </ul> </li> <li>- Transferred out of borough at 9.0 to a mainstream school. Referral made to local SLT service &amp; support organised prior to transfer between school and SLT service</li> <li>- Daily speech intervention provided by trained and monitored Nursery Nurse.</li> </ul>
Indirect intervention	Educational placement within language classes. <ul style="list-style-type: none"> <li>- Small class size (8-12),</li> <li>- experienced teachers, nursery nurses and teaching assistants,</li> <li>- joint lesson planning with SLT</li> <li>- support for successful communication throughout school day. Pictures, signs and gestures all used routinely in class to assist his ability to successfully communicate his ideas and demonstrate his learning and knowledge.</li> <li>- joint setting of targets with SLT</li> <li>- linking of speech work and literacy work thorough use of the same pictures/symbols in both types of activities.</li> </ul>
Parental engagement	All the time
School engagement	His first school found it difficult to support the implemented programme. Ongoing support whilst in specialist provision
Outcomes	Speech is intelligible, minimal residual sound difficulties which affect production of new multisyllabic words and some use of grammatical morphemes. Child confident speaking across a wide range of contexts (both school and social). Written work now good content and sentences but delayed spelling (very phonological but lack of awareness of spelling patterns)

## Appendix 1j

**Key message: Children with severe speech difficulties do not make progress without specific and direct intervention focussing on their speech itself; generalised language work does not impact on speech disorder.**

Age at identification	Initially referred for SLT input at 2;00; Speech diagnosis from specialist SLT at 4;05
Gender	M
Relevant case history	Born at 35 weeks Some feeding difficulties – monitored by hospital but never diagnosed Family history of delayed language development Family speak English and Arabic at home
Co-morbid difficulties	Delayed expressive language skills
Nature of assessment	Second opinion sought at 4;05 from SSLD specialist within borough, Nuffield Centre Dyspraxia Assessment used
Summary of diagnostic profile	Features of Developmental Verbal Dyspraxia, with limited expressive language (receptive language above level of expressive abilities)
Who gave diagnosis	SLT - Specialist in Specific Speech and Language Disorders.
Direct intervention	<ul style="list-style-type: none"> <li>o 3;05 – Parent Child Interaction 5/6 sessions</li> <li>o 3;09 – language groups 4/5 sessions</li> <li>o 4;03 - language groups 4/4 sessions</li> <li>o 4;05 - Support sought from Specialist in borough</li> </ul> <p><i>NB: The specific SLT provision to each mainstream school is agreed between the school and the SLT, and is meant to take into account the priorities of both. However, in this case the school refused to provide 1:1, follow up and refused to allow the SLT to timetable 1:1 session with this child. Their philosophy is that group work is more effective and efficient. They were not able to take on board the specific needs of this child, or allow for them. The SLT was therefore unable to provide any input for this child targeting speech production.</i></p> <ul style="list-style-type: none"> <li>o 4;05 – Mainstream schools language groups 6/6 sessions</li> <li>o 4;10 - Mainstream schools language groups 6/6 sessions</li> <li>o 5;08 - Mainstream schools language groups 5/5 sessions – with carryover from member of support staff</li> </ul> <p><i>Due to on-going serious concerns for this child, and his speech sound production (which has not been improving), the SLT managed to arrange to meet with the child's father weekly, before school (and so not technically in the school's time, and not requiring permission to withdraw this child from class) and to model motor programming type speech work for him to continue daily throughout the week.</i></p> <ul style="list-style-type: none"> <li>o 6;05 (current) – 1:1 weekly speech intervention with father completing activities in the week – no member of school staff available to complete programme in school.</li> </ul>
Indirect intervention	Class teacher has not identified speech as area need for this child – feels he copes well in the classroom and had not noticed any speech difficulties. Therefore no indirect support is being provided for this child re his speech production. SLT unable to get to the bottom of why there is no concern given that there are significant ongoing difficulties in this area. (Wonders if it is because child is passive and does not cause problems, or because they are attributing difficulties to EAL and therefore discounting them??) Schools opinions reflect lack of awareness NOT lack of actual difficulties.
Parental engagement	All the time
School engagement	Some of time – refuse to release member of staff to support speech programme
Outcomes	At age 6;05 is now making progress in speech sessions with father – working on multisyllabic words in isolation, and consonant cluster at phrase level. Reduced intelligibility in connected speech particularly across word boundaries containing s-cluster e.g. “sister’s birthday”. In spite of ongoing <i>language</i> based support being provided, his production of speech sounds and lack of progress in this area had remained a significant concern. Direct speech production related intervention is not currently occurring. School does not have a named SLT due to maternity leave. At end of last year father continued to be happy to provide support at home, while school continued to elect not to engage.

## Appendix 1k

**Key message: Appropriate regular intervention can improve children's speech. However, there may be impact on other skills such as word finding or literacy.**

Age at identification	3 y 1 m
Gender	M
Relevant case history	Family history of speech difficulties and literacy difficulties
Co-morbid difficulties	Severe Language delay
Nature of assessment	Nuffield Dyspraxia Programme assessment / informal and formal language assessment
Summary of diagnosis	Severe speech disorder with characteristics of developmental verbal dyspraxia Characteristics noted: <ul style="list-style-type: none"> <li>• Unintelligible even to family members and even at single word level</li> <li>• Glottal pattern of articulation with initial and final sounds deleted</li> <li>• Frequent vowel distortions</li> <li>• Very restricted range of sounds / favourite articulations – 'd'</li> <li>• Severe difficulties imitating sounds</li> <li>• When able to imitate a sound, not able to put into sequence</li> <li>• Oro motor difficulties – tongue and lips</li> </ul>
Who gave diagnosis	Specialist SLT (specialist in SLI and speech disorders / DVD)
Direct intervention -	<ul style="list-style-type: none"> <li>• 1:1 individual on-going therapy for speech from 3y2m – 5y8m</li> <li>• Language developed spontaneously but word finding difficulties identified</li> <li>• Word finding group – 6 sessions 5y10 – 5y11</li> <li>• Re referred and assessed at rising 10yrs due to slow progress at school but discharged with advice on vocabulary learning / word finding strategies</li> </ul>
Indirect intervention	<ul style="list-style-type: none"> <li>• Regular / daily practise at home</li> <li>• Literacy support at school – at least half termly advice / support from SLT</li> </ul>
Parental engagement	most of time
School engagement	All the time
Outcomes	<ul style="list-style-type: none"> <li>• Speech age appropriate when discharged at 5y11</li> <li>• Residual word finding / vocabulary learning difficulties</li> <li>• Residual literacy difficulties limiting progress at school</li> <li>• Good functional and social skills – confident child</li> </ul>

## Appendix 11

**Key message: It is important to monitor progress over time and revisit the child's diagnostic profile**

Age at identification	2 y 6 m
Gender	M
Any difficulties	Mild pragmatic language impairment
Nature of assessment	<p>Informal / Nuffield Dyspraxia Programme assessment</p> <p>Characteristics:</p> <ul style="list-style-type: none"> <li>• Difficulties producing sequences of sounds he could say in isolation</li> <li>• Atypical errors, particularly intrusive sounds eg. "fjunny"</li> <li>• Poor accuracy on DDK - got worse as number of repetitions increased</li> <li>• Difficulties producing or imitating sequences of sounds</li> <li>• Articulatory groping when working on speech</li> <li>• Difficulties producing oromotor movement sequences</li> <li>• Difficulties remembering motor programmes – needed constant prompts and reminders to enable sound-making and inhibiting habitual patterns</li> <li>• Persistent speech difficulties did not respond to phonological approach</li> <li>• Speech accuracy decreased as length / complexity of sequence increased</li> <li>• Frustration / awareness / avoidance</li> </ul>
Summary of diagnosis	<p>Initial - phonological disorder, but very slow progress with phonological therapy</p> <p>4y3m - Severe speech disorder with characteristics of DVD</p>
Who gave diagnosis	Specialist SLT (specialist in SLI and speech disorders)
Direct intervention	<ul style="list-style-type: none"> <li>• 1:1 individual therapy – phonological approach - from non-specialist SLT from 2y9 – 4y0 but limited progress and lack of compliance</li> <li>• Psycholinguistic approach from 4y1 – 5y9m delivered by specialist SLT: good progress</li> <li>• Daily practise at home, some support at school but not consistent</li> </ul>
Parental engagement	Most of time
School engagement	Some - inconsistent
Outcomes	<ul style="list-style-type: none"> <li>• Speech age appropriate when discharged in 5y 9m</li> <li>• Residual literacy difficulties but good support offered by school</li> <li>• Good functional skills and generalisation but some on-going social difficulties related to mild pragmatic impairment – parents aware but did not want to pursue or investigate further</li> </ul>

**Appendix 2a: Kent Community Health NHS Trust**

**Current service delivery model**

In January 2009, a specialist service supporting children with the DVD symptom cluster was created offering twice weekly direct therapy to each child that meets the criteria, detailed below:

**Entry criteria:** a) The child should have received at least one long block of therapy at

**Appendix 2: Service case studies**

- a) Kent Community Health NHS Trust
- b) Hertfordshire Community Health NHS Trust
- c) Service led by a Consultant SLT for Child Speech Disorder
- d) Nuffield Hearing and Speech Centre, RNTNE Hospital, London

their local community clinic - no less than 10 sessions; b) Specialist speech assessment is carried out by Highly Specialist SLT using formal and informal assessments for differential diagnosis to be reached; c) Child presents with 3 (up to 4 years of age), 4 (4 years and over) or more characteristics of our selected diagnostic criteria.

**Therapy Package:** Twice weekly therapy is offered at the child's school or nursery/home with reviews taking place every 12 weeks to ensure intervention is tailored to the individual child's speech, language and communication needs. Therapy is delivered by a Highly Specialist SLT and carried over on a daily basis by school/nursery staff and parents.

**Exit criteria:** a) No further therapy required (mild speech difficulty; speech errors resolved; client/parents satisfied with level of progress); b) Limited parental/school involvement; c) Other therapy package is more appropriate to meet the child's need e.g. Augmentative Alternative Communication (AAC).

#### **Drivers behind service delivery model**

Team managers identified that the needs of the children with the DVD symptom cluster were not being met effectively through the clinic therapy package offered in our area. Children with suspected or confirmed DVD features were seen for speech and language therapy in their local community clinics, accessing a therapy package of six-weekly blocks (one session per week). Therapy blocks were sporadic as the waiting times in between blocks depended on waiting lists at the time. Children's progress was slow and they often remained in this cycle of having blocks for a significant amount of time.

Also, special school and nursery placements, offered locally, significantly decreased and admission criteria changed which resulted in children with a severe DVD symptom cluster attending mainstream settings which could not effectively meet their needs without direct SLT intervention.

#### **Service design process**

Following discussions and ratification with the Senior Management Team and Commissioners, the DVD service was set up within 2 months. The SLTs appointed used this time to perform the following searches: a) a literature search to collate available information and examples of good practice in the field of DVD to inform service delivery model; b) a caseload review to identify caseload size and level of need within the department & c) searches of literature on DVD definition and diagnosis and therapeutic approaches.

#### **Clinical Effectiveness/Outcomes**

Clinical effectiveness is measured using the East Kent Outcomes System (EKOS), highlighting positive outcomes. Data collated between January 2009 and October 2010 indicated that out of 24 cases who were seen over that period of time (age range 3;5 yrs -13;9 yrs) 10 are now discharged due to exit criteria (a) discussed above.

Service user feedback including parental and school/nursery's reports, are collected through pre & post therapy questionnaires and yearly focus groups. Feedback provided strong support for this service model as respondents give clear preferences as to therapy being delivered in their day-to-day environments (school/nursery/home). They also identify additional benefits such as active engagement in the therapy process playing a key role in positive outcomes.

#### **Challenges & Future Direction**

The service is hindered by the geography of the district and the distances needed to be travelled in order to see the children in schools/nursery/home are vast.

In the future, we will need to look at the expansion of the service and/or at the prioritization of the caseload in order to actively consider each child's level of need i.e. children with a severe DVD symptom cluster would need to receive more than twice weekly therapy.

The service diagnostic criteria will need revising following the DVD Policy Statement published by the RCSLT.

The cost effectiveness of the service will also need to be thoroughly calculated as recent calculations of costs were proven to be a challenging task with further analysis and considerations required.

### **Appendix 2b: Hertfordshire Community Health NHS Trust**

### **Current service delivery model**

- Provision of a needs led service for children of all ages with the DVD symptom cluster (and other speech disorders) as part of the redesign of whole service in West Herts in 2008
- Prioritisation system so that children of concern can be prioritised for therapy input more quickly through peer mediated prioritisation system
- Needs led approach to frequency of therapy - weekly ongoing therapy can be provided if appropriate to the child at that time, peer review system in place to monitor this
- Use of assistants to supplement direct therapy from SLT eg. to provide child with twice weekly input or to alternate weekly input with SLT, if appropriate to child
- Flexibility of service provision to accommodate changing needs over time
- Specialist SLTs available for second opinions via telephone , email and in person if necessary
- Specialist therapist(s ) keeping team up to date through attendance at SIGs and conferences and by providing rolling programme of training and tutorials
- Regular training on identification, diagnosis, management and treatment for all SLTs
- External training provided by specialist centres / experts eg Pam Williams from Nuffield, Joy Stackhouse

Language units available for the children with the most severe difficulties

### **Drivers**

#### **Why follow this model of delivery?**

- Only speech and language therapists have the knowledge and skills to provide input for this group of children
- More effective and timely diagnosis
- Most children are accessing appropriate therapy sooner with and without specialist opinion
- All therapists empowered to treat children with the DVD symptom cluster
- Children with speech disorders able to receive regular ongoing input ( if appropriate to their needs) whatever their age
- Children with speech disorders discharged more quickly (although evidence only anecdotal)
- Children who may need specialist input identified sooner
- Many children considered very severe discharged before specialist input became necessary

#### **Challenges**

- Children waiting longer to be seen for therapy and parental concerns, managed by:
  - reassuring parents that needs would be met once seen
  - peer mediated prioritisation system available for children of particular concern
- Availability / consistency of agent of change, managed by:
  - negotiation with parents / education staff
  - use of speech and language therapy assistants

### **Service design process**

Part of the redesign of whole service in West Herts in 2008, led by senior management in consultation with commissioners and whole SLT team

### **Outcomes and effectiveness**

- Children with a high risk of a long-term impact on social and emotional well being and with a high risk of impact on academic success will be provided with appropriate input in order to minimise these risks (see Bercow review, ICAN cost to nation report)
- Most children with the DVD symptom cluster will have normal speech in the long term if they receive appropriate therapy – literature search regarding outcomes for children with speech disorders

### **Current challenges:**

- West Herts service now merged with North and East Herts leading to total service re design in response to jointly commissioned service specification
- Expectation from commissioners that waiting lists will be shorter and that all children referred to the service will be seen for input sooner

Finite resources available and specification set by commissioners may limit what can be achieved

## **Appendix 2c: Speech disorder service led by a Consultant SLT**

### **Current service delivery model**

- All children with complex speech difficulties receive a short period of diagnostic therapy, where all influencing factors are investigated
  - This episode is either led or supported by a SLT with specialist expertise in the field of speech sound difficulties
  - The approach considers elements such as phonological awareness; speech sound inventory, imitation versus spontaneous production, consistency of repeated productions of target words, auditory skills, concepts and classification skills.
  - At the end of the five week period, a diagnostic profile is drawn up, from which the primary presenting difficulty is identified, in order that the appropriate evidence based intervention approach can be determined
- Thereafter, an intervention plan is established, with frequency of therapy being determined by the severity of the presentation. For those children presenting with the DVD symptom cluster, therapy is offered at least weekly, led by an SLT and often supported by an SLT Assistant, as well as by home and school
- There is an option, should progress be limited and a potential impact on academic achievement be identified, for the most severe children to be placed within a language resource unit where they can receive daily input from the SLT team, supported by the specialist teaching team in the unit.

### **Drivers**

- Prior evidence of inaccurate diagnostic labels being applied, leading to inappropriate intervention approaches and limited progress for the child.
- Desire for more effective and efficient working
- Presence of a clinical expert, able to guide service delivery

### **Service design process**

- Clinical team of SLTs who had / were developing specialist skills and knowledge within the field of child speech disorder ('speech team')
- Whole service redesign, relating to changes of funding streams and commissioning expectations
- Evaluation of prior case management by the 'speech team', identifying strengths and weaknesses of the existing system
- Pilot and evaluation of a diagnostic therapy approach, with positive outcomes
- Development of a firm structure for the diagnostic therapy programme, together with documentation for speech profiling and a differential care pathway
- Determination of the evidence base for differential interventions for subtypes of speech disorder

### **Outcomes and effectiveness**

- It is acknowledged that, to undertake a period of diagnostic therapy, the period before true intervention begins is slowed
- However, the fact that individuals then access the most appropriate intervention approach for their presentation reduces any weaker outcomes due to inappropriate actions
- Hence, the management of children with speech impairment, including those presenting with the DVD symptom cluster, receive an more effective and overall more efficient service to meet their individual needs

### **Current challenges:**

- The current austerity measures are likely to impact, as whilst the period of diagnostic intervention is beneficial, as is the intensive therapy approach, it may be that this model cannot be sustained
- The changing commissioning framework, together with developments such as 'Any Qualified Provider', are likely to impact on the service delivery model

## **Appendix 2d: Nuffield Hearing and Speech Centre, RNTNE Hospital, London**

### **Current service delivery model**

The Nuffield Speech Clinic within the Nuffield Hearing and Speech Centre, is the only national specialist NHS service specifically specialising in children presenting with the DVD symptom cluster. Referrals are made by local speech and language therapists (SLTs) and doctors.

The service provides diagnostic assessment. Children are assessed in a joint clinic by an expert speech and language therapist and a consultant in neurodevelopmental paediatrics or audiovestibular medicine. Following assessment, verbal recommendations are made and written reports are distributed to the referrer, parents and local practitioners (with parental permission). Feedback and management/intervention advice is provided by Nuffield SLT to local SLT, by telephone/email contact.

In addition to an assessment service, we provide some specialist therapy, with the aim of supporting local services in meeting children's needs. The focus of therapy is often to explore effective intervention strategies and overcome particular obstacles, for individual children. Therapy approaches include Nuffield Dyspraxia Programme (NDP3) approach and Electropalatography (EPG) for children over 8 years, with persisting articulation difficulties. Therapy sessions may be offered on a weekly or monthly basis, or as an intensive block during a week within the school holidays. Local therapists and SLT assistants/teaching assistants are encouraged to attend sessions where possible.

We also provide support, management advice, therapy resources and training for SLTs working with children with the DVD symptom cluster.

### **Drivers behind service delivery model**

- SLTs may be unable to access specialist support for challenging cases in their locality, and therefore need access to a national centre.
- Parents may require a second opinion, on the nature of their child's difficulty and/or advice on management, independent of their local provision.
- Given the low incidence of DVD, this national NHS centre ensures the possibility of access to specialist services for all.

### **Clinical Effectiveness/Outcomes**

The aim of the service is to improve speech and quality of life outcomes for children with severe speech disorder, and especially those presenting with the DVD symptom cluster. The effectiveness of the assessment and therapy service is regularly evaluated through parent questionnaires. Following assessment, parents report increased understanding of their child's needs and success in accessing appropriate local services to support their child. Following intervention, parents report high levels of satisfaction and positive therapy outcomes. Pre and post intervention assessment results, based on the Nuffield Dyspraxia Programme Assessment (NDPA) and other formal/informal measures, are used to measure clinical effectiveness.

### **Challenges & Future Direction**

#### **Challenges**

- Maintaining referral numbers and funding of the service in the current economic climate.
- Demonstrating objective clinical effectiveness in short-term intervention periods for children with severe speech impairments.

#### **Future directions**

- To develop assessment and diagnostic procedures in line with developments in the published literature and the available evidence-base.
- To carry out intervention studies, within the context of the clinical service, involving the use of the Nuffield Centre Dyspraxia Programme (NDP3) approach.