MISLToe_SSD Manual

Maximising the Impact of Speech and Language Therapy for Children with Speech Sound Disorder

(version 3.0)

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The views expressed are those of the authors and not necessarily those of the NIHR, HCRW or the Department of Health and Social Care

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Section 1: Foreword

Research has demonstrated that speech and language therapy can make a real difference for children with Speech Sound Disorder (SSD)[1]. However, trying to measure exactly how it makes a difference and which interventions are most effective is fraught with difficulty. Most studies have been conducted in **university or research settings**, using high-intensity approaches that are often **difficult to replicate** in everyday clinical practice. Evidence for specific intervention types is frequently limited to **small-scale studies**, with **inconsistent terminology** and few **comparative trials** [2,3].

While **Randomised Controlled Trials (RCTs)** are considered the gold standard in research, they can be challenging to conduct in speech and language therapy, where intervention must remain responsive to each child's needs and progress.

To strengthen the evidence base, we need an approach that reflects **real-world practice**, using consistent, high-quality data collected during **routine clinical care**. Collecting such data will help us understand **which interventions work best**, **for whom**, and **under what circumstances**.

This requires:

- Shared and consistent **diagnostic criteria**
- Clear **definitions and labels** for interventions
- Agreed **baseline and outcome measures** for evaluating progress

The MISLToe_SSD Programme

The **MISLToe_SSD** initiative, **Maximising the Impact of Speech and Language Therapy for children with Speech Sound Disorder**, was developed to address these needs.

Funded by the **National Institute for Health and Care Research (NIHR) Research for Patient Benefit Programme (2022–2024)**, Phase One of MISLToe_SSD focused on creating the **foundation for consistent, meaningful data collection** across NHS speech and language therapy services.

The specific aims of this first phase were to:

1. **Develop** an agreed diagnostic pathway for subtypes of SSD
2. **Define** and label the interventions used with children with SSD in the UK
3. **Establish** a Core Outcome Set (COS) – a concise group of agreed measures for baseline and outcome data, supported by a minimal dataset of relevant background information

Each element of this work was co-designed with **clinicians**, **parents**, and **children with lived experience** of SSD, ensuring that the resulting framework is both **clinically practical** and **patient centred**.

Purpose of This Manual

This manual brings together the outcomes of Phase One and provides practical guidance for clinicians and services wishing to adopt the MISLToe_SSD framework.

It outlines the:

- **Diagnostic pathway** for subtypes of SSD
- **Agreed intervention definitions and labels**
- **COS** and **minimum dataset** for consistent data collection

Together, these tools support the collection of **high-quality, comparable data** that can be used to improve clinical practice and contribute to future research on the effectiveness of interventions for SSD.

This manual is designed as a **practical guide** to support the consistent use of the MISLToe_SSD framework in everyday clinical work using **System One clinical system** in **England** and **Qualtrics^{XM} Survey platform** in **Wales.**

Clinicians are encouraged to use this manual as both a **reference resource** and a **working document**. It can be adapted to local service needs while maintaining the consistency required for robust data collection and shared learning across the profession.

Section 2: About This Manual

Purpose

This manual has been developed to support speech and language therapists (SLTs), service leads, and researchers in the consistent use of the **MISLToe_SSD** framework – *Maximising the Impact of Speech and Language Therapy for children with Speech Sound Disorder*.

Its purpose is to provide clear, practical guidance for applying the outcomes of the **MISLToe_SSD Phase One** project in everyday clinical practice. By following the diagnostic process, using standardised intervention definitions and labels, and collecting data based on the agreed **COS**, services can contribute to a shared evidence base that will help improve outcomes for children with SSD.

Intended Audience

This manual is designed for:

- **Speech and Language Therapists (SLTs)** working with children with SSD in any setting
- **Clinical leads and service managers** implementing consistent data collection processes across teams
- **Researchers** and **students** interested in evidence-based approaches to SSD intervention
- **Policy and commissioning teams** seeking to understand how MISLToe_SSD supports quality improvement and outcome measurement within services

While the manual focuses on the UK National Health Service (NHS) context, the framework and tools may also be adapted for use in other health systems or countries.

Structure of the Manual

The manual is organised into five main sections:

1. **Background and Context** – introduces the MISLToe_SSD programme and outlines the research that underpins it.
2. **The MISLToe_SSD Protocol**– provides: an overview of the MISLToe_SSD diagnostic process, guidance and visual aids for identifying and categorising SSD subtypes, with suggested tools for assessment.
3. **The COS and Minimum Dataset** – describes the agreed outcome measures and data items for collection at baseline, within and end of each episode of care
4. **Interventions** – offers list of interventions identified as part of Phase 1 of the study

Additional **appendices** include probe lists and example data collection forms that can be adapted for local use.

Acknowledgements

This manual has been produced by the **MISLToe_SSD research team** in collaboration with clinicians, parents, and children across the UK. We would like to thank all those who contributed to workshops, surveys, and advisory panels during the development of Phase One.

We also acknowledge the support of:

- The **National Institute for Health and Care Research (NIHR)** Research for Patient Benefit Programme
- **Health and Care Research Wales (HCRW)**
- **The Underwood Trust**
- The **Royal College of Speech and Language Therapists (RCSLT)**
- **Bristol Speech and Language Therapy Research Unit (BSLTRU)**

Their contributions have been vital in ensuring that the MISLToe_SSD framework reflects both the realities of clinical practice and the priorities of children and families.

Citation

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Section 3: Background to MISLToe_SSD

Why was the MISLToe_SSD Diagnostic Protocol and COS needed?

SSD is defined as a '*persistent difficulty with speech sound production that interferes with speech intelligibility or prevents verbal communication*'[4]. Prevalence is high, with estimates of 3.4% to 3.8% in children aged 4-8[5–7], and upwards of 76,000 children referred to NHS Speech and Language Therapy services annually[8]. It differs from other types of communication impairment such as Developmental Language Disorder, Autism or Social Communication Disorder and stammering in that children with SSD have a specific problem with producing the sounds of speech in a clear and intelligible manner. While a minority of children with SSD have clear aetiology (e.g., cleft palate, cerebral palsy, hearing impairment), in most cases, SSD has no identifiable cause. Untreated, the impact of SSD is far reaching if it continues beyond early childhood, leading to poor outcomes in education[9] employment[10] and, mental health[11].

NHS speech language therapy services are provided to children with SSD via a range of care pathways, typically defined by resource constraints, rather than robust evidence. These care pathways vary in terms of timing of intervention (pre-school, school age), delivery by SLTs or assistants, number, frequency and duration of sessions, and involvement of parents or education staff. Service-level methods for collecting clinical data on outcomes also vary making it difficult to determine which NHS care pathways lead to better outcomes. A COS is an agreed standardised list of outcomes that can be used to measure improvements after therapy. The diversity in service provision and lack of uniformity in the collection of important data makes it very difficult to carry out research in a clinical setting for this population of children.

There is a need to identify which care pathways are associated with the best outcomes and are most cost-effective within the service constraints of the NHS. Effective treatment will reduce the number of children with SSD who have persistent problems and associated sequelae. It will reduce time missed from school and burden of care for families and maximise efficiency and cost of NHS speech and language therapy services. The research undertaken within the MISLToe_SSD study will lead to future work which will support the NHS to deliver the national government priority of providing high quality, safe and sustainable health care.

This research is important to children, their families and clinicians:

SLTs have identified questions about service delivery and types of SSD intervention and dosage as the highest priority for research[12]. Parents have told us they want to know which SSD interventions are the most effective.

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Evidence and support for MISLToe_SSD from UK national guidance and policy

The work undertaken by the MISLToe_SSD study addresses and is supported by the following national guidance and policies:

National guidance / policy	Relevance for MISLToe_SSD
NHS England Five Year Forward View	Reduce variability in demand and provision of intervention for SSD across the country
NHS 10 Point Efficiency Plan	
Fit for the Future : 10 Year Health Plan for England	
'Getting it Right First Time' methodology (http://gettingitrightfirsttime.co.uk/girft-methodology)	Prevention of later poor outcomes due to addressing issues earlier
Public Health England 2022 (https://www.gov.uk/government/publications/best-start-in-speech-language-and-communication).	Builds on and progresses the guidance to improve speech, language and communication skills in the early years
Royal College of Speech and Language Therapists (RCSLT) and I CAN national consultation[13] in 2018	Identified the need to collect consistent data. It highlighted the lack of evidence to support services (p.26-28) and recommended that NHS England support providers to collect data on the quality and outcomes of interventions (rec4.5, p.29).
RCSLT ROOT[14]	While this tool is valuable for the purposes of providing service level data across different patient groups, the dimensions of impairment, activity, participation and well-being measured by the tool are too broad to be used to evaluate differences in response to intervention. Indeed, it was always the intention of RCSLT to develop COS for each of the major client groups in speech and language therapy. MISLToe_SSD is the first COS for children with SSD
RCSLT Wales (2025) State of the Nation Report: The Speech and Language Therapy Workforce in Wales (RCSLT-Wales-State-of-the-Nation-report_English-version-January-2025.pdf)	Insufficient speech and language therapy provision and unmet needs among children
Welsh Government (2020) Talk With Me: Speech, Language and Communication (SLC) Delivery Plan (https://www.gov.wales/sites/default/files/publications/2020-11/talk-with-me.pdf)	
Welsh Government (2024) Healthy Child Wales Programme (Healthy Child Wales Programme | GOV.WALES)	The provision of high-quality, safe and sustainable healthcare for children is a key government priority
Welsh Government Annual Report (2024) (Welsh Government Annual Report 2024 [HTML] | GOV.WALES)	

The MISLToe_SSD study

Phase 1 of the MISLToe_SSD study confirmed that consensus can be reached on key elements which are vital to creating a COS for SSD. This was achieved by:

1) Large scale literature review (umbrella review) following an investigation of the existing literature[15]
2) Participatory workshops with SLTs[16]
3) A large-scale consensus process (Delphi Study) with SLTs, clinical experts and academics[17]

Throughout the study we have worked with children and parents to ensure the research aligned with their needs and priorities. We now have:

- an agreed diagnostic process for identification of SSD and subtypes of SSD
- a list of defined interventions in common use in UK speech and language therapy practice
- a COS together with an agreed minimum dataset which can be used to collect consistent data across multiple NHS services. A minimum dataset is the information we need to help us make sense of the COS (e.g., gender, number of intervention sessions).

Section 4: The MISLToe_SSD Process

4.1. Overview of the MISLToe_SSD Process

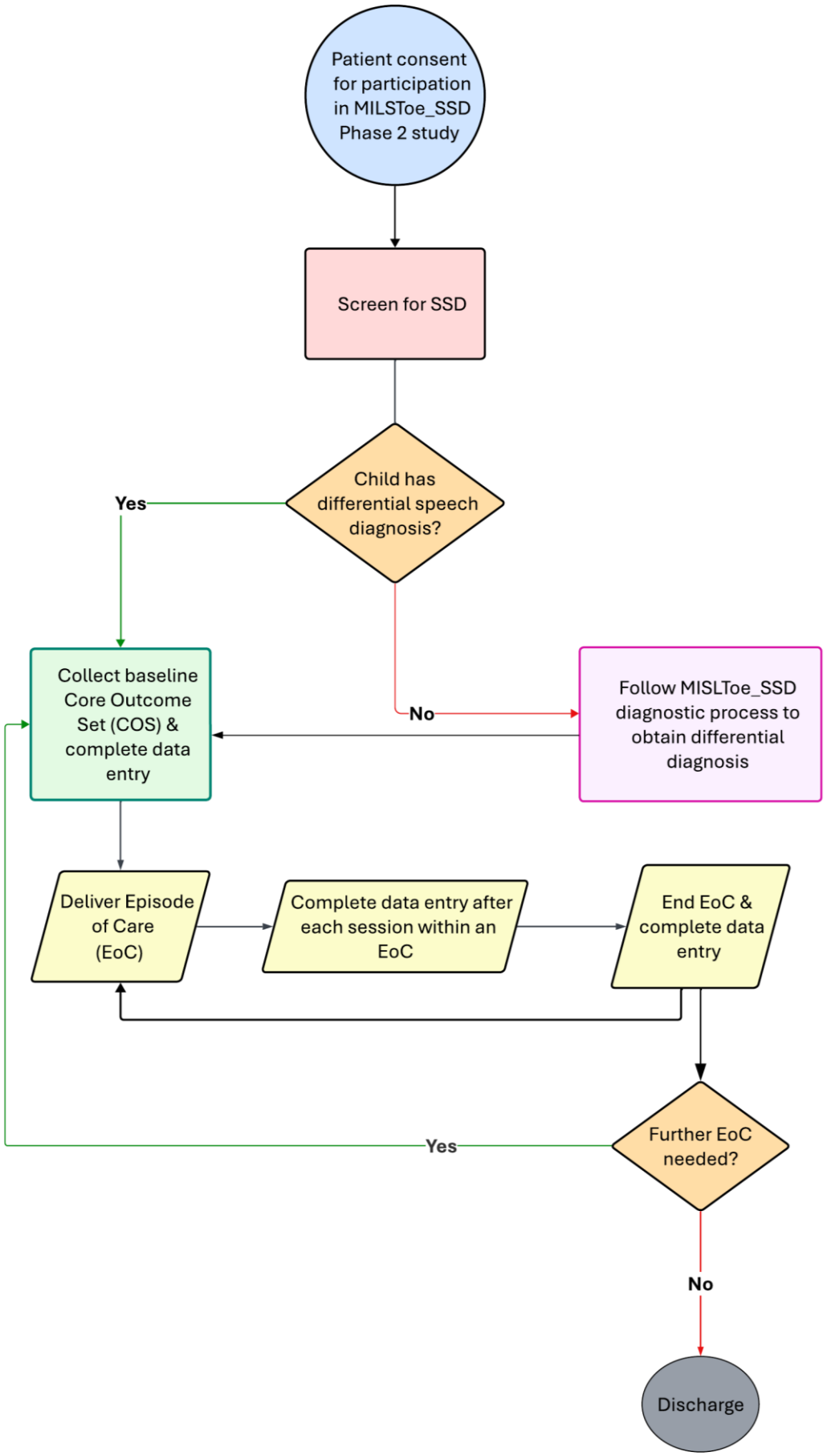
The aim of the MISLToe_SSD process and COS is to enable collection of routine clinical data from children with SSD of **unknown origin**. It is acknowledged that some children may present with SSD where the origin is known or suspected (e.g., submucous cleft palate or childhood dysarthria). In such cases the principles of the MISLToe_SSD protocol can still be applied, but further assessment and additional outcome measures may apply.

Note: this protocol has been designed mainly for English-speaking children. We are not yet able to suggest standardized assessment measures for children who speak other or additional languages. We acknowledge that this is a limitation, particularly in the context of Wales where the Welsh language has official status. While some assessments are available in Welsh (e.g. ICS), which are suitable for collecting certain components of the COS, there are currently no standardised single-word assessments in Welsh to support the measurement of other COS components. Further work is required to develop appropriate tools.

Research is currently underway to address this gap. For example, a Welsh-language version of the NAPA will be available soon. The research team will share updates on this work with participants.

The MISLToe_SSD Process with data entry points is presented in **Figure 1.**

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Patient consent for participation in MILSToe_SSD Phase 2 study
Screen for SSD
Child has differential speech diagnosis?
Yes
No
Collect baseline Core Outcome Set (COS) & complete data entry
Follow MISLToe_SSD diagnostic process to obtain differential diagnosis
Deliver Episode of Care (EoC)
Complete data entry after each session within an EoC
End EoC & complete data entry
Further EoC needed?
Yes
No
Discharge

4.2. Making a Differential Speech Diagnosis Using the Diagnostic Process

When to do the MISLToe_SSD Diagnostic Process?

Complete the MISLToe_SSD diagnostic process with each child, either new to the service or currently known to the service, for whom a differential diagnosis conforming to the labels below has not already been established. A differential diagnosis should be given based on the SSD subtypes specified in **Figure 2.**

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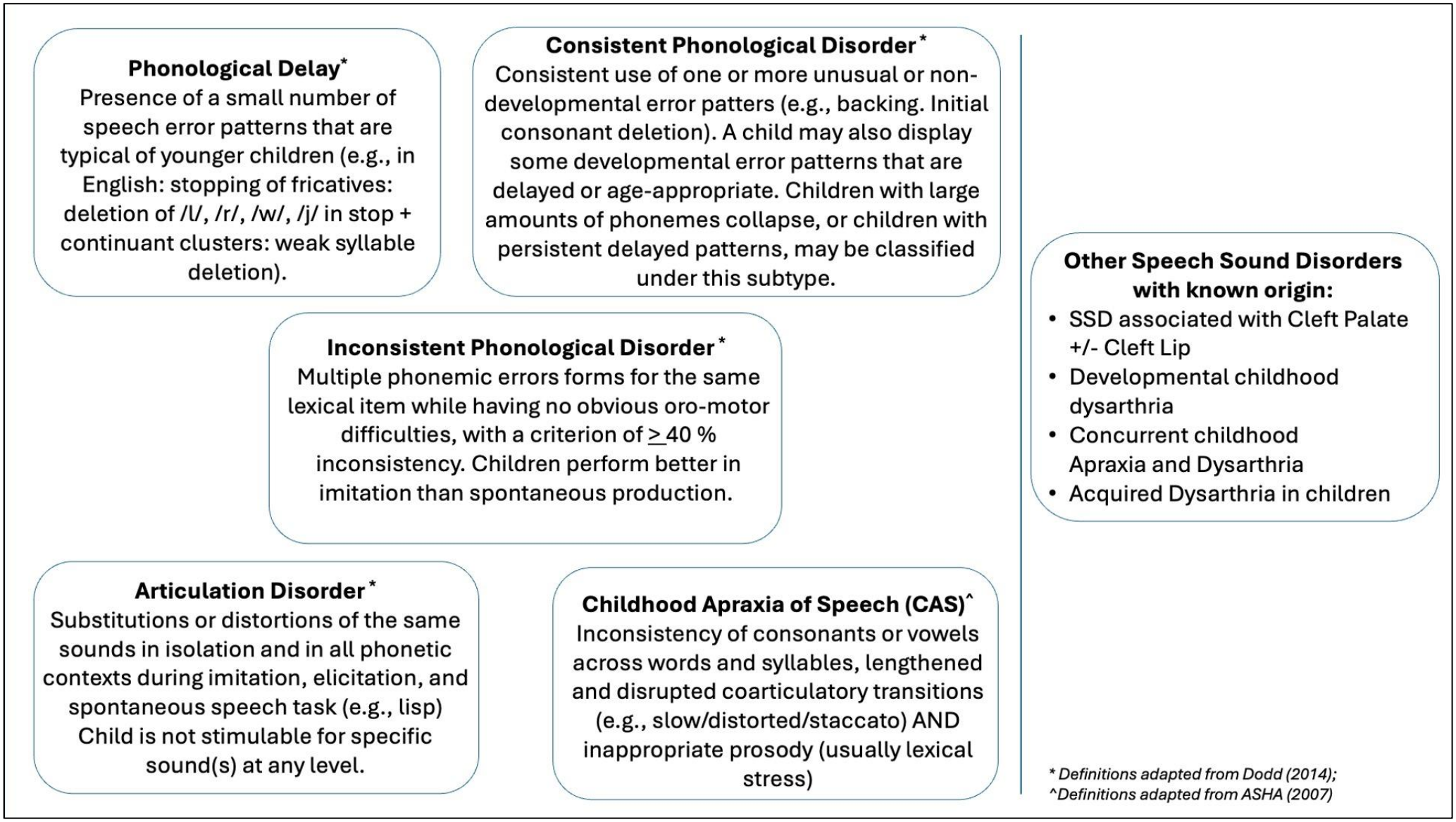


Figure 2: Definitions based on agreed clinician-led UK consensus on classification system for SSD of unknown origin (Cleland *et al.*, 2025)

The MISLToe_SSD diagnostic protocol consists of:

- A mandatory core speech sample
- Additional drill down sample
- Subjective impressions made by the SLT

See **Figure 3** for an overview of the MISLToe_SSD diagnostic process for differential diagnosis. A video explaining this protocol for differential diagnosis can be found here

Note: If a differential diagnosis using the subtypes from the MISLToe_SSD protocol has already been reached, then the diagnostic protocol **does not** need to be repeated.

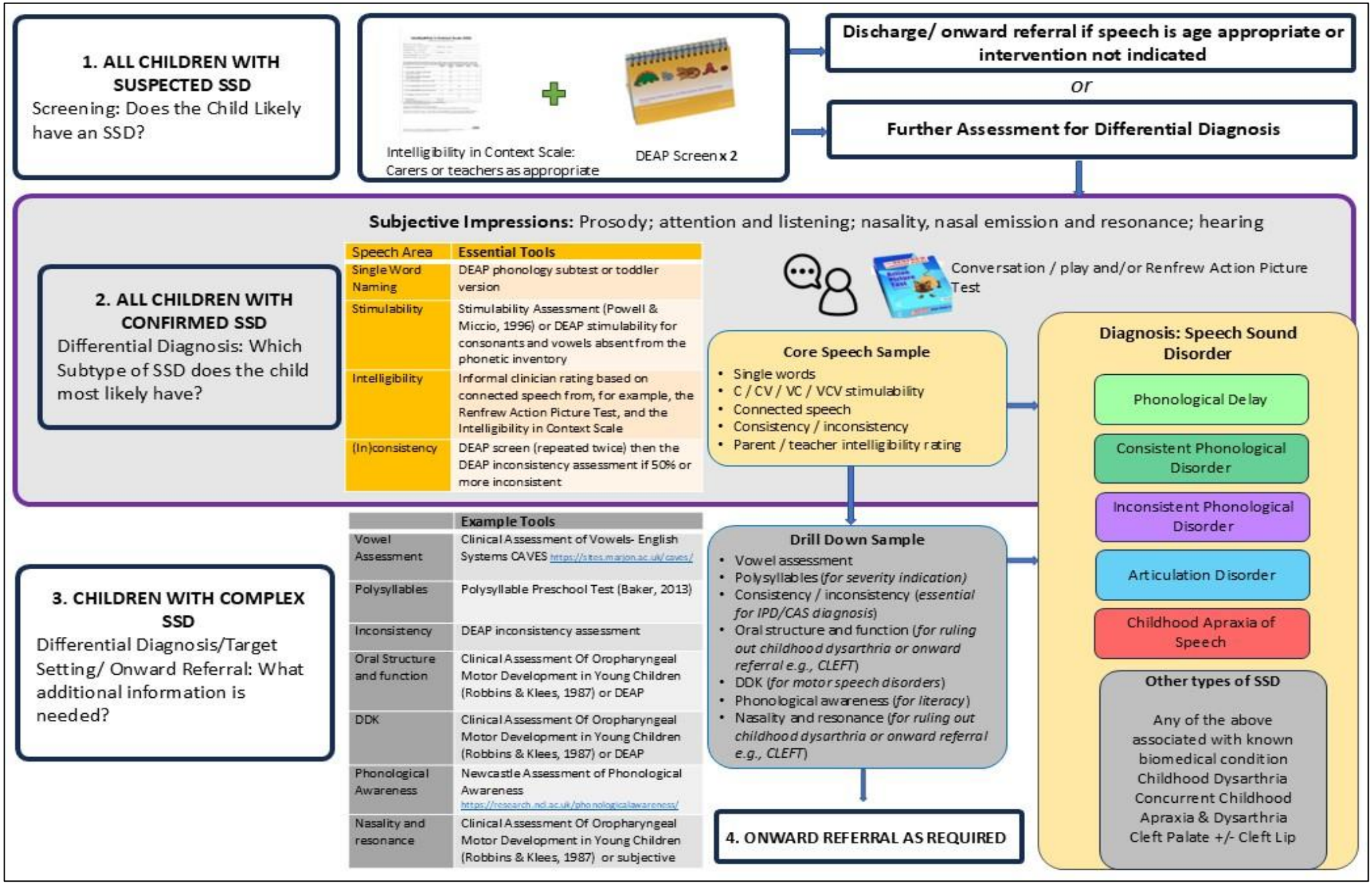


Figure 3: Overview of the MISLToe_SSD Process for Differential Diagnosis

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MISLToe_SSD Core Speech Sample

All the Core Speech Sample tasks should be completed with all English-speaking children with SSD to determine a differential diagnosis. For children who speak languages other than English, appropriate assessments can be substituted (i.e. a single word naming test in the target language). The assessments for English-speaking children are listed in **Table 1.**

Table 1: Core Speech Sample Tasks and Assessments

Assessment domain	Aim	Assessment tools
Consistency / inconsistency screening	To screen for consistency in the child's production of the same word across multiple attempts. Inconsistency refers to variation in production of the same word across multiple repetitions as opposed to variable production of the same phoneme across different words[18].	Elicit a single set of words as specified in the **Diagnostic Evaluation of Articulation and Phonology (DEAP), Diagnostic Screen**[19]**.** If ≥50% of the words in the screen are produced inconsistently, complete the full inconsistency assessment using the **DEAP Inconsistency subtest**[19]. The subtest criteria to identify inconsistency is >40%.
Single word naming test	To provide information regarding phonetic inventory; productive phonological knowledge, phonological processes or articulatory errors present in the child's speech, and intelligibility at a single word level.	Use the **Phonology, Inconsistency and Articulation subtests of the DEAP assessment** as options for single word naming sample**.** The subtest(s) should be chosen based on the results of the DEAP screen[19]**^** (i.e., the **Articulation Subtest** is completed when sounds are not stimulable). The **Inconsistency Subtest** is completed for any child who scores ≥50% inconsistency on the DEAP screen when words are elicited twice. Finally, the **Phonology Subtest** is completed where inconsistency is <50% and sounds in error are stimulable. **The Phonology Subtest** of the DEAP assessment should be administered with all children to report the COS. Therefore, some children will require more than one single word assessment.
Stimulability of sounds in C / CV / VC / VCV	To determine if the child can produce sounds in error in different contexts such as consonant in isolation (C), consonant-vowel (CV), Vowel-Consonant (VC) and Vowel-Consonant-Vowel (VCV). A sound is stimulable if it is produced at least twice out of 10 opportunities.[18]	Use the **DEAP Articulation Assessment stimulability section**[19] OR **Stimulability Assessment*[20]. Sounds for stimulability testing are selected following analysis based on sounds absent from the child's inventory in the single word naming sample. [16]
Connected speech sample	To provide information regarding the child's connected Speech including suprasegmental features, and overall rating of intelligibility.	Use **The Renfrew Action Picture Test** (RAPT)[21]. Observations regarding suprasegmental features should be made (e.g., the child's speech rate, stress, intonation, volume etc.
Parent/teacher intelligibility rating	To measure the functional impact of the child's SSD	The freely available **Intelligibility in Context Scale** (ICS) [22] should be used, this is available in a variety of languages and should be completed for all of the languages the child speaks.

Note: ^any child who scores ≥50% inconsistency in the DEAP screen must complete the **DEAP Inconsistency subtest** [19] as part of their core speech sample. A differential diagnosis will be needed between Inconsistent Phonological Disorder (IPD) and CAS if inconsistency is present, as inconsistency is a feature of both diagnoses. See the RCSLT CAS Position Paper [23] for further guidance regarding differential diagnosis of CAS. **Phonological Awareness assessment** is not required in the core sample but note that it is required for the COS. This ***should*** be completed using **The Newcastle Assessment of Phonological Awareness (NAPA)** [24] and it is recommended that this is completed at the same time as the Core Speech Sample.

*
There are different versions of the stimulability assessment available. However, we recommend using the Stimulability Assessment developed by Miccio with accent appropriate vowels.

The Drill Down Sample: Optional Additional Assessment

Tasks within the Drill Down Sample should be selected depending on the outcome of the Core Speech Sample and the further information the SLT requires to make a differential diagnosis for more complex presentations. Note, the Inconsistency Assessment is non-optional for children who present with ≥50% inconsistency in the DEAP diagnostic screen. Additional tasks that may be completed as part of the drill down sample are listed in **Table 2.**

Table 2: Drill down sample tasks and Assessments

Assessment domain	Aim	Suggested Assessment tools
Inconsistency assessment	(** Essential for children with **≥50%** Inconsistency in the DEAP screen**) – should be completed if the core speech sample indicates possible inconsistency (≥50% of the 10 words screened produced inconsistently).	The **DEAP Inconsistency subtest**[19] should be used. A differential diagnosis will be needed between Inconsistent Phonological Disorder (IPD) and Childhood Apraxia of Speech (CAS) if inconsistency is present, as inconsistency is a feature of both diagnoses. See the RCSLT CAS Position Paper[23] for further guidance regarding differential diagnosis of CAS.
Vowel assessment	To assess the vowel errors and the stimulability of vowels identified in the core speech sample.	**The Clinical Assessment of Vowels – English Systems (CAV-ES)** can be used to assess vowel errors and stimulability.
Polysyllables	To identify more severe SSD[18] and conduct differential diagnosis of Childhood Apraxia of Speech (CAS)[25]	This can be completed informally or using published speech assessments such as, the **Multisyllabic Subtest of the Nuffield Dyspraxia Programme-Third Edition**[26] or the **Word Level Assessment of Polysyllables**[27].
Oral structure and function	To rule out any structural anomalies (e.g., Submucous Cleft Palate) or motor control difficulties (e.g., Dysarthria) which may require onward referrals.	This can be completed informally or using published assessments such as **The Oro-Motor subtest of the DEAP**[19]**,** The **Nuffield Dyspraxia Programme (NDP 3)**[26]or the **Clinical assessment of oropharyngeal motor development in young children**[28].
Diadochokinetic (DDK) rate	To assess concerns regarding the child's motor speech skills.	This can be completed informally or using published assessments such as the **DDK section of the NDP3** [26]or of the **DEAP Oro-Motor subtest.** [19]
Nasality and resonance	To conduct in-depth assessment if concerns are identified perceptually with nasality and resonance.	**The Great Ormond Street Speech Sound Assessment (GOS.SP.ASS)**[29] can be used.

Subjective Impressions

Alongside the core and drill down samples the SLT should make subjective observations in the areas detailed in **Table 3** that can contribute to differential diagnosis:

Table 3: Assessment domains for subjective impressions

Assessment domain	Aim
Prosody	To assess the rate, intonation, rhythm, pausing, stress and volume subjectively by the SLT in connected speech. Difficulties with prosody can be due to motor speech disorders such as CAS and Dysarthria or part of neurodevelopmental diagnosis such as Autism.
Nasality and resonance	To judge the presence of any hyponasality or hypernasality and provide appropriate onwards referrals as necessary.
Nasal emission	To assess if nasal emission (air being released through the nose) is perceived by the SLT and further determine whether this is passive (due to a structural difficulty whereby the child cannot fully close the velopharyngeal sphincter) or active (where the child has learnt to direct the air through their nose rather than their mouth) using nasal occlusion.
Hearing	To review a recent hearing test report from the audiology service or seek information from the parent concerning the outcome of a recent hearing test. Appropriate referrals should be made if no reports or information is available.
Attention and listening	To identify any concerns or indications of challenges related to attention and listening skills.

4.3. MISLToe_SSD COS and Minimum Data Set

An overview of the COS, and the data entry measures is presented in **Figure 4**

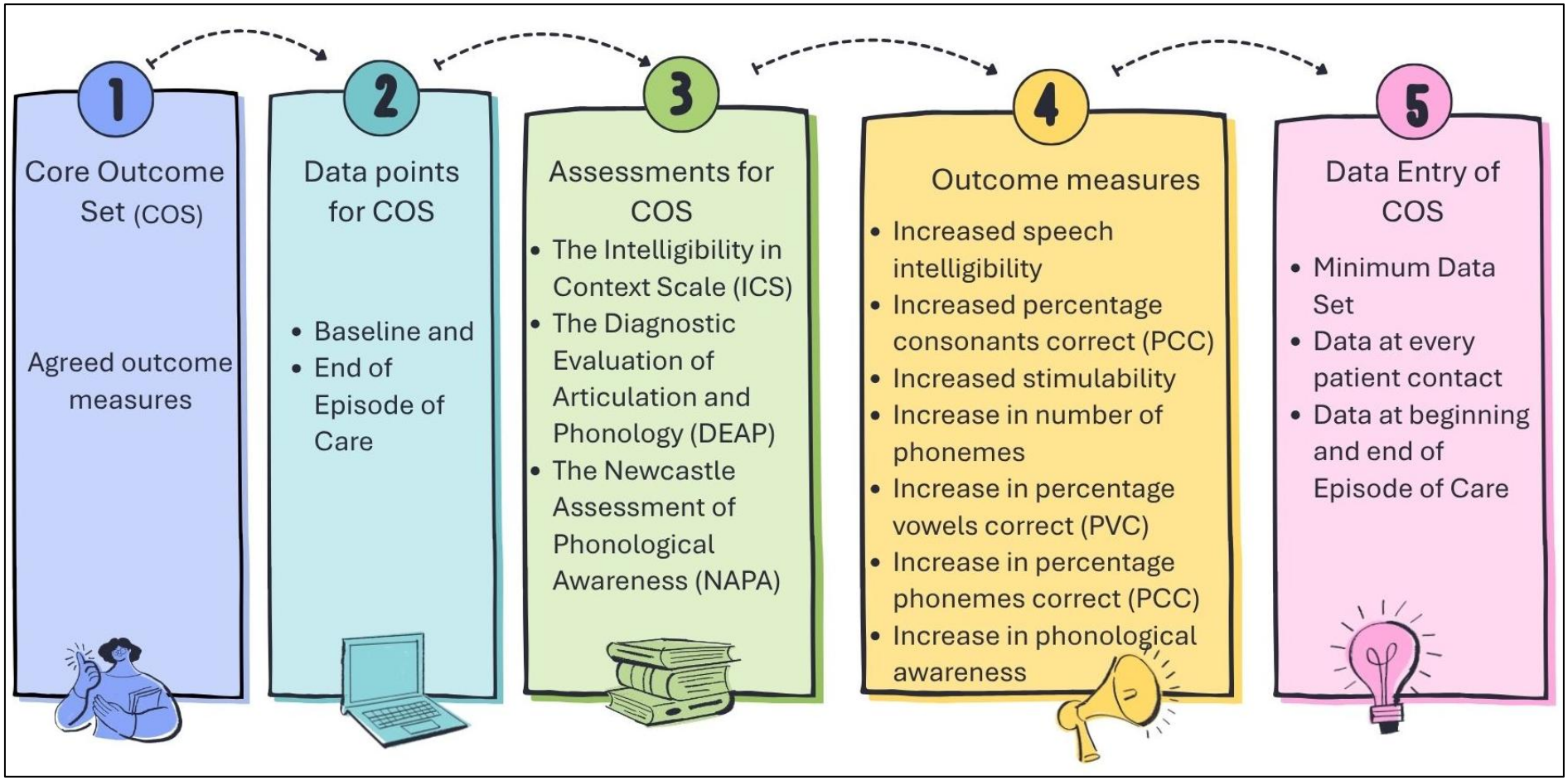


Figure 4: Overview of COS and Minimum Data Set Entry

When to collect the MISLToe_SSD COS

The MISLToe_SSD COS should be collected with all children at baseline, within each episode of care and at the end of episode of care. An **Episode of Care (EoC)*** is defined as a discrete, goal-oriented period of clinical engagement in which a speech and language therapist undertakes intervention, monitoring, and/or consultative activities, in response to a defined communication or swallowing need. It follows the baseline assessment but does not include it. An episode of care begins when the first session of intervention related to one or more clinical goals is delivered and concludes when:

1. the agreed therapeutic goals have been met, or sufficient progress has been achieved
2. progress has plateaued and alternative approaches or a period of consolidation are indicated
3. the client transitions to a different service or level of support; or
4. therapy is paused or discontinued for contextual, medical, or personal reasons

A child may therefore receive multiple episodes of care, corresponding to changes in developmental stage, communicative demands, health status, or functional needs. An episode of care is followed by outcome assessments which captures the COS parameters.

Note: there is some overlap between the MISLToe_SSD diagnostic protocol and the COS. This means if a child is newly diagnosed with SSD using the MISLToe_SSD protocol, any overlapping measures (e.g., PCC score derived from the DEAP Phonology subtest) can serve as both diagnostic data and as part of the baseline COS prior to intervention. If there is a substantial break (4 -5 weeks) between baseline assessment and the start of intervention, the baseline COS must be repeated.

Additionally, the assessment sessions may be split across multiple sessions. The MISLToe_SSD diagnostic protocol should be completed first, followed by the COS. However, the interval between the baseline assessment completion and questionnaire data entry should not exceed two weeks.

*Episode of care definitions were developed with The Intervention Consensus for Language Disorders Group

Assessments used for the MISLToe_SSD COS

The Intelligibility in Context Scale (ICS)[22] – complete the ICS at the beginning and end of each episode of care to measure changes in perceived intelligibility. The average score out of 5 should be entered onto the MISLToe_SSD COS questionnaire. The ICS needs to be completed in the child's home language. Therefore, for bi/multilingual children, the ICS may be completed in languages other than English, based on the availability of the tool in the child's language and parents' proficiency in that language.

For bilingual Welsh-English children, the ICS should be completed in both languages whenever possible. However, for children attending Welsh-medium school if their home language is whose home language is English and whose family does not speak Welsh, the ICS should be completed in English only.

The Diagnostic Evaluation of Articulation and Phonology (DEAP)[19] – complete the DEAP Phonology subtest at the beginning and end of each episode of care for **all** children to obtain values for: Percentage Consonants Correct (PCC), Percentage Vowels Correct (PVC) and Percentage Phonemes Correct (PPC). For children with Inconsistent Phonological Disorder, you must also complete the DEAP Inconsistency subtest at the beginning and end of their episode of care and enter their percentage inconsistency onto the MISLToe SSD COS questionnaire. A video link explaining how to administer and score the DEAP subtests is provided here

The Newcastle Assessment of Phonological Awareness (NAPA)[24]– complete at the beginning and end of each episode of care to measure change in the child's phonological awareness skills. The NAPA is available online and can be downloaded here. If the child does not have the skills to progress to the next subtest, please type 'not administered' in the relevant NAPA subtest section(s). NAPA Cymraeg is now available and should be used for children whose first language is Welsh, regardless of whether they attend an English-medium or Welsh-medium school. NAPA Cymraeg can be downloaded via the same link as the English version.

The outcome parameters of COS that need to be recorded on the MISLToe SSD COS questionnaire is summarised in **Table 4.**

Table 4: Overview of the MISLToe_SSD COS

Outcome	**Measured by**	
	Baseline	**Outcome**
Speech intelligibility	ICS Average score	ICS Average score
Percentage consonants correct (PCC)	DEAP Phonology	DEAP Phonology
Stimulability	DEAP Articulation	DEAP Articulation
Number of phonemes	DEAP Phonology	DEAP Phonology
Percentage vowels correct (PVC)	DEAP Phonology	DEAP Phonology
Percentage phonemes correct (PPC)	DEAP Phonology	DEAP Phonology
Phonological awareness	NAPA	NAPA

Additional assessments

Probe word list – specific informal word probe lists can be developed and completed as outcome measures to capture change more sensitively (e.g., a probe wordlist for /k/ in word initial, medial and final position, a probe wordlist for CVCV words). You can devise these based on the child's intervention targets. A video explaining how to develop a probe list provided here. Example probe lists are included in Appendix 1. A link to the video(s) explaining the scoring of example probe list is provided here for (a) velar fronting example probe list , (b) s-cluster reduction example probe list

Language – SLTs should complete an appropriate assessment of language to rule out language difficulties co-occurring with SSD.

4.4. The Minimum Dataset (MDS)

The minimum dataset (MDS) includes the demographic information and the data elements across timepoints that we need to make sense of the COS data. The information related to the data elements are collected at three timepoints (i) baseline, (ii) within an Episode of Care (intervention) and (iii) at the end of Episode of Care. The information from these data elements is entered into the MISLToe_SSD COS questionnaire on System One in England (see Appendix 2 for the System One questionnaire) or Qualtrics^{XM} in Wales (see Appendix 3 for the Qualtrics^{XM} survey). **Table 5** describes the various data elements collected in this study.

Data collected as part of Minimum Data Set:

Table 5 below describes the data elements that are being collected as part of MISLToe_SSD study.

Data Element	Description
Child's sex assigned at birth	Select the appropriate option from the drop-down menu
Child's partial postcode	Enter the first part of the child's postcode (XXX(X)) e.g., EX1 3
Child's ethnicity	Select the appropriate option from the drop-down menu
Child's religion or belief	Select the appropriate option from the drop-down menu
Child's first language	Select the appropriate option from the drop-down menu
Child's additional language(s)	Select the appropriate option(s) from the drop-down menu
Number of previous episodes of care (EoC)	Enter the number of episodes of care prior to using the MISLToe_SSD protocol (including indirect interventions). See page 21 for the definition of EoC
Child's unique ID number	Enter the child's unique MISLToe_SSD ID number based on the format provided by the research team (e.g., HER0000X)
Date of data collection^	The date the MISLToe_SSD data collection form was submitted. This will be extracted by the IT team member in System One but has to be entered in Qualtrics^{XM}
Child's age	Record age in years and months at the time of data entry
Current episode of care status	Select the appropriate option from the drop-down menu to indicate if this is an assessment or intervention session. In case of assessment select if baseline or end of EoC
Duration of session	Record the duration of the session in minutes.

Total time in intervention^	The total time of intervention in hours and minutes. This will be calculated by the research team
Location of sessions	Choose the options from the drop-down menu to select the location of delivery
Session provider	Record who delivered the session (e.g., SLT, SLTA, SLT student)
Additional practice materials provided	Indicate whether homework/practice materials were provided between sessions (Yes/No)
Who delivered practice materials	Specify who delivered the practice (e.g., parent/family, school staff)
Primary SSD subtype	Select the main presenting SSD diagnosis (e.g., Phonological Delay, CAS)
Secondary SSD subtype	Select any secondary SSD diagnosis or "not applicable"
Additional diagnoses	Select all appropriate additional diagnoses from the list provided
Current concerns about language development	Indicate Yes/No if there are current language development concerns. These should be confirmed through appropriate assessments.
Intervention delivered today	Select intervention(s) provided during the session
DEAP Phonology Subtest score	Enter PCC, PVC, and PPC from DEAP Phonology Subtest
DEAP Inconsistency Subtest score	For children with Inconsistent Phonological Disorder, enter inconsistency score from the DEAP
Stimulability for age-expected consonants	Indicate Yes/No based on stimulability assessment (refer to DEAP/RCSLT norms)
Number of phonemes correct (DEAP Phonology)	Record number of consonant phonemes (out of 25) produced correctly at least once. Please use the checklist (Appendix-5)
Percentage of target phones correct (probe wordlist)	Enter percentage of target phones correct from informal or suggested probe list.
NAPA scores	Enter scores from the NAPA assessment
Intelligibility in Context Scale	Enter the average score (out of five)

Note: ^These data elements will be extracted / calculated by the IT team of the study site or by research team

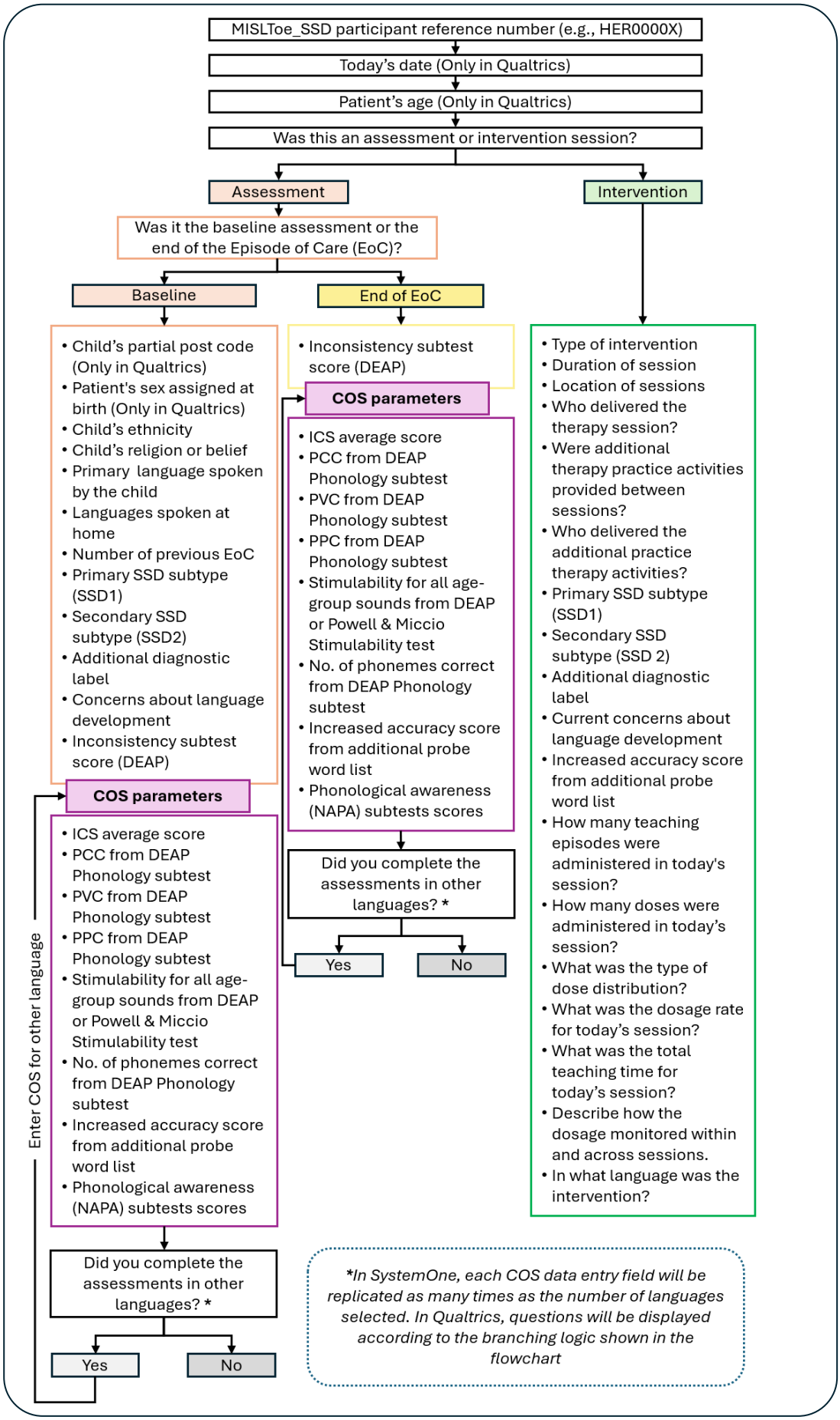


Figure 5: Flowchart depicting data elements collected at study timepoints

4.5. Interventions

A full list of interventions is provided here (please refer to Box 2 (page 10)). This is based on work undertaken in Phase 1 of the MISLToe_SSD study. We aim to capture various ingredients of dosage of interventions as listed in **Table 6** in the upcoming versions of the MISLToe SSD COS questionnaire.

Table 6 Definitions of Ingredients of dosage of interventions

Ingredient/Label	Definition	Examples
Dose	The number of properly administered teaching episodes in a single intervention session. Teaching episodes are counted only if they are completed as intended.	In a r speech sound teaching session, a properly administered teaching episode could be defined simply as a word/sound exposure or listening opportunity or could be defined collectively as the SLT provides a model, the child attempts a response and the SLT provides feedback. NB What is considered a teaching episode is determined by the SLT and should be specified within any given intervention.
Dose- Distribution	The scheduling or distribution of teaching episodes within sessions or between the total number of sessions – the pattern and spacing of teaching episodes across time.	To deliver 30 teaching episodes: *Concentrated Distribution*- 30 teaching episodes are delivered back-to-back in the 20 minutes of teaching time. Dose Distribution is concentrated (Dose rate is 1.5 episodes per minute). *Spaced Distribution* – 10 teaching episodes are delivered at 3 time points– from minutes 5- 8, minutes 15- 18 and minutes 25 – 28. Same total number of teaching episodes (30), same total active teaching time (20 minutes), same Dose rate (1.5 episodes per minute), distribution is spaced within the session. *Distributed across sessions* - 10 teaching episodes per session, delivered across 3 sessions over one week. Same total episodes (30), Dose rate could still be 1.5 episodes per minute, but the distribution is different.
Dose- Rate	The number of teaching episodes per unit of time within a session where time is measured from the first to the last use of that teaching episode	In a 30-minute session in which 30 teaching episodes were achieved, if teaching episodes start at minute 5

	within the session. Dose rate captures how dense or rapid the teaching episodes are.	and end at minute 25, the total active teaching time is 20 minutes. Dose rate = 30 teaching episodes ÷ 20 minutes = 1.5 episodes per minute
Therapeutic Time Per Session	The portion of a session spent actively engaging the client in structured therapeutic activities designed to achieve speech, language or communication goals.	In a 30-minute session in which 30 teaching episodes were achieved, if teaching episodes start at minute 5 and end at minute 25, and the remaining time is spent explaining tasks or rapport building, the total active teaching time is 20 minutes.
Teaching Episode	A teaching episode delivers one or more key active ingredients that the therapist hypothesises is needed for therapeutic change within a session at a given stage of the intervention process. Teaching episodes are measured from the perspective of what the SLT does or a combination of what the SLT does and how the child responds.	In a vocabulary or speech sound teaching session, a properly administered teaching episode could be defined simply as a word/sound exposure or could be defined collectively as the SLT provides a model, the child attempts a response and the SLT provides feedback. NB What is considered a teaching episode is determined by the SLT and should be specified within any given intervention.
Cumulative Intervention Dosage	An indicator of the overall dosage of delivered teaching episodes up to up to and including a particular point in time but before the end of the planned episode of care.	As the episode of care progresses the cumulative dosage is the product of dose x session frequency x intervention duration up to that point in time.
Total Intervention Dosage	An indicator of the overall dosage of delivered teaching episodes over a complete episode of care.	The product of dose x session frequency x total intervention duration. This provides a general indicator of the overall intensity.
Total Intervention hours	The cumulative amount of time a child spends engaged in therapy across the entire intervention period.	Calculated by multiplying the length of each session by the number of sessions delivered, across the full duration of the intervention.
Monitoring Dosage	The therapist keeps track of all aspects of the intended dosage, given to the child/adult, both within and cumulatively across sessions.	

Dosage definitions were developed with The Intervention Consensus for Language Disorders Group

4.6. Reference Documents

Appendix 1: Probe list of words (English)

Appendix 2: Probe list of words (Welsh)

Appendix 3: A sample of the MISLToe_SSD COS questionnaire in System One (England)

Appendix 4: A sample of the MISLToe_SSD COS questionnaire in Qualtrics^{XM} (Wales)

Appendix 5: Printable checklist for the manual calculation of the number of different phonemes produced correctly in English (DEAP Phonology Subset)

Appendix 6: Printable checklist for the manual calculation of the number of different phonemes produced correctly in Welsh

Appendix 7: Printable checklist for the collection of Core Speech Sample as part of the MISLToe_SSD diagnostic process

Appendix 8: Printable checklist for the collection of COS data

Appendix 1

Examples of probe list (English)

This example of probe list is taken from the *ULTRAX2020 : Ultrasound Technology for Optimising the Treatment of Speech Disorders : Clinicians' Resource Manual*. University of Strathclyde, Glasgow published by Cleland *et al.*,(2018).

Velar fronting

Word	Transcription	Score	Word	Transcription	Score
Pat			*Cone		/1
Gear		/1	Cape		/1
Team			Deer		
Tore			Cop		/1
Keep		/1	Core		/1
Tan			Monkey		/1
Cool		/1	Goal		/1
*Poking		/1	*Call		/1
*Cap		/1	Car		/1
*K		/1	Hoot		
Beak		/1	Peeking		/1
Tape			Tall		
Pack		/1	Pink		/1
Top			Hook		/1
Beat			Tar		
*Back		/1	Can		/1
*Book		/1	Dawn		
Tea			Gap		/1
Gone		/1	*Key		/1
Tool			*Peak		/1
*Cook		/2			
Packing		/1	Happy Karen is baking a cake		
Tap					
Goose		/1			
	Subtotal	/15	Subtotal		/15
Blue = target sound			Total Targets Correct		/30
*Asterisk and Italics = suggested treated words			Percent Targets Correct		

Alveolar Backing

Word	Transcription	Score	Word	Transcription	Score
Pat		/1	*Toe		/1
Gear			Cape		
Team		/1	Deer		/1
Tore		/1	Cop		
Keep			Core		
Tan		/1	Bendy		/1
Cool			Door		/1
*Loading		/1	Call		
Cap			Car		
*Tail		/1	Hoot		/1
Beak			Reading		/1
Tape		/1	*Tall		/1
Pack			Mint		/1
Top		/1	Hook		
Beat		/1	Tar		/1
*Mat		/1	Can		
*Boot		/1	Dawn		/1
*Tea		/1	Dam		/1
Gone			Key		
Tool		/1	*Bead		/1
*Toot		/2			
Adding		/1	Tiny Tim is putting a hat on		
*Tap		/1			
Doom		/1			
	Subtotal	/18	Subtotal		/12
			Total Targets Correct		/30
			Percent Targets Correct		

Blue = target sound

Asterisk and Italics = suggested treated words

Labialised /r/

Word	Transcription	Score	Word	Transcription	Score
Read		/1	Berry		/1
Sewing			*Rude		/1
Wood			Whale		
*Rope		/1	*Pour		/1
Tourist		/1	Rot		/1
*Rug		/1	Bowing		
Weed			*Scary		/1
Run		/1	*Pier		/1
Boring		/1	*Rail		/1
Wok			Wake		
*Reel		/1	Wool		
*Car		/1	*Soaring		/1
*Rock		/1	Rake		/1
Sorry		/1	Carry		/1
Wheel			Woah!		
Boar		/1	Beer		/1
Curry		/1	Row		/1
Won			Earring		/1
Rack		/1	Rule		/1
Bar		/1	Whack		
*Rat		/1			
Tearing		/1			
What?					
Fur		/1			
	Subtotal	/17	Subtotal		/14
			Total Targets Correct		/31
			Percent Targets Correct		

Blue = target sound

Asterisk and Italics = suggested treated words

Post-alveolar fronting

Word	Transcription	Score	Word	Transcription	Score
She		/1	*Shoe		/1
Suit			Shrink		/1
*Shop		/1	Puss		
Sam			Crashing		/1
Shave		/1	Save		
Sea			Sharp		/1
*Cash		/1	Sew		
Leash		/1	*Shape		/1
Shack		/1	Shore		/1
Sore			Treasure		/1
*Mashing		/1	*Bush		/1
Seat			Mash		/1
Push		/1	Shock		/1
*Quiche		/1	*Sham		/1
Sock			Sack		
Shoot		/1	*Show		/1
*Shark		/1			
Mushroom		/1	Sean is washing a dirty dish		
*Sheet		/1			
Sue					
	Subtotal	/13	Subtotal		/12
			Total Targets Correct		/25
			Percent Targets Correct		

Blue = target sound

Asterisk and Italics = suggested treated words

Stopping of affricates

Word	Transcription	Score	Word	Transcription	Score
Coach		/1	*Cheap		/1
Pat			Top		
Chart		/1	Dam		
Angel		/1	*G		/1
Chair		/1	Dog		
Tart			*Patch		/1
*Fudge		/1	Bad		
Badge		/1	Match		/1
Chop		/1	Deep		
Jam		/1	*Charm		/1
Juice		/1	Jaw		/1
*Peach		/1	Tap		
Jeep		/1	Tear		
*Chalk		/1	*Poach		/1
Cheer		/1	Mat		
*Chance		/1	Beat		
Chap		/1	2		
*Catching		/1	*Choke		/1
Chore		/1	Doll		
Talk			*Tune		/1
*Jar		/1	Jog		/1
Coat			D		
Watching		/1	Tore		
Tear			*Chain		/1
Tea			Cheeky Charlie's watching a football match		
Badger		/1			
Chew		/1			
Beach		/1			
	Subtotal	/23	Subtotal		/11
			Total Targets Correct		/33
			Percent Targets Correct		

Blue = target sound

Asterisk and Italics = suggested treated words

Deaffrication

Word	Transcription	Score	Word	Transcription	Score
Cheap		/1	Cheer		/1
Shin			Watch		/1
Watching		/1	Catching		/1
Peach		/1	Shane		
Chap		/1	Share		
Chin		/1	Chance		/1
Cash			Ship		
Witch		/1	Crutch		/1
Chop		/1	Chart		/1
Charm		/1	Match		/1
Chain		/1	Washing		
Mash			Shore		
Chore		/1	Sheer		
Sheep			Chew		/1
Coach		/1	Wash		
March		/1	Leash		
Chair		/1	Choose		/1
Shoe			Marsh		
Shop			Catch		/1
Crush			Wish		
Leech		/1	Chip		/1
Cashing			Choke		/1
Chalk		/1	Poach		/1
Shoes					
Cheeky Charlie's watching a football match					
	Subtotal	/15	Subtotal		/13
			Total Targets Correct		/28
			Percent Targets Correct		

Blue = target sound

**Asterisk and Italics = suggested treated words*

Sibilant distortions (fricatives)

Word	Transcription	Score	Word	Transcription	Score
*Shark		/1	Sharp		/1
Zap		/1	*Straw		/1
Snail		/1	Suit		/1
Shoot		/1	Buzzing		/1
*Moose		/1	*Smoke		/1
Push		/1	She		/1
*Police		/1	Zoo		/1
*Mashing		/1	Shrink		/1
Shock		/1	Save		/1
*Sam		/1	*Shoe		/1
*Shape		/1	*Bush		/1
*Stamp		/1	Lose		/1
Spot		/1	*Sew		/1
Shave		/1	Strong		/1
*Zoom		/1	Treasure		/1
*Shop		/1	*Snow		/1
Scream		/1	*Sob		/1
Shore		/1	*Screw		/1
*Seat		/1	Shack		/1
Piece		/1	Sore		/1
*Shoes		/2	*Sail		/1
Mushroom		/1	*Spoon		/1
Stairs		/2	*Class		/1
Leash		/1	Passing		/1
*Sham		/1	Sea		/1
Jazz		/1	Smell		/1
Mash		/1	Puss		/1
*Grassy		/1	*Keys		/1
Sock		/1	Sack		/1
*Sheet		/1	*Zip		/1
*Cash		/1	*Sue		/1
Bees		/1	Pass		/1
			*Quiche		/1
			Crashing		/1
			*Show		/1
	Subtotal	/34	Subtotal		/35
			Total Targets Correct		/69
			Percent Targets Correct		

Blue = target sound

*Asterisk and Italics = suggested treated words

Sibilant distortions (affricates)

Word	Transcription	Score	Word	Transcription	Score
*Charm		/1	Chore		/1
Juice		/1	Jam		/1
Badger		/1	Badge		/1
Chop		/1	*Match		/1
*Chance		/1	*Peach		/1
*Fudge		/1	Watching		/1
*Catching		/1	*Jar		/1
Chart		/1			
Jeep		/1	Chew		/1
*Chalk		/1	*Cheap		/1
*Chain		/1	Coach		/1
*Poach		/1			
*G		/1	Cheer		/1
Patch		/1	Jog		/1
Angel		/1	Beach		/1
Chair		/1			
Chap		/1			
*Choke		/1			
*Tune		/1			
Jaw		/1			
	Subtotal	/20	Subtotal		/13
			Total Targets Correct		/33
			Percent Targets Correct		

Blue = target sound

Asterisk and Italics = suggested treated words

/s/ Cluster Reduction

Word	Transcription	Score	Word	Transcription	Score
Spot		/1	*Stomp		/1
Smoke		/1	Treat		
Nail			Nail		
*Screw		/1	*Smash		/1
Strong		/1	Stop		/1
Slope		/1	Ski		/1
Star		/1	Nap		
School		/1	Scar		/1
Lap			Scone		/1
Scream		/1	Key		
Cam			Small		/1
Sneeze		/1	Tears		
Snore		/1	Snap		/1
Cot			Scram		/1
Car			Knees		
Stairs		/1	Pot		
Stack		/1	*Stamp		/1
Sleep		/1	Tack		
Crew			Smartie		/1
Stone		/1	Tar		
Spade		/1	Pain		
Mash			*Scoop		/1
Coop			Gone		
Street		/1	*Straw		/1
Scroll		/1	Paid		
Cram			*Spoon		/1
Slim		/1	Top		
Skate		/1	*Scam		/1
Toll			Cream		
*Scott		/1	Tone		
Leap			*Stole		/1
Snow		/1	Kate		
Slap		/1	The slow snail was skipping down the stairs		
No					
*Spain		/1			
Cool					
	Subtotal	/23	Subtotal		/16

Blue = target sound

Asterisk and Italics = suggested treated words

Total Targets Correct	/39
Percent Targets Correct	

Stopping of /s/ and /ʃ/

Word	Transcription	Score	Word	Transcription	Score
Sock		/1	Tape		
*Shape		/1	Shock		/1
Jazz		/1	Leash		/1
*Quiche		/1	*Class		/1
Sharp		/1	Mash		/1
*Sew		/1	Put		
Passing		/1	Bead		
Zoo		/1	*Grassy		/1
*Zoom		/1	*Zip		/1
Tail			Shack		/1
Shoes		/2	Pass		/1
Piece		/1	Crashing		/1
*Show		/1	*Sail		/1
Save		/1	*Sheet		/1
*Moose		/1	Lose		/1
*Shark		/1	Mat		
*Mashing		/1	*Seat		/1
Sack		/1	Patting		
*Police		/1	Sea		/1
Matting			*Shop		/1
*Shoe		/1	Tack		
Shrink		/1	She		/1
Bees		/1	Zap		/1
Cat			Tore		
Shoot		/1	Sore		/1
Mushroom		/1	Top		
*Sam		/1	*Cash		/1
Toot			Puss		/1
Suit		/1	*Sue		/1
Buzzing		/1	Treasure		/1
Shave		/1	Pat		
2			Tea		
Toe			*Sham		/1
*Sob		/1	Push		/1

Doom			*Bush		/1
Shore		/1	*Keys		/1
			Dip		
	Subtotal	/30	Subtotal		/26
Blue = target sound			Total Targets Correct		/56
*Asterisk and Italics = suggested treated words			Percent Targets Correct		

Target Specific Treatment Wordlists

Velar Fronting

	vowel context	treated	minimal pair
/k/ WI	i	key	tea
	e	K	
	a	cap	tap
	ɔ	Call	tall
	o	cone	
	u	cook	
/k/ WF	i	peak	
	a	back	
	u	book	
/k/ WM		poking	
/g/ WI	ɔ	got	dot
	o	ghost	
	u	goo	do

Alveolar backing

	Vowel context	treated	Minimal pair
/t/ WI	i	tea	key
		tail	
	a	tap	cap
	ɔ	tall	call
	o	toe	
	u	Toot	
/d/ WF	I	bead	
	a	mat	
	u	boot	
/d/ WM	o	loading	

MISLToe Speech Sound Disorder
Bristol Speech and Language Therapy Research Unit
NHS Bristol NHS Foundation Trust Bristol | Weston
Funded by NIHR | National Institute for Health and Care Research
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Ymchwil Iechyd a Gofal Cymru Health and Care Research Wales

Labialised /r/

	treated	Minimal pair
/r/ WI	Reel	wheel
	Rail	whale
	rat	
	rug	
	rock	wok
	rope	
	Rude	wood
/r/ WF	pier	
	car	
	pour	
/r/ WM	scary	
	Soaring	sewing

Post-alveolar fronting

	vowel context	treated	Minimal pair
/ʃ/ WI	i	sheet	Seat
	e	shape	
	a	sham	Sam
	ɑr	shark	
	ɔ	shop	
	o	show	Sew
	u	shoe	Sue
/ʃ/ WF	i	quiche	
	a	cash	
	u	bush	
/ʃ/ WM		mashing	

Stopping of affricates

	vowel context	treated	Minimal pair
/ʧ/ WI	i	cheap	tea
	e	chain	
	a	chance	
	ɑr	charm	
	ɔ	chalk	talk
	o	choke	
	u	tune	
/ʧ/ WF	i	peach	
	a	patch	pat
	o	poach	
/ʧ/ WM	a	catching	
/ʤ/ WI	i	G	D
	a	Jar	
/ʤ/ WF		fudge	

Deaffrication

	vowel context	treated	Minimal pair
/ch/ WI	i	cheap	sheep
	e	chain	Shane
	a	chance	
	ɑr	charm	
	ɔ	chalk	
	o	choke	
	u	choose	shoes
		chip	ship
/ch/ WF	i	peach	
	a	catch	cash
	o	poach	
/ch/ WM		catching	cashing

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Ymchwil Iechyd a Gofal Cymru Health and Care Research Wales

Sibilant Distortions (fricatives and affricates)

Fricatives		
	vowel context	Treated
/ʃ/ WI	i	sheet
	e	shape
	a	sham
	ɑr	shark
	ɔ	shop
	o	show
	u	shoe
/ʃ/ WF	i	quiche
	a	Cash
	u	Bush
/ʃ/ WM	a	Mashing
/s/ WI	i	Seat
	e	Sail
	a	Sam
	ɔ	Sob
	o	Sew
	u	Sue
/s/ WF	i	Police
	a	Class
	u	Moose
/s/ WM		Grassy
/z/ WI		Zip
		Zoom
/z/ WF	i	Keys
	u	Shoes
Clusters		Screw
		Straw
		Spoon
		Stamp
		Smoke

Affricates		
	Vowel context	Treated
/ʧ/ WI	i	cheap
	e	Chain
	a	Chance
	ɑr	Charm
	ɔ	Chalk
	o	Choke
	u	Tune
/ʧ/ WF	i	Peach
	a	Match
	o	Poach
/ʧ WM		Catching
/ʤ/ WI	i	G
	a	jar
/ʤ/ WF		fudge

		Snow	

/s/ cluster reduction

	vowel context	treated	Minimal pair
/skr/ WI	U	screw	crew
/str/ WI	ɔ	straw	
/sp/ WI	E	spain	pain
/st/ WI	U	spoon	
	A	stamp	
	ɔ	stomp	
	O	stole	toll
/sk/ WI	ɑr	scam	cam
	ɔ	Scott	cot
	U	scoop	coop
/sm/ WI	A	smash	mash
	O	smoke	
/sn/ WI	A	snap	nap
	o	snow	no
sl	i	slim	
	a	slap	lap

Stopping of /s/ and /ʃ

treated	Minimal pair
sheet	
shape	tape
sham	
shark	
shop	top
show	toe
Shoe	2
quiche	
Cash	cat
Bush	
mashing	matting
Seat	
Sail	tail
Sam	
Sob	
Sew	
Sue	
police	
Class	
moose	
grassy	
Zip	dip
Zoom	doom
Keys	
shoes	

Appendix 2

Examples of probe list (Welsh)

This example of probe list was developed by Rhonwen Lewis, Senior Lecturer in Speech and Language Therapy (Welsh Medium) at Cardiff Metropolitan University, School of Sport & Health Sciences

Amnewid 'll'

Gair	Trawsgrifiad	Sgor	Gair	Trawsgrifiad	Sgor
llwynog		/1	coch		
mochyn			gallu		/1
llong		/1	saith		
cannwyll		/1	sychu		
bws			pell		/1
llwy		/1	llaeth		/1
gwrach			nos		
dillad		/1	twll		/1
sebon			lleuad		/1
sefyll		/1	sugno		
chwech			llinell		/2
llun		/1	asyn		
tylluan		/1	pabell		/1
allan		/1	llwyd		/1
sach			mwsog		
llaw		/1	braich		
colli		/1	cyllell		/2
sal			glas		

seren					
castell		/1			
llygoden		/1			
llew		/1	Mae Llio yn gallu rhedeg yn bell		
	Isgyfanswm	/15	Isgyfanswm		/10
Glas = sain targed			Cyfanswm targedau'n gywir		/25

Amnewid 'dd' a 'th'

Gair	**Trawsgrifiad**	**Sgor**	**Gair**	**Trawsgrifiad**	**Sgor**
lleiaf			ceffyl		
meddal		/1	newydd		/1
gweiddi		/1	jiraff		
ffrwythau		/1	gwthio		/1
braf			eistedd		/1
gaeaf			cath		/1
boddi		/1	llyffant		
bathodyn		/1	llythur		/1
dafad			deffro		
teithio		/1	blaidd		/1
meddwl		/1	enfys		
nofio			gogledd		/1
traeth		/1	nyth		/1
danedd		/1	yfed		
cynffon			llaeth		/1

saith		/1	cleddyf		/1
			Mae Rhodd yn eistedd ar y traeth meddal		
	Isgyfanswm	/10	Isgyfanswm		/10
Glas = sain targed			Cyfanswm targedau'n gywir		/20
			Canran targedau'n gywir		

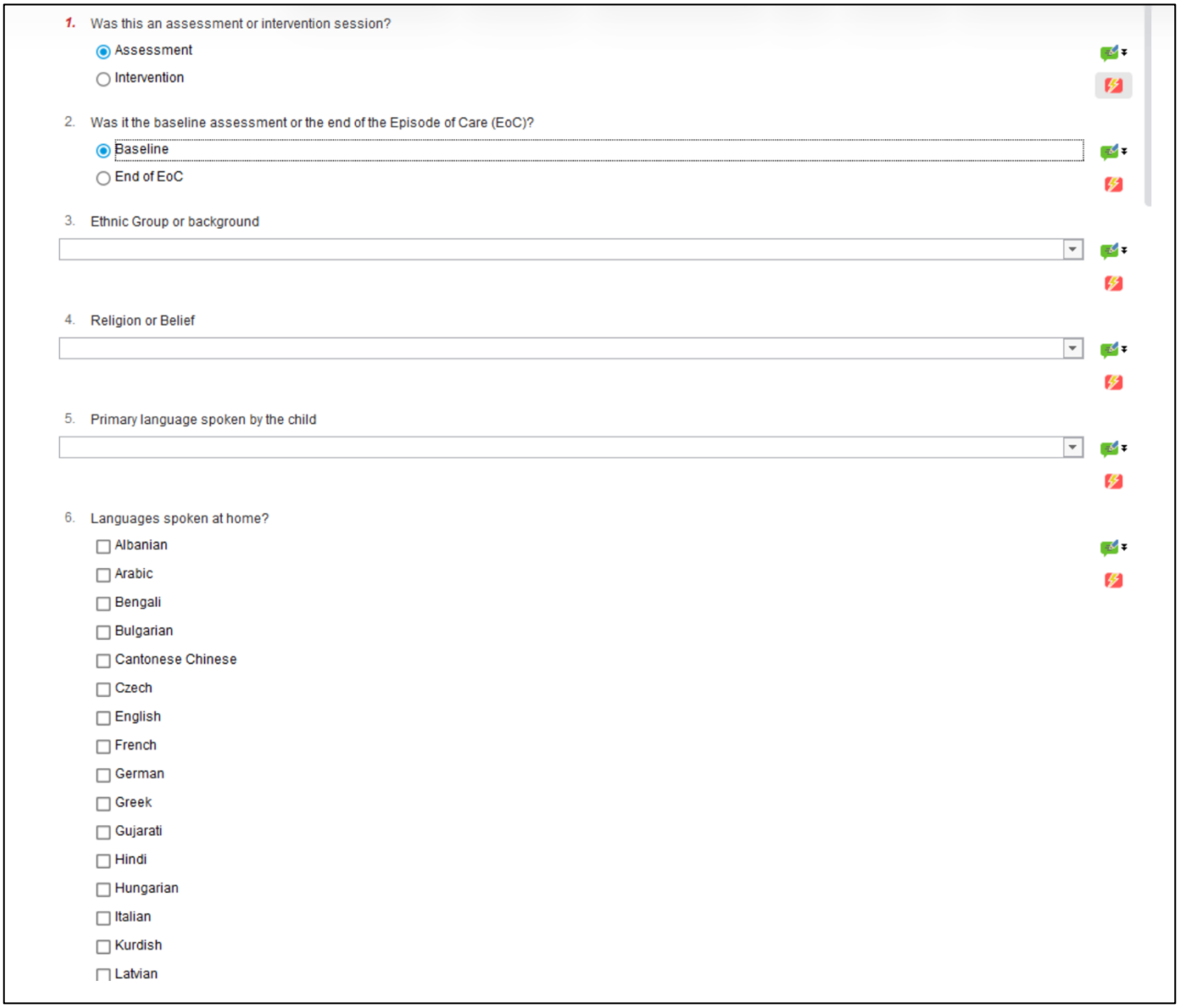
Blaenu felar

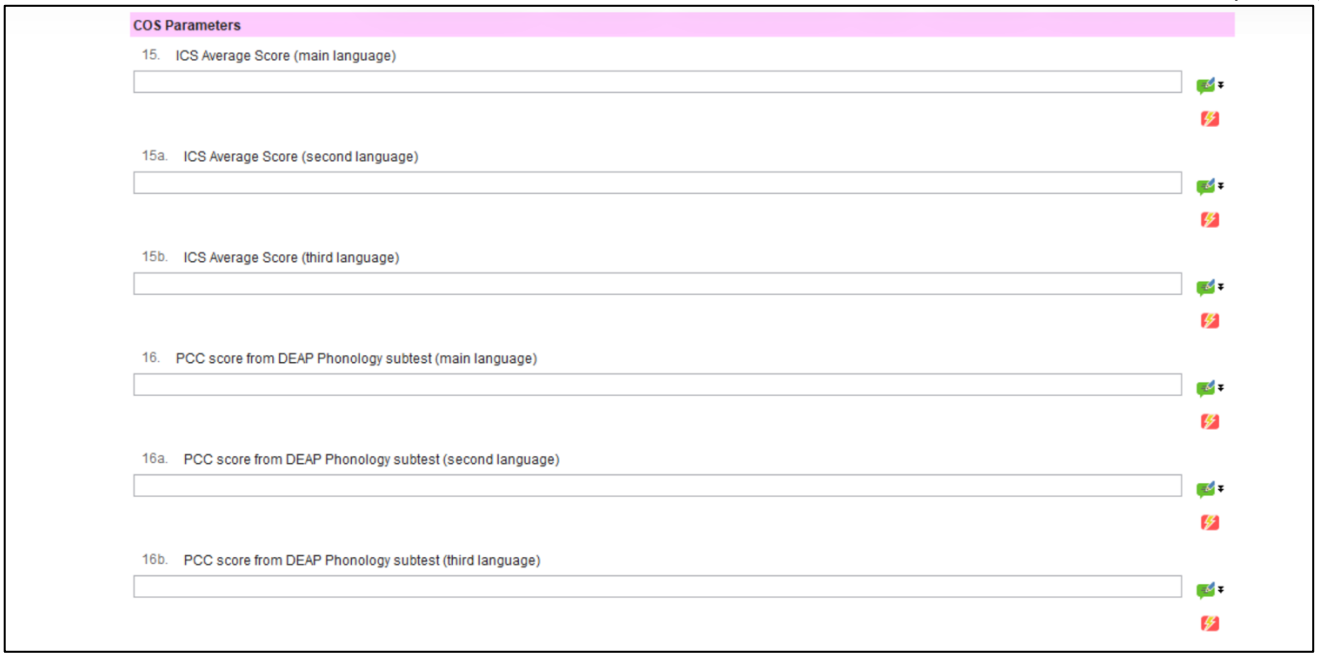
Gair	Trawsgrifiad	Sgor	Gair	Trawsgrifiad	Sgor
gem		/1	toes		
tarw			mwg		/1
hoci		/1	robot		
cicio		/2	cacen		/2
dail			bwgan		/1
botwm			codi		
cinio		/1	giat		/1
gafr		/1	dwr		
byd			coffi		/1
canu		/1	golau		/1
telyn			dewin		
blodyn			du		
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gaeaf		/1	peintio		
tan			ogof		/1

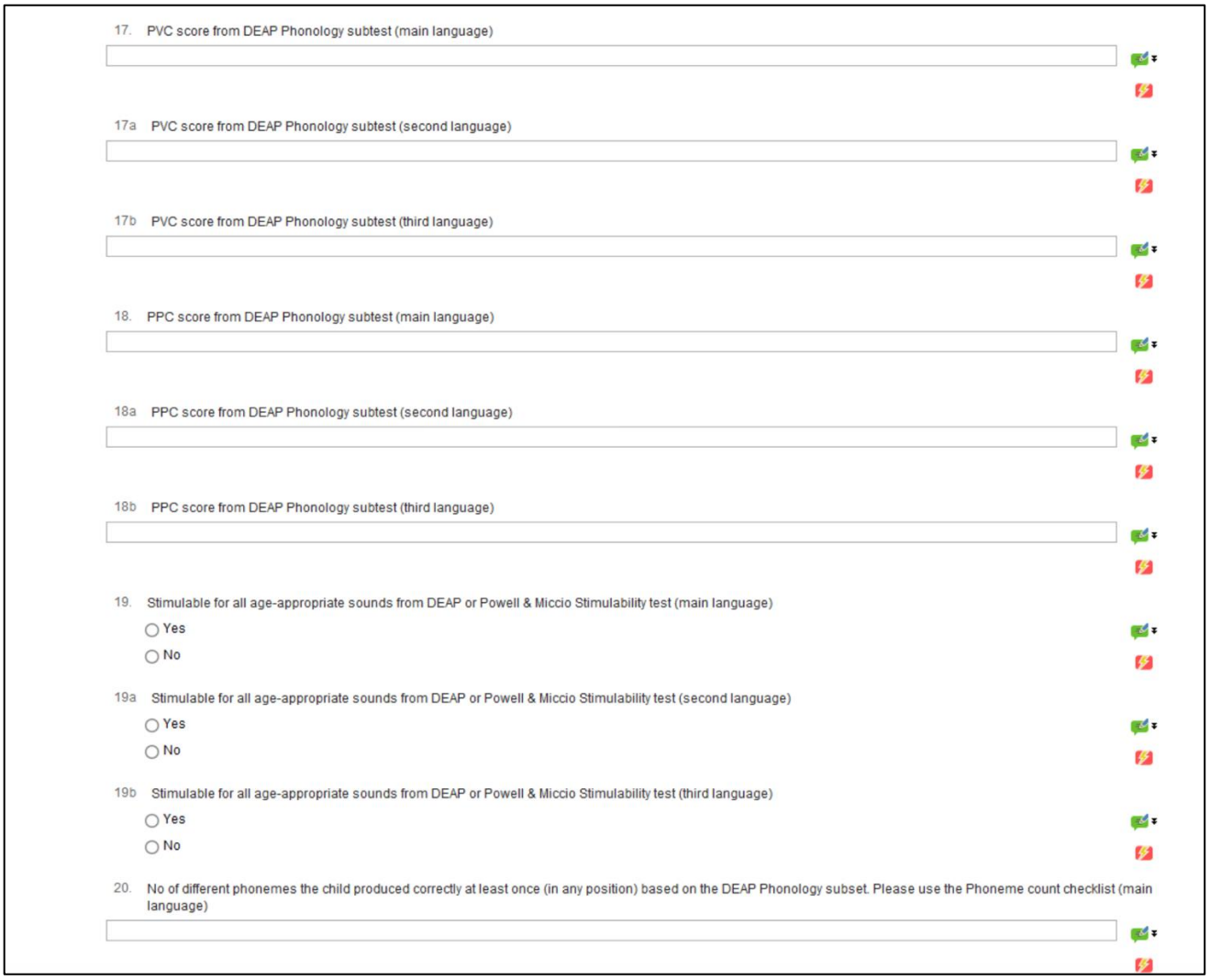
tudalen			torri		
ci		/1	cwch		/1
	Isgyfanswm	/10	Isgyfanswm		/10
Glas = sain targed			Cyfanswm targedau'n gywir		/20
			Canran targedau'n gywir		

Appendix 3

Snapshot of MISLToe_SSD COS questionnaire in System One (England)




COS Parameters
15. ICS Average Score (main language)
15a. ICS Average Score (second language)
15b. ICS Average Score (third language)
16. PCC score from DEAP Phonology subtest (main language)
16a. PCC score from DEAP Phonology subtest (second language)
16b. PCC score from DEAP Phonology subtest (third language)


17. PVC score from DEAP Phonology subtest (main language)
17a PVC score from DEAP Phonology subtest (second language)
17b PVC score from DEAP Phonology subtest (third language)
18. PPC score from DEAP Phonology subtest (main language)
18a PPC score from DEAP Phonology subtest (second language)
18b PPC score from DEAP Phonology subtest (third language)
19. Stimulable for all age-appropriate sounds from DEAP or Powell & Miccio Stimulability test (main language)
Yes
No
19a Stimulable for all age-appropriate sounds from DEAP or Powell & Miccio Stimulability test (second language)
Yes
No
19b Stimulable for all age-appropriate sounds from DEAP or Powell & Miccio Stimulability test (third language)
Yes
No
20. No of different phonemes the child produced correctly at least once (in any position) based on the DEAP Phonology subset. Please use the Phoneme count checklist (main language)

Appendix 4

Snapshot of MISLToe_SSD COS questionnaire in Qualtrics (Wales)



*Please enter the participant's unique ID number

*Please enter today's date in the format DD/MM/YYYY

*Please enter the patient's age today in years;months e.g 4;0 or 4;7

*Was this an assessment session or an intervention session?

Select one

*Was it the baseline assessment or the end of the Episode of Care (EoC)?

- Baseline (Beginning of Episode of Care)
- End of the Episode of Care

Patient's sex assigned at birth

Select one

*First Part of Patient's Post Code (e.g. EH49 or G1)

0/4

*Patient's Ethnicity

Select one

*Patient's Religion

Select one

*Patient's Home or First Language

Select one

Patient's Second or Additional Language (If relevant)

Select one

Does the patient attend Welsh-medium day care/primary school?

- Yes
- No

*How many episodes of care has this patient had prior to this study?

No Prior EoC

0 20

Appendix 5

Printable checklist for the manual calculation of the number of different consonants produced correctly (DEAP Phonology Subset)

N.	Consonant	Present
1	p	
2	b	
3	m	
4	f	
5	v	
6	t	
7	d	
8	n	
9	θ	
10	ð	
11	s	
12	z	
13	ɹ	
14	l	
15	ʃ	
16	ʒ	
17	t͡ʃ	
18	d͡ʒ	
19	j	
20	k	
21	g	
22	ŋ	
23	h	
24	w	
	Tot. C	

Note: Tick each phoneme that the child produces correctly at least once, in any position, during the DEAP Phonology Subtest

Appendix 6

Printable checklist for the manual calculation of the number of different consonants produced correctly in Welsh. From Mayr, R, Lewis, R and Wren, Y (2026) Welsh speech development. In Sharynne McLeod (ed.), The Oxford Handbook of Speech Development in Languages of the World, Oxford Handbooks

N.	Consonant	Present
1	p	
2	b	
3	m	
4	f	
5	v	
6	t̪	
7	d̪	
8	n̪	
9	θ	
10	ð	
11	r̥ʰ	
12	r	
13	s	
14	ɬ	
15	l	
16	ʃ	
17	t͡ʃ	
18	d͡ʒ	
19	t͡ʃ	
20	j	
21	k	
22	g	
23	ŋ	
24	χ	
25	h	
26	w	
	Tot. C	

Note: Tick each phoneme that the child produces correctly at least once, in any position

Appendix 7

Printable checklist for the collection of Core Speech Sample as part of the MISLToe_SSD diagnostic process

This checklist is designed to help you track the assessments completed as part of the diagnostic process and the data entered into the MISLToe_SSD Questionnaire for collection of the Core Outcome Set (COS). You may use columns 3 and 5 to record the date, or simply tick the relevant box once the assessment has been administered and the score calculated. Some scores are marked with an asterisk (*) as they may also be entered as part of the baseline COS. Please see the note at the bottom of the table for further details.

PRN:

Core Speech Sample				
1 **Speech area**	**2** **Assessment**	**3** **Administered**	**4** **Score**	**5** **Score calculated**
Single word naming	*DEAP Phonology		* % Consonants correct (PCC)	
			***% Vowels correct (PVC)	
			*% Phonemes correct (PPC)	
Stimulability	*Stimulability Assessment (Powell & Miccio,1996) or Stimulability from DEAP Articulation		* Stimulable for all age-appropriate speech sounds	Yes / No (circle)
Intelligibility	*Intelligibility in Context Scale + informal clinician rating		* Average score (ICS)	
Inconsistency	DEAP Screen		% Inconsistency	
	*DEAP Inconsistency (Only if more than 50% inconsistent at DEAP Screen)		% Inconsistency	
***Note**: Scores from these assessments can be entered directly as baseline COS if you are starting therapy within the next 4 weeks				

Appendix 8

Printable checklist for the collection of COS data

This checklist is designed to help you track the assessments completed and the data entered into the MISLToe_SSD Questionnaire for collection of the COS. You may use columns 2, 3 and 5 to record the date, or simply tick the relevant box once the assessment has been administered and the score calculated. Some assessments are marked with an asterisk (*) as you might have administered them previously for diagnosis purposes. In this case mark column only 3. Please see the note at the bottom of the table for further details.

PRN:

1 **Assessment**	**2** **Administered**	**3** **Previously completed for diagnosis**	**4** **Score**	**5** **Score entered**
*ICS			Average score	
*DEAP Phonology			% Consonants correct (PCC)	
			% Vowels correct (PVC)	
			% Phonemes correct (PPC)	
			Number of phonemes (consonants) produced	
*DEAP Articulation/ Stimulability Assessment			Stimulable for all age-appropriate speech sounds	Yes / No (circle)
NAPA			Subtests as required	
***Note**: Column 2 and 3 are mutually exclusive. If assessments marked with (*) were administered recently as part of the MISLToe_SSD diagnostic process to obtain a differential diagnosis, do not repeat them. Instead, mark the column 3, enter the data, and then mark column 5				

Section 5: Glossary

Clinical Assessment of Vowels – English Systems (CAV-ES) is designed to help SLTs clinically derived profile of a child's contrastive vowel profile. Further information related to CAV-ES assessment tool could be found here

Core Outcome Set (COS) – A standardised set of agreed outcomes which should be measured and reported in all trials in specific clinical areas.

C – Consonant

Core Speech Sample – set of speech assessment tasks completed with all children with suspected SSD of unknown origin

Diagnostic Evaluation of Articulation and Phonology (DEAP) - a comprehensive speech assessment tool standardised on a UK population

Diadochokinetc (DDK) rate – a measure of rapid alternating speech movements, used to assess motor speech skills

Drill down sample – additional targeted speech assessment tasks completed if the core speech sample suggests areas requiring further investigation

Episode of Care (EoC) – a discrete, goal-oriented period of clinical engagement in which a speech and language therapist undertakes intervention, monitoring, and/or consultative activities, in response to a defined communication or swallowing need. It follows the baseline assessment but does not include it. An episode of care begins when the first session of intervention related to one or more clinical goals is delivered and concludes when:

1. the agreed therapeutic goals have been met, or sufficient progress has been achieved
2. progress has plateaued and alternative approaches or a period of consolidation are indicated
3. the client transitions to a different service or level of support; or
4. therapy is paused or discontinued for contextual, medical, or personal reasons

Hypernasality – excessive nasal resonance during speech, often due to velopharyngeal insufficiency

Hyponasality – reduced nasal resonance during speech, often due to nasal blockage

Intelligibility in Context Scale (ICS) – a 7 -item caregiver questionnaire measuring how well a child's speech is understood in different contexts. The intelligibility is rated on a 5-point scale and is available in various languages. Further information about the ICS scale can be found here.

Inconsistency – to variation in production of the same word produced by the child across multiple repetitions

Nasality and resonance – acoustic qualities of speech related to airflow through the nasal cavity

Nasal emission – audible air escape through the nose during speech which may be passive (structural cause) or active (learned pattern)

Nuffield Dyspraxia Programme (NDP3) – a structured speech assessment and therapy tool for children with Childhood Apraxia of Speech or other motor speech disorders

Percentage Consonants Correct (PCC) – a measure of the proportion of consonants correctly produced in a speech sample

Percentage Vowels Correct (PVC) – a measure of the proportion of vowels correctly produced in a speech sample

Percentage Phonemes Correct (PPC) – a measure of the proportion of sounds (consonants and vowels) correctly produced in a speech sample

Phonological Awareness – the individual's awareness of the sound or phonological structure of a spoken word.

Probe word list – a set of words selected to either elicit more target speech sounds for assessment or to monitor progress on specific target sounds during therapy

Prosody – the rhythm, stress, intonation and volume of speech

Single word naming test– assessment of series of sounds elicited to assess the errors present in child's speech.

Subjective impressions– additional observations made by the SLTs based on subjective evaluation.

Stimulability – a child's ability to produce a sound correctly on its own and in CV/VC/VCV contexts. A sound is considered stimulable when it can be produced at least twice in 10 opportunities

Suprasegmental features – aspects of speech that operate "above" the speech sounds such as stress, intonation, rate and rhythm

V – vowel

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