PSYCHOLINGUISTIC PROFILING OF A DEAF CHILD WITH ADDITIONAL LITERACY DIFFICULTIES: A SINGLE CASE STUDY

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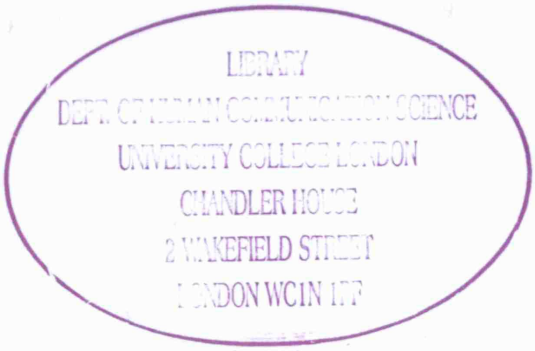

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(Frederickson, Frith & Reason, 1997)

1. ABSTRACT

A study by Susan Ebbels (2000) showed that it was possible to use the Stackhouse & Wells (1997) psycholinguistic framework to plan and interpret an investigation of a hearing-impaired child's speech processing skills in order to determine points of breakdown and so inform therapy. The first aim of this study was to examine the speech processing abilities of a ten year old hearing-impaired boy with speech difficulties using the Stackhouse & Wells (1997) psycholinguistic framework.

The subject chosen had literacy difficulties that did not seem to be wholly accounted for by his hearing loss. This led to the study's second aim of using a psycholinguistic hypothesis-led approach to investigate and determine the reasons for the additional literacy difficulties of a hearing-impaired child. Thus the study used a psycholinguistic approach to identify the root of speech processing *and* literacy difficulties experienced by a hearing-impaired child.

It was found that, despite his hearing impairment and output difficulties for certain consonant clusters, the subject's speech production was not affected by poor auditory discrimination or phonological representations, but that he had faulty motor programmes for some words, in line with the phenomenon of 'frozen phonology'. An exploration of the reasons for his literacy difficulties uncovered phonological awareness difficulties, particularly with blending and segmenting of words and found that his knowledge of the letter-to-sound relationship for vowels was extremely poor.

A set of picture/word/sound colour cards was used to teach the sounds associated with a set of vowels, as suggested by Broomfield and Combley (2003). One teaching session was found to improve the

subject's ability to correctly read the vowels taught, thus demonstrating his potential to acquire this skill.

2. INTRODUCTION

2. 1. Introduction to psycholinguistic approaches in general and the Stackhouse & Wells (1997) approach in particular

For many years speech impairments were categorised using a medical approach. This approach sought to explain underlying causes as due to identifiable organic or structural problems, such as cleft palate, for which medical intervention may have been appropriate. In the mid-70s a linguistic perspective was popularised allowing speech and language therapists greater insight into children's phonological systems and providing new intervention approaches targeting children's phonological rule systems (Baker, Croot, McLeod and Paul, 2001). However, although these approaches provide *descriptive* information, they are limited in their capacity to provide *explanations* of speech impairments, especially those present in children with no accompanying structural difficulties.

The psycholinguistic approach, however, aims to investigate and clarify at a cognitive level the way in which children process speech and language, in order to formulate hypotheses about faulty psychological processes or components. In simplistic terms the approach examines the process between the spoken word entering the child's ear as sound waves and the child producing an utterance which may or may not match that word. It highlights three major aspects of speech processing: the receptive processing of words, the storage or underlying representations of words, and the processes involved in their production (Dodd, 1995; Fee, 1995, both cited in Baker et al, 2001). Each step of this process is scrutinised and the individual cognitive processes examined and tested to identify any which may be faulty.

In 1973 Smith (Baker et al, 2001) devised a simple box-and-arrow model to illustrate the information-processing activities involved in carrying out cognitive functions, such as speech. Each hypothesized level of representation or processing was represented by a box, and the relationships between them by arrows. Menn and colleagues (1977 to 1993) subsequently produced a more complex model then Smith's, introducing the concept of two lexicons for their underlying representations; an input lexicon used in word recognition and an output lexicon used in word production (Baker et al, 2001). Other models exist which differ in the number of psychological processes (and therefore the number of boxes) they contain.

One model which has become popular amongst speech and language therapists is the 1997 model devised by Joy Stackhouse and Bill Wells. This is the model upon which this study is based and is illustrated in Appendix 1. As can be seen in Appendix 1, while Stackhouse & Wells do not explicitly differentiate between an input and an output lexicon, as suggested by Menn and colleagues (Baker et al, 2001), their single lexical representation is broken down into *phonological representation* (akin to an input lexicon), *semantic representation* and *motor program* (akin to an output lexicon), shown by bold boxes. Input processes of *peripheral auditory processing*, *speech/non-speech discrimination*, *phonetic discrimination* and *phonological recognition* are shown on the left of the model, with output processes of *motor programming*, *motor planning* and *motor execution* being shown on the right of the model. The relationship between each process (or box) is represented by arrows, with broad arrows and shaded boxes representing processes hypothesized to occur offline (Baker et al, 2001). It is interesting to note that, while the lexical representation is broken down into semantic, phonological and motor program components, there is no recognition in this model of the grammatical and orthographic components of the lexical representation (Baker et al, 2001). Stackhouse & Wells (1997) do acknowledge that the lexical representation of a word is also likely to

have a *grammatical representation* (the grammatical function(s) of the word), an *orthographic representation* (how the word appears in writing) and an *orthographic program* (how it is produced in writing). Appendix 2 illustrates the relationship between the various proposed parts of the lexical representation. However these grammatical and orthographic components are not included in their commonly used psycholinguistic model as shown in Appendix 1.

Later in this study efforts are made to examine the phonological awareness and phonological decoding skills of a child, in relation to reading (input) and spelling (output) difficulties. Whilst the scope of this study did not allow it, an interesting and useful adjunct would have been further investigations using Stackhouse & Wells' (1997) additional lexical components as shown in Appendix 2 in order to further explore the subject's orthographic processing, on both the input and output sides of the model.

2. 2. Use of the Stackhouse & Wells approach with hearing children to investigate speech processing

Several studies have utilised the Stackhouse and Wells (1997) psycholinguistic model successfully in their investigations of children's speech and language difficulties. One of the best examples is a case study cited by Stackhouse & Wells (1997) of a child named Zoe. The study followed Zoe from the pre-school years to the age of 9;08 and conducted various psycholinguistic and general speech and language assessments at three points during the study. For example, they assessed *auditory discrimination of real and non-word minimal pairs, real and non-word rhyme detection, imitation of sounds and sound sequences, real and non-word repetition* and *picture naming.* Stackhouse & Wells' (1997) psycholinguistic model was successfully used as a framework for identifying the level(s) of breakdown within speech processing, and led to the formulation of hypotheses about Zoe's speech and literacy, such as:

- Zoe had difficulty with the production of unfamiliar words and consonant clusters due to motor programming problems (Baker et al, 2001);
- Zoe had difficulty with voiced/voiceless contrasts due to weak phonological representations for voiced/voiceless onsets and difficulties with auditory processing (Baker et al, 2001).

The hypothesised deficits were then targeted with intervention tasks such as:

- Syllable segmentation tasks designed to help Zoe acquire new words;
- Voiced/voiceless auditory discrimination tasks.

The psycholinguistic approach has been found to provide a comprehensive framework for the analysis of a child's difficulties and a logical basis for planning intervention. The skills required to carry out different tasks can be analysed with reference to the model – by determining whether they are input or output processing tasks and how dependent they are on stored phonological representations. Underlying deficits can be identified and intervention targeted at the appropriate level.

2. 3. Application of the Stackhouse & Wells approach to hearing-impaired children

Clearly a child with a hearing impairment is likely to experience auditory input difficulties which may affect speech output. The ability of the Stackhouse & Wells (1997) speech processing model, not just to differentiate between input and output, but to identify the precise loci of input and/or output difficulties, makes it an ideal framework for use with a hearing-impaired child. Susan Ebbels (2000) carried out a study of TG, a child of 10;04 years with bilateral sensorineural hearing loss. Although previously diagnosed as both hearing- and language-impaired, traditional assessments were unable to reveal

TG's precise difficulties. Through use of the Stackhouse & Wells (1997) speech processing model Ebbels showed that, rather than one single level of breakdown, multiple levels of breakdown existed. More specifically, TG's hearing impairment was found to be affecting her ability to hear differences between some pairs of sounds, and she was failing to give phonological significance to some contrasts which she could hear, while her output errors were found to result from input deficits (Ebbels, 2000). The study showed that it was possible to use the Stackhouse & Wells (1997) framework with a hearing-impaired child and in doing so gain insights into the difficulties of the child which could inform therapy. Ebbels (2000) pointed out that, bearing in mind that hearing impairment is likely to affect the perception of some phonemes more than other, and that a child's phonological processing system is still developing, the framework is particularly suited to identifying the precise level of breakdown for each stimulus word (assuming a closed set are used) and each contrast.

2. 4. Application of the Stackhouse & Wells approach to hearing-impaired children who may have phonological awareness difficulties as well as speech difficulties

One direction of investigation which appears not to have received much attention is the use of the Stackhouse & Wells (1997) model to investigate speech processing *and* phonological awareness deficits in a hearing-impaired child. "Phonological awareness refers to the ability to reflect on and manipulate the structure of an utterance as distinct from its meaning" (Stackhouse & Wells, 1997, p.53). Many authors and clinicians recognise the value of phonological awareness skills as a predictor of reading ability. Joy Stackhouse and Bill Wells devote a chapter of their 1997 book to the subject of testing phonological awareness. They demonstrate how investigation from a psycholinguistic perspective of certain skills often used to examine phonological awareness in isolation (e.g. rhyme, spoonerisms,

blending and segmenting) can help to illustrate the relationship between speech, literacy and phonological awareness. As the development of phonological awareness is dependent on an intact speech processing system, so testing of phonological awareness assesses the integrity of the underlying speech system (Stackhouse & Wells, 1997). Furthermore, given the correlation between reading achievement and the ability to demonstrate good phonological awareness (Dyer, MacSweeney, Szczerbinski, Green & Campbell, 2003), it is incumbent upon the speech and language therapist to include an investigation of phonological awareness in psycholinguistic assessments, especially where any signs of literacy difficulties exist.

Dyer et al (2003) state that the reading and writing skills of most hearing-impaired students fail to reach levels appropriate to their age and intelligence. Given that "many hearing-impaired children exhibit speech and language levels below that which would be predicted from their hearing loss" (Ebbels, 2000, p.3), it would seem a logical progression to use the Stackhouse & Wells (1997) approach with hearing-impaired children, not just to identify speech processing problems but also to highlight any additional phonological awareness difficulties.

2. 5. Phonological awareness, phonological decoding and their contribution to reading and spelling

In their 2003 study, Dyer et al made a clear distinction between tasks of phonological awareness and of phonological decoding. As discussed above, phonological awareness involves recognising and manipulating parts of phrases and words and does not necessarily require an orthographic representation. Phonological decoding, on the other hand, involves mapping speech sounds onto orthographic symbols, a skill which enables a child to read and spell new and unfamiliar words (Dyer et al, 2003). Dyer et al (2003) found that

measures of both phonological awareness and phonological decoding were negatively correlated with reading delay. Spelling correlates were not examined.

2. 6. Aims of the study

In line with the theoretical issues discussed above, this study aims to use the Stackhouse & Wells (1997) assessment framework to conduct a single case study of a hearing-impaired child with literacy difficulties in addition to speech processing difficulties. It aims to use the Stackhouse & Wells (1997) model to do the following:

1. Investigate the child's speech processing skills;
2. Identify the specific point(s) of breakdown for certain problematic consonant contrasts;
3. Establish the nature of any phonological awareness problems in the light of identified literacy difficulties.
4. Explore the child's phonological decoding skills in the light of identified literacy difficulties.

2. 7. Hypotheses

Table 1: Pre-assessment hypotheses, based on the theoretical findings above, with rationales.

Pre-assessment hypothesis	Rationale
1. *Assessment based on the Stackhouse & Wells (1997) speech processing model will identify areas of breakdown for particular consonant contrasts.*	Previous studies (mentioned above) have shown this to be the case.
2. *The subject will be found to have phonological awareness difficulties and/or difficulties with phonological decoding.*	As discussed above, a strong correlation exists between poor performance on phonological awareness and phonological decoding tasks and poor literacy skills.

2. 8. Questions the study aims to answer

In line with the pre-assessment hypotheses above, the study aims to answer the following questions:

1. Given that the subject is hearing-impaired, to what extent is speech production affected by poor auditory discrimination?
2. Precisely where on the Stackhouse & Wells (1997) model do the subject's speech processing difficulties lie?
3. Is the subject's poor spelling and reading due to more than just his hearing loss?

3. METHODOLOGY

3. 1. Selection of subject

Criteria used to select a child for the study are shown in Table 2, along with factors which were not considered important.

Table 2: Inclusion and exclusion criteria used for subject selection, and factors considered unimportant.

Inclusion criteria. The child should:	▪ be aged between six and 11 years ▪ have a spoken vocabulary of at least four years ▪ have a non-verbal IQ within normal limits ▪ have speech which is mostly intelligible in context ▪ have a reduced system of consonant contrasts and difficulties with consonant clusters ▪ have some literacy difficulties not wholly explained by *his/her degree of hearing impairment* ▪ have adequate attention to complete the tests ▪ understand the concept of same/different ▪ be able to discriminate between minimal pairs (with amplification)
Exclusion criteria. The child should not:	▪ have such severe deafness that listening tests are inaccessible
Factors which were not considered to be important	▪ Age of onset of hearing loss ▪ Presence of cochlear implant ▪ Type of amplification worn ▪ Presence of home languages other than English

Following discussion with the Speech and Language Therapist at a hearing-impaired unit, the subject LS was proposed. LS' teachers of the deaf reported that his reading and spelling were extremely poor, in comparison to his general progress in other subjects, despite having good aided hearing levels, being an enthusiastic worker and being considered to be a 'bright' child. In short, LS' literacy difficulties appeared to be more severe than would be suggested by his degree of hearing impairment. For these reasons he was selected as an

ideal subject for the author's aims of using the Stackhouse & Wells (1997) approach to identify speech processing problems whilst simultaneously exploring phonological awareness skills. Examples of his difficulties follow under case details, below.

In line with ethics protocol, permission to use LS as a subject was obtained from LS' parents prior to testing.

3. 2. Case details and description of subject

LS was a boy of ten years and one month at the start of testing. He first received a cochlear implant at 2 years of age and at the time of testing was a well-established cochlear implant user, taking responsibility for changing the batteries and setting the controls of his speech processor. He had a Clarion CII implant and used an Auria Behind The Ear speech processor in his left ear. Hearing in his right ear was not aided. LS used a radio aid during lessons.[1]

Audiological Information[1]

LS' hearing thresholds through his cochlear implant were assessed at various frequencies, as shown in table 3, below.

Table 3: LS' hearing thresholds at various frequencies

Frequency (Hz)	500	1000	2000	4000
Hearing threshold (dB HL)	30	25	30	40

Listening Skills[1]

LS' listening skills were evaluated as 97% using the Meaningful Auditory Integration Scale – a parent-reported scale designed to assess behaviour in everyday situations. The only reported difficulty was hearing speech signals in high levels of background noise.

[1] Information in this section was taken from a recent hospital implant review report.

Speech Perception Skills[1]

LS scored 71% on the PBK Word Test – where the child is required to repeat back single words.

Further Background Information

Table 4: Summary of background information on LS

Date & CA	Assessment	Aim of assessment	Results		
			RS	SS	AE or %ile
31/10/05 9;11	The Coloured Progressive Matrices (Raven, 1984)	Assessment of non-verbal reasoning skills	33		90th %ile
31/10/05 9;11	British Picture Vocabulary Scale (Dunn, 1997)	Assessment of receptive vocabulary	62	71	6;01 3rd %ile
31/10/05 9;11	Clinical Evaluation of Language Fundamentals (Semel, Wiig & Secord, 2000)	Comprehensive assessment of receptive and expressive language	Sentence structure 17 Word classes 18	6[2] 7	9th %ile 16th %ile
21/11/05 9;11	Test for Reception of Grammar (Bishop, 1989)	Assessment of comprehension of grammatical structures	11 blocks passed		5;06 1st %ile
21/11/05 9;11	Action Picture Test (Renfrew, 1997)	Evaluation of spoken language in terms of information provided and grammatical form used	Information 37½ Grammar 25		Ceiling for age 8;05 6;06 to 6;11

[2] LS' raw score was below the floor for his chronological age. The standard score of 6 relates to the chronological age of 7;0 to 7;11.

18/10/05 9;10	Oxford Reading Comprehension	Assessment of reading comprehension	6/20		
21/10/05 9;10	Oxford Brookes Word Spelling Assessment	Assessment of spelling	2/44		
18/10/05 9;10	Schonnell Graded Word Spelling Test	Assessment of spelling	9/50		

CA = chronological age, RS = raw score, SS = standardised score,
AE = age equivalent, %ile = percentile

Notes on table 4

- The Coloured Progressive Matrices (Raven, 1984), British Picture Vocabulary Scale (BPVS) (Dunn, 1997), Clinical Evaluation of Language Fundamentals (CELF) (Semel et al, 2000), Test for reception of Grammar (TROG) (Bishop, 1989) and the Action Picture Test (RAPT) (Renfrew, 1997) are all standardised on hearing children. This means that the norms and age equivalents are not likely to be accurate for a hearing-impaired population. However a qualitative examination of a collection of assessment results can give a broad picture of the hearing-impaired child's language profile.
- The Oxford Reading Comprehension, Oxford Brookes Word Spelling Assessment and Schonnell Graded Word Spelling Test are not standardised, but are used by the teachers of the deaf to assess reading comprehension and spelling.
- Copies of the scoresheets listed in table 4 can be found in appendices 3 to 10.

LS' **non-verbal reasoning** skills, as highlighted by the Coloured Progressive Matrices (Raven 1984), showed his general level of intelligence to be higher than average. **Receptive language**, as assessed by the BPVS (Dunn, 1997), CELF (Semel et al, 2000) and TROG (Bishop, 1989) was lower than the average expected of a

hearing population. LS' **expressive language**, as assessed by the RAPT (Renfrew, 1997) showed a higher score for information than grammar. This was not dissimilar to findings by Myklebust (1960) and Fries (1952) (both cited in Bamford and Saunders, 1991) that deaf children have a tendency to use nouns over function words. Whilst not standardised or norm-referenced, the Oxford Reading Comprehension, Oxford Brookes Word Spelling Assessment and Schonnell Graded Word Spelling Test supported the reports by LS' teachers of the deaf that his **literacy skills were particularly poor**; poorer than his peers with similar levels of hearing impairment, and **worse than would be expected given his degree of hearing loss**.

3. 3. Identification of contrasts for further testing

Procedure

The overall aims of the naming section of the PETAL are to examine the phonetic and phonological features of an individual's speech in relation to his/her intelligibility and communicative abilities. Initially the precursors naming section of PETAL (Parker, 1999) was carried out, giving an opportunity for LS and the author to familiarise themselves with the testing procedure. The author transcribed LS' speech whilst administering the test and the procedure was recorded onto video using a Sony digital video camera recorder, model no. DCR-HC14E. The author checked and amended her transcription as indicated by the video recording. This transcription was then checked by an independent Speech and Language Therapist with many years experience of working with and transcribing the speech of hearing-impaired children.

Having established that her transcription skills were adequate, the author then carried out the following naming sections of PETAL (Parker, 1999):

- T3: Initial Plosives
- T4: Initial Affricates and Fricatives

- T5: Initial Nasals and Approximants
- T7: Initial Clusters

Sections T3, T4 and T5 provide information about the contrastive relationships of sounds within words in their simplest forms (CV or CVC), while section T7 allows the tester to examine an individual's speech features of syllable-initial consonant clusters.

Again, the procedure was transcribed and recorded onto video, enabling the author to check and amend the transcription accordingly.

Results

The PETAL (Parker, 1999) speech assessment naming results are shown in Appendix 11. Examples of problematic cluster realisations are as follows:

bread → [fʊɐ]

crisp → [fɹɪ]

glove → [lʌf]

green → [ɸʊin]

pram → [ɸɹæm]

quack → [wæʔ]

school → [du]

slide → [ɬaɪ]

snake → [nɐɪ]

spoon → [bun]

stick → [gɪk]

sweet → [ɸwi]

As LS appeared to have particular difficulty with clusters, these were analysed further using the PACS (Grunwell, 1985) Cluster Realizations assessment sheet in Appendix 12. In order to keep the study containable, four word-initial cluster contrasts were selected for

further investigation. Table 5 lists the contrasts chosen and their realisations elicited by the PETAL (Parker, 1999) naming tasks.

Table 5: Cluster contrasts chosen for further investigation

Cluster	Target	Realisation
sk/g	school	[du]
	skirt	[gɜ]
	skate	[geɪ]
sm/m	smoke	[məʊ]
	small	[mɔ]
	smile	[maɪəl]
st/d	star	[da]
	stairs	[deɸ]
	stick	[gɪk]
	stamp	[dæm]
	stitch	[dɪʔʃ]
sw/w	swing	[ɸwɪŋ]
	sweet	[ɸwi]

3. 4. Selection of psycholinguistic tests and stimuli

Combined use of sections of the PETAL (Parker, 1999) and a PACS (Grunwell, 1985) assessment sheet led to the identification of cluster contrasts that LS was not marking. However, as discussed previously, such assessments gave no further information regarding the source of LS' difficulties. Further investigation from a psycholinguistic viewpoint attempts to classify the child's difficulties with particular consonant contrasts as resulting from a breakdown at one or more of the following levels (Stackhouse and Wells, 1997):

- Input, e.g. auditory discrimination;
- Stored linguistic knowledge, such as phonological representations;
- Output, e.g. motor programming, planning or execution.

A number of computerised tests was administered, along with associated formal and non-formal assessments, during various assessment sessions. These various tests adopted a hypothesis-testing approach based on the Stackhouse & Wells (1997) model of speech processing and allowed the author to test and refine hypotheses concerning LS' speech production difficulties. Tests administered, along with their rationales, are listed under paragraph 3. 5. c) on page 19.

Stimuli used in the computerised tests were selected according to certain criteria as shown in Table 6.

Table 6: Criteria for selection of real words and non-words used in the computerised tests

Real words selection criteria	Non-words selection criteria
▪ Able to be represented visually, ▪ Familiar words, bearing in mind a child's limited vocabulary, ▪ Of one syllable, as the purpose of the study is to investigate speech processing of initial consonant clusters, not word length effects.	▪ Matched to real words by retaining the consonants and substituting the vowel, e.g. /swɪtʃ/ → [swetʃ], /stɪk/ → [stik], /smǝuk/ → [smɔɪk] ▪ Phonologically legal in English.

3. 5. Testing

3. 5. a) Procedures and dates

Testing took place on five dates over the course of five and a half months. Each session was administered by the author in a quiet room at LS' school. At all times the author ensured that LS was provided with phonetic and visual information by speaking clearly at a normal volume and ensuring that her mouth and face were visible. Testing took place in the morning as it was felt that LS sometimes became tired in the afternoons. Sessions lasted no more than an hour, and were carried out in a relaxed manner with the tester

providing verbal encouragement throughout the session. LS earned merit-style rewards for each session and was co-operative and attentive throughout.

The computerised tests were run using a Pentium III, Dell Latitude CPx laptop computer, attached to a Yamaha MS101 II Monitor Speaker. All sessions were recorded using a Sony digital video camera recorder, model no. DCR-HC14E. The use of video recordings helped to ensure accurate transcriptions and scoring of tests.

3. 5. b) Rationale for selection and order of tests

A large number of tests was administered, falling into three broad categories: Tests to look at LS' speech processing for four problematic contrasts; tests to examine phonological awareness and decoding in the light of LS' literacy difficulties; and finally a collection of tests designed to examine the source of hypothesised difficulties with vowels.

3. 5. c) Examining speech processing: tests administered, with rationale for each test

Input tests

According to the Stackhouse & Wells (1997) speech processing model a breakdown or difficulty on the input side will feed through and be manifested as certain difficulties in speech output.

Non-word Auditory Discrimination

LS was presented with pairs of computer-generated non-words, e.g. /skil gil/, /smɒl mɒl/, /staʊ daʊ/, /sweŋ weŋ/. (For this and subsequent computerised tests, the computer played words which

were recorded live, as opposed to synthetic speech.) LS was then required to press one of two computer keys to indicate whether he thought the two non-words were the same or different. There were 32 pairs of non-words presented for each contrast. 16 pairs of non-words were presented first using audio-visual stimuli: The computer simultaneously played a video clip of the speaker's face and an audio recording of the speaker saying the pairs of non-words. The test was then carried out using 16 audio only stimuli in which the audio recording was accompanied by a screen image of empty speech bubbles.

LS completed this test for each of the contrasts sk/g, sm/m, st/d and sw/w as well as the contrast p/b, which acted as a control to indicate whether he understood the task. For each contrast he was presented with 16 pairs of randomised same or different minimal pairs.

Rationale

The ability to detect differences between certain speech sounds or pitch changes is crucial to speech processing. Bishop (1992, cited in Stackhouse & Wells, 1997) cites auditory processing difficulty as a likely cause of language difficulties. Non-word auditory discrimination is a 'bottom-up' processing task in that it is achieved without accessing stored linguistic or semantic knowledge; the test items are novel and do not match any stored representations.

Picture Yes/No Judgement

For each contrast being investigated the computer showed an empty speech bubble alongside a picture, accompanied by a live recording of either the correct word (e.g. 'swing'), or an incorrect word (e.g. 'wing' or 'ling'). LS was required to press one of two computer keys to indicate whether he thought the word that he heard was correct or incorrect. For each contrast two pictures were shown (e.g. 'swing'

and 'sweet' for /sw/) one at a time. Each of the two pictures was shown eight times, in randomised order, giving a total of 16 items for each target consonant/consonant cluster. As with non-word discrimination, the test was carried out using audio-visual stimuli, then using audio stimuli only.

Rationale

This task investigates how accurate LS' phonological representations are for each target word. It is a challenging investigation of a child's phonological representations, particularly for a hearing-impaired child, as the stimuli are phonetically close to one another and the incorrect stimuli (e.g. 'wing' for 'swing') usually correspond to the child's errors. Thus it involves good auditory discrimination alongside accurate phonological representations of the target words.

Output tests

A child may have speech output problems whether or not input difficulties exist. Output tests investigate the child's spoken production.

Picture Naming

For each contrast a series of eight different pictures was presented, four of them beginning with the target consonant cluster (e.g. scarf, skate, skirt, school for the sk/g contrast) and four of them beginning with a typically incorrect realisation for the target consonant cluster (e.g. goat, girl, gun and gate for the sk/g contrast). Each picture was shown twice, in random order. LS was required to name each picture in turn. The tester used the mouse to select 'correct', 'incorrect' or 'unsure' after each response and the use of video recording was used to verify the results. As the initial focus of this study was LS'

word-initial cluster contrasts, this was the only part of the response that was scored, although naming realisations were transcribed in full.

Rationale

In order to name a picture LS had to access his stored representations for the word and then say the word, without hearing an auditory (input) prompt from the tester. Successful naming is a complex task requiring a child to identify a visual stimulus semantically, and then access his motor programme for that word. Thus, provided no input difficulties are found, poor naming scores may indicate a breakdown at one or more of the levels of phonological representations or motor programmes, planning or execution.

This task was an extension of the initial PETAL (Parker, 1999) naming tests as it provided more stimuli for each contrast.

Real Word Repetition

LS was presented with spoken versions of the words used in the naming test, without picture stimuli, and was asked to repeat each one. Each word was presented twice, in random order, giving a total of 16 stimuli for each contrast. The words were presented as audio-visual stimuli, then as audio stimuli only. The test was scored and checked with a video recording as in Picture Naming.

Rationale

As LS was asked to repeat real words it is likely that he would have accessed a stored motor programme for each word. However he may have treated it like an unfamiliar word and created a new motor programme for each word.

Non-Word Repetition

This test proceeded in the same way as Real Word Repetition except that the stimuli were matched to the real word stimuli by changing the vowel in each case (e.g. 'sweet' became /swɑt/ and 'smell' became /smul/). Again each word was presented twice, in random order, giving a total of 16 stimuli for each contrast

Rationale

When asked to repeat non-words, a child has no phonological representations or existing motor programmes to access. He is required to create a new motor programme. Comparison of real word and non-word repetition scores can help to narrow down the location of an output difficulty.

Real Word Reading

Real word stimuli from the naming and repetition tests were presented to LS in a written form and he was asked to read each word. Each of the stimuli words was presented once, giving eight stimuli for each contrast. Responses were transcribed and checked later using the video recording.

Rationale

A comparison of reading and naming responses may indicate whether visual (i.e. orthographic, or written letter) clues produce a more accurate output of initial clusters.

Non-Word Reading

Again, stimuli from the repetition tests were presented to LS in a written form (eight stimuli for each contrast). He was told that they were made-up words and he was asked to read each one. Responses were transcribed and checked later using the video recording. Non-word reading and segmentation of non-words were also explored further in the investigation of LS' letter-to-sound awareness described on page 26.

Rationale

As the stimuli are non-words, phonological representations are not accessed. If non-word reading is superior to real word reading, this may suggest that inaccurate phonological representations are responsible for real word reading errors, and that 'bottom-up' processes are superior to 'top-down' processes. If the individual can not draw on his/her representations to tell them what the word is, it is assumed that they need to utilise some degree of phonological awareness, and letter-to-sound conversion rules, in order to identify which sounds are needed, in what order (Stackhouse & Wells, 1997). Alternatively the reader may read the non-word by analogy, matching part of its written form to a known word, using the sound for that part and then substituting the sound for whichever letter is different. This process also requires competent phonological awareness skills. Whichever method is used, phonological awareness skills are considered to correlate with non-word reading skills (Treiman, cited in Sawyer and Fox, 1991)

Conversation

LS was encouraged to have an informal conversation with the tester about his forthcoming holiday. A video recording (approximately four and a half minutes long) was made of the conversation.

Rationale

Analysis of the video recording allowed the tester to see whether speech errors highlighted during testing were consistent with those demonstrated during continuous speech.

3. 5. d) Phonological awareness and decoding: tests administered, with rationale for each test

Investigation of LS' Phonological Awareness

The Phonological Assessment Battery (PhAB) (Frederickson, Frith and Reason, 1997) was administered.

Rationale

When faced with an alphabetic script, such as English, a child's awareness of and ability to manipulate the structure of a word is crucial to his development of reading and spelling skills. As LS was known to have marked difficulties with reading and spelling, an investigation of his phonological awareness and processing was likely to be informative.

Test of Letter and Sound Knowledge

LS was asked to provide the name and the common phoneme, or sound, of each letter of the alphabet. If he was unable to produce the sound, he was asked to imitate it. Responses were recorded and checked using the video recording. Note was made of any particular help that was needed to produce a correct sound

Rationale

Knowledge of the sound that is commonly represented by each written letter is essential for the reading and writing of words, in

particular novel words. This test would highlight any gaps in LS' letter sound knowledge and would indicate whether LS could imitate sounds he failed to produce in naming or reading.

Investigation of LS' Letter-to-sound awareness

This was an informal investigation of LS' ability to produce the correct sounds in response to segmented phonemes of simple CVC words presented in their written form. The tester used a small number of CVC non-words (e.g. 'tib', 'lut') and words (e.g. 'bed', 'sit') and, for those he was unable to read correctly, asked him what the first, middle and last sounds were.

Rationale

"Explicit awareness of sounds is predictive of future reading ability." (Broomfield & Combley, 2003, p.25). Bearing in mind LS' poor reading and non-word reading, the aim of this assessment was to find out whether LS had difficulties matching phonological representations and motor programmes of *phonemes* (as opposed to whole words) with their orthographic form.

3. 5. e) Exploring vowel difficulties: tests administered, with rationale for each test

Previous data collected indicated that LS had particular problems with reading and writing vowels and producing the correct sounds associated with vowels. Further tests were administered to explore the possible sources of these difficulties with vowels.

Non-word Reading Test (looking at vowels)

This was administered in the same way as the previous non-word reading test, except that the stimuli were ten CVC non-words, such

as 'wib', 'zob' and 'nuck', each containing one of the five short vowels /æ, e, ɪ, ɒ, ʌ/. All realisations were transcribed and the number of vowel phonemes pronounced correctly was recorded.

Rationale

As before, non-word stimuli meant that representations of words were not accessed so that LS could not use a whole word recognition approach, but rather had to match written letters to representations of individual phonemes. The selection of the five short vowels in the stimuli words allowed the tester to determine whether LS was able to produce accurate representations for the vowels tested and to match them to written letters.

Auditory Discrimination with non-word vowel minimal pairs

The tester devised her own test, introducing three grades of difficulty:
Grade 1: Easiest
Short vowel versus diphthong, e.g. /fep/ versus /faʊp/
Grade 2: Medium
Long vowel versus short vowel and long vowel versus diphthong, e.g. /lɔp/ versus /lʌp/ and /dɜp/ versus /dɔɪp/
Grade 3: Hardest
Short vowel versus short vowel, e.g. /pæs/ versus /pes/
The grade 3 minimal pairs contained vowels which are close together on the cardinal vowel chart (Ladefoged, 2001), making them harder to discriminate than vowels far apart on the cardinal vowel chart (Ladefoged, 2001), such as those used in the grade 1 minimal pairs. In this way the test got progressively harder.

For each grade of difficulty LS was presented with five minimal pairs (interspersed with five identical non-word pairs), spoken by the tester, and in each case had to say whether the two non-words in the

pair were the same or different. This gave a total of 30 non-word pairs. The tester ensured that the two words in each minimal pair or identical pair were spoken with the same length, pitch, volume and intonation. LS' eyes were covered as each pair was spoken, making the stimuli auditory only.

Rationale

This test is designed to indicate whether LS' difficulties with reading vowels are on the auditory input side; namely, whether he is able to discriminate between vowels auditorily.

Picture Yes/No Judgement – changing vowels

LS was presented with pictures of four words (smell, stamp, switch, skirt) from the computerised output tests for which he made vowel reading errors. (He read 'stamp' as [stɪmp] and 'skirt' as [deɪk].) For each of these four pictures the tester gave four correct spoken words and four incorrect spoken words, with only the vowel changed (e.g. /smul/ for 'smell') in random order. LS was asked to indicate whether the word was right or wrong.

Rationale

As with the previous picture Yes/No judgement test, this test investigated the accuracy of LS' phonological representations for each picture stimulus. More specifically, as only the vowel was changed, it investigated the accuracy of the specifications of vowels in LS' system of phonological representations.

Segmenting of real words and non-words into phonemes

Using the words 'dog', 'cat' and 'ship' as examples to ensure that he understood the task, LS was given five CVC real words ('mat', 'let', 'zip', 'hot' and 'bus') and five matched CVC non-words ('mot', 'lat', 'zup', 'het' and 'bis') and asked to segment them into separate 'sounds'.

Rationale

A study by Muter, Hulme, Snowling and Taylor. (1998, cited in Stackhouse & Wells, 2001) suggests that early segmentation skills and letter name knowledge interact and are predictive of later reading and spelling development. This simple segmentation task was designed to test LS' ability to manipulate phonological units. The results were expected to back up the PhAB (Frederickson et al, 1997) assessment results.

Investigation of paired associations between sounds and symbols for vowels

The author used simple 2-sided laminated colour cards, illustrated in appendix 13, as suggested by Broomfield & Combley (2003) to teach LS the vowel sounds which most commonly correspond to the short vowels a, e, i, o, u (/æ e ɪ ɒ ʌ/) and the four following diphthongs:

'ai' → /eɪ/ as in 'train'

'or' → /ɔ/ as in 'fork'

'ar' → /ɑ/ as in 'star'

'oa' → /eʊ/ as in 'boat'.

LS was given a short spelling and reading test of words containing these vowel sounds before and after the teaching session. Each test comprised one word containing each of the target vowels (e.g. 'cost', 'bat', 'farm', 'mend'), giving nine (different) words in each test. During

the post-teaching reading test LS was helped and encouraged to identify the vowel in the stimulus word, to locate the correct colour card showing that vowel and to say the vowel out loud before attempting to read each word. In order to do this, the tester used such questions as 'What is the sound in the middle?', 'Show me the right card' and 'Say the sound'.

Rationale

The pre- and post-teaching tests were designed to investigate whether LS may have the potential to learn sound-letter correspondences, or paired associations, for vowels when they are taught explicitly, and whether such correspondence knowledge would manifest itself in improved reading or spelling scores for the vowels taught.

Blending of consonants and vowels (real words and non-words)

As with the segmenting task, the words 'dog', 'cat' and 'ship' were used as examples to ensure that LS understood the task. He was then given five CVC real words ('mat', 'let', 'zip', 'hot' and 'bus') and five matched CVC non-words ('mot', 'lat', 'zup', 'het' and 'bis') as segmented phonemes. He was required to blend the phonemes and was asked for a description or definition of the blended word, to check his understanding of the word. In an effort to present the segmented parts as separate phonemes, the tester did not add schwas to consonants if possible and made sure that voiceless consonants were not voiced, so that the segmented version of 'mat' was [m æ t], not [mə æ tə].

Although the segmenting, paired associations and blending tests are presented in this order to reflect the order that a child carries them out when reading, the blending test was administered before the

segmenting test so that the subject would not remember the segmenting test stimuli and reproduce them as answers in the blending test.

Rationale

The ability to blend phonemes or syllables in this way "correlates well with reading achievement and is a good predictor of reading performance" (various, cited in Stackhouse & Wells (1997), p. 67). In addition a study by Muter, Hulme, Snowling, et al. (1998, cited in Stackhouse & Wells, 2001) suggests that early segmentation skills and letter name knowledge interact and are predictive of later reading and spelling development. As with the segmentation task, this blending task was designed to test LS' ability to manipulate phonological units. The results were expected to back up the PhAB (Frederickson et al, 1997) assessment results.

4. RESULTS

Test results are presented in the following order:

Examining speech processing

a) **Input tests**
   Non-word Auditory Discrimination
   Picture Yes/No Judgement

b) **Output tests**
   Picture Naming
   Real Word Repetition
   Real Word Reading
   Non-Word Repetition
   Non-Word Reading

c) **Conversation**

Phonological awareness

a) Investigation of LS' Phonological Awareness
b) Test of Letter and Sound Knowledge
c) Investigation of LS' Letter-to-sound awareness

Exploring vowel difficulties

a) Non-word Reading Test (looking at vowels)
b) Auditory Discrimination with non-word vowel minimal pairs
c) Picture Yes/No Judgement – changing vowels
d) Segmenting of real words and non-words into phonemes
e) Investigation of paired associations between sounds and symbols for vowels
f) Blending of consonants and vowels (real words and non-words)

In Tables 7 and 8, below, p represents the probability of performance being due to chance, based on Siegel & Castellan's Binomial Test, (1988). Where p is less than .05 ($p < .05$), the score or performance is considered to be 'significant', i.e. not due to chance, with a 'highly significant' score being represented by values of p less than .001 ($p < .001$). Where p is greater than .05 ($p > .05$), the performance may be due to chance.

Non-word Auditory Discrimination

Table 7: Non-word auditory discrimination scores for each consonant cluster with their associated p values.

Cluster	Audio-visual or Audio Alone	Score	p	s or hs or ns
p/b	Audio-visual	15/16	$p < .0005$	hs
	Audio Alone	15/16	$p < .0005$	hs
sk/g	Audio-visual	13/16	$p < .05$ ($p = .011$)	s
	Audio Alone	11/16	$p > .05$ ($p = .105$)	ns
sm/m	Audio-visual	14/16	$p < .005$ ($p = .002$)	s
	Audio Alone	16/16	$p < .0005$	hs
st/d	Audio-visual	16/16	$p < .0005$	hs
	Audio Alone	16/16	$p < .0005$	hs
sw/w	Audio-visual	13/16	$p < .05$ ($p = .011$)	s
	Audio Alone	15/16	$p < .0005$	hs

p represents the probability of the results occurring by chance

s represents a statistically significant result ($p < .05$)

hs represents a highly significant result ($p < .001$)

ns indicates that the result is not significant ($p > .05$)

Picture Yes/No Judgement

Table 8: Picture yes/no judgement scores for each consonant cluster with their associated p values.

Cluster	Audio-visual or Audio Alone	Score	p	s or hs
sk/g	Audio-visual	-	-	-
	Audio Alone	8/8	$p < .005$ ($p = .004$)	s
sm/m	Audio-visual	15/16	$p < .0005$	hs
	Audio Alone	19/20	$p < .0005$	hs
st/d	Audio-visual	15/16	$p < .0005$	hs
	Audio Alone	15/16	$p < .0005$	hs
sw/w	Audio-visual	13/16	$p < .05$ ($p = .011$)	s
	Audio Alone	16/16	$p < .0005$	hs

p represents the probability of the results occurring by chance

s represents a statistically significant result ($p < .05$)

hs represents a highly significant result ($p < .001$)

ns indicates that the result is not significant ($p > .05$)

Note: Due to technical difficulties, the audio-visual section of the test for the sk/g cluster was not available, and only eight stimuli were available for the audio alone section of the test. Also due to computer error 20 items were presented for the audio alone condition of the sm/m contrast, so the results are presented out of 20.

Picture Naming

The picture naming results are shown in Tables 9 (i) to 9 (iv), below.

Real Word Repetition

The real word repetition results are shown in Tables 9 (i) to 9 (iv), below.

Real Word Reading

The real word reading results are shown in Tables 9 (i) to 9 (iv), below.

Non-Word Repetition

The non-word repetition results are shown in Tables 9 (i) to 9 (iv), below.

Non-Word Reading

The non-word reading results are shown in Tables 9 (i) to 9 (iv), below.

Table 9 (i): Output realisations for sk/g cluster

Real word stimulus	**Naming**	**Real word repetition**		**Real word reading**
		Auditory-visual	**Auditory alone**	
scarf	[da, gɑ]	[gɑp, gɑf]	[(s)kɑ, gɑ]	[sfɔ, dɑ[3]]
skate	[geɪʔ, geɪ]	[geɪ, (s)geɪ(k)]	[keɪt, geɪʔ]	[sdɑ, sdeɪk]
skirt	[gɜ, gɜ]	[gɜ, (s)gɜ]	[(s)gɜ, gɜ]	[deɪk, gɜ[4]]
school	[duo, duo]	[(s)dul, dul]	[stul, stul]	[sdul]
Initial clusters correct	0/8	0/8	1/8	0/7
Non-word stimulus		**Non-word repetition**		**Non-word reading**
		Auditory-visual	**Auditory alone**	
skirf		[ɬkɜpˀ, (s)kɜf]	[gɜp, gɜf]	[skɑf]
skort		[stɔ, gɔ]	[skɔ, dɔk]	[skɑ]
skart		[stɑ, skɑ]	[skɑ, skɑ]	[gɪn]
skeel		[skil, (s)kil]	[skil, skil]	[skim]
Initial clusters correct		4/8	5/8	3/4 (75%)

[3] In response to description of object
[4] In response to 'what girls wear'

Table 9 (ii): Output realisations for sm/m cluster

Real word stimulus	**Naming**	**Real word repetition**		**Real word reading**
		Auditory-visual	**Auditory alone**	
smile	[maɪjo, maɪo]	[maɪl, maɪl]	[maɪl, smaɪl]	[maɪl[5], smaɪl]
small	[mɔ, mɔ]	[mɔl, mɔl]	[smɔl, smɔl]	[smɔl, smɔl]
smoke	[məʊ, məʊ]	[(s)məʊk, məʊʃ]	[məʊ(ʃ), (s)məʊ]	[swɒ, smәʊ[6]]
smell	[meo, meo]	[(s)mel, mel]	[mel, smel]	-, -
Initial clusters correct	0/8	2/8	5/8	4/6 (67%) ('smell' not attempted)
Non-word stimulus		**Non-word repetition**		**Non-word reading**
		Auditory-visual	**Auditory alone**	
smarl		[smaɪl, maɪl]	[smaɪl, smaɪl]	[smɜg]
smol		[(s)mɔl, maɪl]	[mɒl, smɒl]	[smɔl, smɔl]
smoyk		[(s)maɪk, (s)maɪt]	[(s)maɪt, (s)maɪt]	[smɜ, smə]
smool		[(s)mɔl, mɔl]	[smɔl, smʊəl]	[swɒn]
Initial clusters correct		5/8	7/8	5/6 (83%)

[5] In response to a visual demonstration
[6] In response to 'it comes out of a chimney'

Table 9 (iii): Output realisations for st/d cluster

Real word stimulus	**Naming**	**Real word repetition**		**Real word reading**
		Auditory-visual	**Auditory alone**	
stamp	[dæm, dæmp]	[dæmp, dæmp]	[dæmp, dæmp]	[mɔl, stɪmp]
star	[dɑ, dɑ(d)]	[dɑ, gɑ]	[dɑ, dɑ]	[dæŋ, dɑ[7]]
stick	[dɪʔ, dɪ]	[gɪp, dɪp]	[dɪp, dɪp]	[stʌk]
stairs	[deə, deə]	[deəs, deə]	[deə, deə]	[dɑ]
Initial clusters correct	0/8	0/8	0/8	2/6 (33%)
Non-word stimulus		**Non-word repetition**		**Non-word reading**
		Auditory-visual	**Auditory alone**	
stimp		[stɪmp, (s)tɪmpˀ]	[stɪm, stɪnk]	[dɪp, stɪn]
stowe		[staʊ, staʊ]	[daʊ, staʊ]	[sɒ, ʃɒ]
steek		[(s)tik, stik]	[sti, stim]	[di]
stowse		[staʊ, staʊs]	[staʊm, staʊ]	[staʊs, staʊs]
Initial clusters correct		8/8	6/8	3/7 (43%)

[7] In response to being shown a drawing of a star

Table 9 (iv): Output realisations for sw/w cluster

Real word stimulus	**Naming**	**Real word repetition**		**Real word reading**
		Auditory-visual	**Auditory alone**	
sweet	[wit, wit]	[wi, swit]	[ɸwi, ɸwi]	[ɸwit, swit]
swimming	[ɸwɪmɪn, wɪmɪn]	[swɪmɪn, swɪmɪn]	[ɸwɪmɪn, ɸwɪmɪn]	[ɸwɪmɪn, ɸwɪmɪn]
switch	[wɪtʃ, wɪtʃ]	[wɪtʃ, wɪtʃ]	[wɪtʃ, wɪtʃ]	[rʌm, wɪtʃ[8]]
swing	[wɪn, wɪn]	[wɪn, wɪn]	[wɪŋ, ɸwɪŋ]	[ɸwɪm, swɪm]
Initial clusters correct	0/8	3/8	0/8	2/8 (25%)
Non-word stimulus		**Non-word repetition**		**Non-word reading**
		Auditory-visual	**Auditory alone**	
swart		[(s)wɑt, swɑ]	[(s)wɑ, (s)wɑ]	[swæ]
swoming		[ɸwɪmɪn, ɸwɪmɪŋ]	[ɸwɒmɪn, wɒmɪn]	[ʃə]
swetch		[swetʃ, wetʃ]	[(s)weʃ, wetʃ]	[wi, swæ]
sweng		[(s)weŋ, wen]	[sweŋ, weŋ]	[swe, swet]
Initial clusters correct		4/8	4/8	4/6 (67%)

[8] In response to 'to turn the lights on'

Further Non-word reading information

- LS' teachers of the deaf report that he finds non-word reading extremely difficult (consistent with the PhAB result (Frederickson et al, 1997), below).
- During testing LS appeared to have no strategies in place for attempting to read novel words. Occasionally he substituted a word that he already knew. Often he made a guess, inserting a random vowel in place of the correct one.
- When learning to read a new word in class, LS was reported to ask the teacher what the word was, and learn it as a whole.

Conversation

Analysis of the video recording confirmed that LS' speech errors highlighted during testing were consistent with those demonstrated during continuous speech, and that the consonant clusters chosen for further investigation (sk/g, sm/m, st/d and sw/w) were not evident during continuous speech.

Examples of continuous speech are as follows:
"loads of small ones" → [ləʊd ə mɔ wʌn]
"we're gonna stay there five days" → [wɪə gə deɪ jeə faɪ deɪ]
"Playstation" → [pleɪteɪʃʊn]
"go back to school" → [gəʊ bæʔ də dʊo]

Investigation of LS' Phonological Awareness

The PhAB score sheets (Frederickson et al, 1997) can be found in appendix 14. Table 10 shows the standardised scores for each of the subtests. The normal range of scores for a child of LS' chronological age lies between 85 and 115. Standardised scores below 85 indicate that the child's performance is in the bottom 15% of the population. The presence of three or more standardised scores below 85 is

usually interpreted as "indicating marked phonological difficulties" (PhAB, Frederickson et al, 1997, p.59)

Table 10: Standardised scores for the PhAB subtests (Frederickson et al, 1997)

PhAB Test	Standardised score
Alliteration test	94
Ryhme test*	77*
Spoonerisms test*	73*
Non-word reading test*	0*
Naming speed test (pictures)	111
Naming speed test (digits)	87
Fluency test (Alliteration)*	82*
Fluency test (Rhyme)*	69*
Fluency test (Semantic)*	72*
(Non-Phonological test)	

*: Scores fall more than one standard deviation below the mean score of 100.

Test of Letter and Sound Knowledge

Table 11 shows the test of letter and sound knowledge results. Columns two and three show LS' responses when asked for the name and the sound of each letter. Where LS' letter sound was incorrect, he was asked to imitate the tester and his attempts at imitation are shown in column four. Note of any other help required is in column five.

Table 11: Results for test of letter and sound knowledge

Letter	Name	Sound	Produced in imitation	Help needed with imitation
A	[eɪ]	[eɪ, ə]	[æ]	
B	[bi]	[bə]		
C	[ʃsi] (imitation)	[də, gə]	[kə, k]	
D	[di]	[də]		
E	[i]	[i]	[e]	
F	[ef]	[fə]	[f]	Help needed with positioning of front teeth
G	[dʒi]	[gə]		
H	[heɪtʃ]	[hə]	[h]	
I	[aɪ]	[æ, ʌ, ɪ[9]]		
J	[dʒeɪ]	[dʒə]	[tʃ, dʒə]	
K	[keɪ]	[kə]		
L	[el]	[lə]	[ʊ(l)]	
M	[em]	[mə, m]		
N	[en]	[n]		
O	[əʊ]	[ɒ]		
P	[pi]	[pə]		
Q	[kju]	-	[kwə]	
R	[ɑ]	[rə]	[r]	
S	[es]	[ʃs[10]]		
T	[ti]	[t]		
U	[ju]	[u]	[ʌ]	LS produced this when shown the written word 'up' and asked to remove the /p/.
V	[fi, vi]	-	[v]	LS tended to produce a dental [m̪]. He achieved voicing when asked to feel the 'buzz' in his neck.
W	[dʌdu, dʌbəlju] (imitation)	[wə]	[w]	
X	[e, eʃs]	-	-	
Y	[waɪ]	[wə, jə]	[j]	
Z	[ded]	[ʒ]	[z]	LS achieved voicing when asked to feel the 'buzz' in his neck.

[9] LS produced this when shown the written word 'sit', and asked for the middle sound.

[10] LS does not produce a pure [s]. He tends to produce somewhere between a [ʃ] and a [s], with lips spread. Help was not effective in achieving a purer [s].

Investigation of LS' Letter–to-Sound Awareness

- LS was reluctant to attempt to read even simple CVC non-words, but when encouraged to do so, he often appeared to pronounce the consonant phoneme correctly, make a guess at the vowel, and leave the final consonant off, unless reminded to pronounce it.
- LS appeared to have a good consonant phoneme awareness but only minimal awareness of vowel phonemes. For instance, when asked to 'say the sounds' in the non-word 'tib', he indicated that it began with [t] and ended with [b] but he was not able to give the middle sound.
- This lack of vowel phoneme awareness was evident from the test of letter and sound knowledge and from informal questioning on vowels in CVC non-words.
- When given the written stimuli 'tib', and helped to identify the sounds as [t], [ɪ] and [b], he was likely to say [t ɪ bə] out loud but seemed unable to put them together to make the word 'tib'.

Non-word Reading Test (looking at vowels)

Table 12: Non-word reading test realisations (vowels)

Stimulus	Realisation	Vowel
wib	[wæ]	✗
tas	[tɪ]	✗
nuck	[nʌk]	✓
kosh	[kɒ]	✓
seck	[dɪʃ]	✗
pab	[pɑ]	✗
fesh	[fɪʃ]	✗
pif	[pɪʃ]	✓
zob	[dub]	✗
fut	[fɔt]	✗

Each of the stimulus words contained one of the short vowels /æ e ɪ ɒ ʌ/.

Auditory Discrimination with non-word vowel minimal pairs

Table 13 (i): Auditory discrimination with non-word vowel minimal pairs:

Grade 1: Easiest - short vowel versus diphthong

Minimal pair	Same / different ?	LS' response	
/fep : fep/	same	same	✓
/gɒk : geɪk/	different	different	✓
/dæp : dɔɪp/	different	different	✓
/nɪf : nɪf/	same	same	✓
/fep : faʊp/	different	different	✓
/gɒk : gɒk/	same	same	✓
/lʌp : lʌp/	same	same	✓
/nɪf : nəʊf/	different	different	✓
/lʌp : laɪp/	different	different	✓
/dæp : dæp/	same	same	✓

Grade 1 score: 10/10 correct.

Table 13 (ii): Auditory discrimination with non-word vowel minimal pairs:

Grade 2: Medium - Long vowel versus short vowel and long vowel versus diphthong

Minimal pair	Same / different ?	LS' response	
/lɔp : lʌp/	different	different	✓
/fip : fip/	same	same	✓
/guk : gɒk/	different	different	✓
/dɜp : dɜp/	same	same	✓
/lɔp : lɔp/	same	same	✓
/fip : feɪp/	different	different	✓
/nɑf : nɑf/	same	same	✓
/dɜp : dɔɪp/	different	different	✓
/nɑf : nɑʊf/	different	different	✓
/guk : guk/	same	same	✓

Grade 2 score: 10/10 correct.

Table 13 (iii): Auditory discrimination with non-word vowel minimal pairs:

Grade 3: Hardest - Short vowel versus short vowel

Minimal pair	**Same / different ?**	**LS' response**	
/bɒʃ : bɒʃ/	same	same	✓
/med : məd/	different	different	✓
/jin : jin/	same	same	✓
/nʌtʃ : nʊtʃ/	different	different	✓
/pæs : pes/	different	same	✗
/pæs : pæs/	same	same	✓
/bɒʃ : bəʃ/	different	different	✓
/jin : jʊn/	different	same	✗
/med : med/	same	different	✗
/nʌtʃ : nʌtʃ/	same	same	✓

Grade 3 score: 7/10 correct.

Total score: 27/30 correct. $p < .0005$

Picture Yes/No Judgement – changing vowels

Table 14: Picture yes/no judgement (changing vowels) results

Picture stimulus	Auditory stimulus	LS' response	
smell	smell	right	✓
	smell	right	✓
	/smul/	wrong	✓
	smell	right	✓
	/smul/	wrong	✓
	/smul/	wrong	✓
	smell	right	✓
	/smul/	wrong	✓
stamp	/stɪmp/	wrong	✓
	stamp	right	✓
	stamp	right	✓
	/stɪmp/	wrong	✓
	stamp	right	✓
	/stɪmp/	wrong	✓
	/stɪmp/	wrong	✓
	stamp	right	✓
switch	switch	right	✓
	/swetch/	wrong	✓
	switch	wrong	✗
	/swetch/	wrong	✓
	/swetch/	wrong	✓
	switch	right	✓
	/swetch/	wrong	✓
	switch	right	✓
skirt	skirt	right	✓
	/skɔt/	wrong	✓
	skirt	right	✓
	skirt	right	✓
	/skɔt/	wrong	✓
	skirt	wrong	✗
	/skɔt/	wrong	✓
	/skɔt/	wrong	✓

Total score: 30/32 correct. $p < .0005$

Segmenting of real words and non-words into phonemes

Table 15: Segmenting of real words and non-words into phonemes

Real word stimulus	**LS' efforts to segment it**
mat	[em æ tə] (m - a - t)
let	[lə ʌ] (l – u)
zip	[ʒi ɪ pə] (z – i – p)
hot	[heɪtʃ ɒ tə] (h – o – t)
bus	[bʌ æ tə] (b – a – t)
Non-word stimulus	**LS' efforts to segment it**
mot	[mə ɒ tə] (m – o – t)
lat	[lə ɒ kə, gə] (l – o – k, g)
zup	[iʒ ə gɒ] (?)
het	[hə pə] (h – p)
bis	[bə] (b)

Investigation of paired associations between sounds and symbols for vowels

Table 16 (i): Spelling test results, pre- and post-teaching

Stimulus	**Pre-teaching**		**Post-teaching**	
	Reading results	**Vowel**	**Reading results**	**Vowel**
farm	far	✓	farm	✓
mend	man	×	mant	×
drum	drakr	×	darom	×
pain	par	×	pit	×
sport	speat	×	spoat	×
coat	cant	×	coat	✓
thin	thre	×	t	×
shot	s	×	s	×
rag	ran	✓	ran	✓

Table 16 (ii): Reading test results, pre- and post-teaching

Stimulus	Pre-teaching		Post-teaching	
	Reading results	Vowel	Reading results	Vowel
cost	[kɒt]	✓	[kɒts]	✓
bat	[bæk]	✓	[bæt]	✓
dark	[drɪŋk]	x	[gɑk]	✓
torn	[tɒ]	x	[tɔ]	✓
flip	[pɒʔ, fɒʔ]	x	[flu?ɪp]	✓
jug	[jɒʔ]	x	[dʒʌ]	✓
paid	[pen]	x	[peɪd]	✓
boat	[bəʊt]	✓	[bəʊt]	✓
test	[tɪk]	x	[tet]	✓

Blending of consonants and vowels (real words and non-words)

Table 17: Blending of real words and non-words

Real word stimulus (given as segmented phonemes)	LS' efforts to blend the phonemes	LS' verbatim response to the question 'What is it?'
m – a – t	[mæ — t]	where you wipe your feet
l – e – t	[lɒg]	tree
z – i – p	[jɪp]	on a coat and zip it up
h – o – t	[hɒʔ]	when you have to jump on one leg
b – u – s	no attempt	
Non-word stimulus (given as segmented phonemes)	**LS' efforts to blend the phonemes**	
m – o – t	[mɔt, mɒt]	
l – a – t	[læt]	
z – u – p	[jɪp, dɪp]	
h – e – t	[hə, hək]	
b - i – s	[bə]	

5. DISCUSSION

Input Tests:

Four word-initial clusters contrasts – sk/g, sm/m, st/d and sw/w – were tested in the study. These represented a selection of clusters with which the subject had difficulty in production.

Non-word Auditory Discrimination

LS scored highly on non-word discrimination, under both audio-visual (AV) and audio alone (AA) conditions. The p value for the AA condition of sk/g indicates that the score may have occurred by chance. All the other scores reflected an accurate performance as the probabilities of the scores occurring by chance was less than .001 for six out of the ten scores and less than .05 for the remainder. These results would suggest that, despite LS' hearing impairment, **speech production was not affected by poor auditory discrimination for most of the consonant clusters tested**. The scores also suggest that LS did not favour either AV or AA stimuli. This may have been because the pairs of phonemes tested (sk/g, sm/m, st/d, sw/w) are to some extent visually indistinct; the articulation of /s/ is largely unseen. It was also noted that, under the AV condition, LS often did not look at the screen, suggesting that he was relying on auditory more than visual clues.

Picture Yes/No Judgement

Again, LS scored highly under both AV and AA conditions. For the AA condition of sk/g and the AV condition of sw/w the probabilities of the scores occurring by chance was less than .05; for all others the probabilities of the scores occurring by chance was less than .001. Thus all scores were considered to reflect an accurate performance.

This task required LS to access his representations of the words illustrated by the pictures shown, so the results suggest that **his phonological representations for the target words were accurate**. It also supports the above finding that **LS had good auditory discrimination for the clusters tested**.

Output tests:

LS scored 0/8 in the naming tests for all four contrasts tested. This poor performance may result from one or more of:

a. Imprecise phonological representations,
b. Incomplete stored motor programmes,
c. Motor planning difficulties,
d. Motor execution difficulties.

Analysis of the input tasks above established the likelihood that LS' phonological representations of words including the four clusters being tested were accurate, discounting reason a). Moreover for some words (scarf, smoke, smell, small, smile) real word repetition produced the correct consonant clusters, suggesting that lower level articulatory skills (i.e. motor planning and execution) were intact for those clusters, discounting reasons d) and e).

Non-word repetition scores for each consonant cluster were better than real word repetition scores suggesting that, for a novel word containing each of those clusters, LS was able to devise a new motor program and articulate it successfully. Stackhouse & Wells (1997) describe the case of DF who, like LS, repeated matched non-words better than real words and better than his naming attempts. (DF repeated and named 'soap' as [dəʊʔ], whilst /sæp/ was repeated correctly). The patterns for both LS and DF suggest that speech

output skills for words containing the clusters being examined were in fact greater than was indicated by real word production and naming; a phenomenon known as 'frozen phonology'. When asked to repeat 'school' he said [stul], whereas he was able to repeat /skil/ correctly, suggesting that improved auditory discrimination skills and new motor programming skills acquired subsequently (e.g. differentiating in his output between [sk] and [st]) had not been applied to some words in his vocabulary, such as 'school'. LS was able to successfully devise new temporary motor programmes for the clusters being examined when he heard a novel word or non-word. However, due to his hearing impairment, **he may have laid down erroneous motor programmes for a set of real words that began with certain clusters** and had not updated those erroneous motor programmes.

Again, LS did not appear to favour either AV or AA stimuli, suggesting that he was not making use of the visual information provided under the AV condition. As with the input tests, this could have been because the articulation of /s/ is largely unseen in the clusters being examined, and/or because he was relying on auditory more than visual clues.

LS had known literacy difficulties, so his poor real word and non-word reading scores were unsurprising. The number of initial clusters correct was higher when reading non-words than when reading real words for each contrast. For example, for the sk/g contrast his reading of four real words did not produce any words beginning with /sk/ ('school' → [sdul]), whilst his reading of four non-words produced three words beginning with /sk/ ('skirf' → [skɑf], 'skort' → [skɑ] and 'skeel' → [skim]). This may suggest that, when reading a word he knew was not a real word, rather than attempting to recognise the word as a whole, he used orthographic clues to help him pronounce it. When reading real words it is likely that he was accessing motor

programmes which, as discussed above, were believed to be faulty for some words beginning with the clusters being examined. This would affect output despite relatively good auditory discrimination and motor execution skills.

Discounting those words for which LS was provided with a clue, an informal tally of vowels indicates that a large number were read incorrectly, with slightly more vowels being read correctly in real words (12/23) than in non-words (8/23). These difficulties with vowels reflect those found in the test of letter and sound knowledge, the investigation of letter-to sound awareness and the vowel non-word reading test. LS' vowel difficulties are discussed further on pages 54 to 56.

Although LS scored higher for the number of initial clusters correct when reading non-words than when reading real words, his non-word reading shows marked difficulties (e.g. 'skart' read as [gɪn], 'swetch' read as [wi] and [swæ]) which are reflected in the PhAB findings, discussed on page 52.

Analysis of the psycholinguistic tests above has provided us with specific information regarding the likely point(s) of breakdown on the Stackhouse & Wells (1997) model for all cluster contrasts investigated. We have established that LS had good auditory discrimination for the clusters tested and that his phonological representations for the target words seemed accurate. This means that, despite his hearing impairment, LS' speech output difficulties were unlikely to be directly related to input problems. The information gained from output tests suggests that **the source of LS' speech production difficulties for the clusters examined was due to incomplete stored motor programmes**.

Thus we can accept Hypothesis 1:

"Assessment based on the Stackhouse & Wells (1997) speech processing model will identify areas of breakdown for particular consonant contrasts."

Conversation

The results of a video analysis of LS' continuous speech confirmed that he was not marking contrasts between /sk/ and /g/, /sm/ and /m/, /st/ and /d/ or /sw/ and /w/. Along with a tendency to leave off word-final consonants, this contributed to a reduced intelligibility during continuous speech.

Investigation of LS' Phonological Awareness

LS' results clearly showed **phonological awareness difficulties**, although the good score for the alliteration test showed that he was able to isolate initial sounds in single syllable words. The picture naming speed test showed that he was very competent in retrieving phonological coding at the whole word level. However his zero non-word reading test scores reflect his **difficulties with phonological coding of letter strings**.

Test of Letter and Sound Knowledge

The fourth column of table 11 on page 41 shows the letter sounds, or phonemes, which LS failed to produce spontaneously. These sounds were all produced in imitation and were as follows:

A → [æ]

C → [kə]

E → [e]

F → [f]

H → [h]

J → [dʒə]

L → [ʊ(l)]

Q → [kwə]

R → [r]

U → [ʌ]

V → [v]

W → [w]

Y → [j]

Z → [z].

For four of these sounds (F → [f], U → [ʌ], V → [v] and Z → [z]) LS needed help with imitation, such as encouragement to feel the 'buzz' in his neck when producing a voiced sound.

Although LS was able to name all the letters of the alphabet, for 14 of the letters (including most of the vowels) he was unable to spontaneously produce the usual sound. This difficulty is reflected in the investigation of letter-to-sound awareness and the vowel non-word reading test below, and is discussed in relation to vowels under the investigation of paired associations between sounds and symbols for vowels on page 55.

Investigation of LS' Letter–to-Sound Awareness

This investigation backed up what was revealed by the test of letter and sound knowledge and by the PhAB assessment (Frederickson et al, 1997); that **whilst LS' knowledge of the letter-to-sound relationship was relatively good for consonants, it was extremely poor for vowels**.

Non-word Reading Test (looking at vowels)

LS' poor phonological coding of vowels was again highlighted by the results of this test.

The results of the previous four tests enable us to accept Hypothesis 2:

"*The subject will be found to have phonological awareness difficulties and/or difficulties with phonological decoding.*"

The remaining tests were designed to further examine LS' difficulties with vowels, and to determine whether the difficulties were due to any or a combination of the following factors:

a) Poor auditory discrimination of vowels,
b) Inaccurate specifications of vowels in his system of phonological representations,
c) Difficulty with segmenting phonological representations into phonemes,
d) Difficulty with paired associations between sounds and symbols for vowels, or
e) Difficulty with blending consonants and vowels.

Auditory Discrimination with non-word vowel minimal pairs

Unsurprisingly, LS' weakest score was for the hardest grade of difficulty, namely discriminating between non-words containing short vowels which are close together on the cardinal vowels chart (e.g. /jin/ versus /jʊn/). However his overall score for this test was 27/30. The probability of this score occurring by chance is extremely low ($p < .0005$) suggesting that **his difficulties with reading vowels were not due to poor auditory discrimination of vowels**.

Picture Yes/No Judgement – changing vowels

LS' total score for this test was 30/32. The probability of this score occurring by chance is extremely low ($p < .0005$) suggesting that **his**

difficulties with reading vowels were not due to inaccurate phonological representations of vowels.

Segmenting of real words and non-words into phonemes

The segmenting, paired associations and blending tests are presented in this order to reflect the stages that the child has to master in order to read within an alphabetic system (Reid and Wearmouth, 2002). First, the child has to break down words into letters or phonemes (segment), then learn to associate letters with their sounds (learn 'paired associations') in order to decode them, then understand how sounds can be put together to make words (blend). Spelling requires the child to be able to segment the spoken word into phonemes and then to associate the relevant letters or groups of letters with them (i.e. to use paired associations, but in the reverse order to reading).

LS' attempts to segment real words were more successful (3/5 correct) than the attempts to segment non-words (1/5 correct). One likely explanation for this is that he was able to segment words that he already knew how to spell ('mat', 'zip' and 'hot'), but that his poor sound-to-letter knowledge prevented him from being able to do the same with non-words. However, even the real word segmentation was poor, indicating that **LS had some difficulties segmenting simple CVC words into phonemes.**

Investigation of paired associations between sounds and symbols for vowels

As discussed above, "learning to read requires the child to establish a set of mappings between the letters (graphemes) of printed words and the speech sounds (phonemes) of spoken words" (Hatcher and Snowling, cited in Reid and Wearmouth, 2002, p. 71). Dyslexic children can learn to read words they have been taught, however

they tend to learn correspondences between the letters of these words and their pronunciations in chunks or larger units, rather than grapheme-phoneme mappings (Reid and Wearmouth, 2002). As a consequence, dyslexic children have difficulty generalising paired associations, leading in turn to poor non-word reading – one of the most robust signs of dyslexia (Rack et al, 1992, cited in Reid and Wearmouth, 2002).

Having established that LS' paired associations between vowel symbols and sounds was weak, an informal investigation was carried out to establish whether a short teaching session focusing on teaching paired associations for a set of vowels, aided by colour cards as shown in appendix 13, would bring about any improvement in LS' reading or spelling of the vowels targeted. This would indicate whether LS had the potential to acquire this skill (if it were specifically taught).

LS' spelling test results show minor improvements following the teaching session; two final consonants were added and the number of vowels spelled correctly improved slightly from 2/9 to 3/9.

LS' reading test results, however, showed a marked improvement, with the number of vowels correct jumping from 3/9 to 9/9. As the focus of the short teaching session was on the teaching of paired associations for a set of vowels, rather than on segmentation or blending, this improvement in reading results suggests two things: Firstly, it seems likely that **LS' weak knowledge of paired associations contributed greatly to his poor reading skills**, in particular his poor non-word reading skills. Secondly, **LS' knowledge of paired associations between vowel symbols and sounds responded positively to focused treatment** and brought about a direct improvement in the reading of vowels. This implied that he had the potential to make associations.

Blending of consonants and vowels (real words and non-words)

Of the five segmented real word stimuli given LS was able to blend two successfully ('mat' and 'zip'), as shown by the transcriptions of his efforts to blend the phonemes and his definitions of the blended words. Two stimuli resulted in incorrect blended words (l – e – t → [lɒg], defined by LS as 'tree', and h – o – t → [hɒʔ], defined by LS as 'when you have to jump on one leg') and one stimulus produced no response. The quality of responses to non-word stimuli was similar to that of the real word stimuli. These results indicate that **LS has some difficulties blending the phonemes of simple CVC words**. This was certainly found to be the case during the investigation of LS' letter-to-sound awareness (see results, p. 42); even after saying three phonemes out loud, he was unable to put them together to produce a non-word.

Conclusions

In line with Ebbels (2000), this study has illustrated how it is possible to use the Stackhouse & Wells (1997) psycholinguistic framework to identify the specific points of breakdown – and thus the targeted areas for therapy - for the clusters examined. In addition this study has used a psycholinguistic hypothesis-led approach to identify the root of literacy difficulties experienced by a hearing-impaired child.

The author hopes that this study may serve as a cautionary tale to those working with children who may have literacy difficulties, whether or not they have a hearing impairment. It is hoped that speech and language therapists adopt an approach of automatically checking the phonological awareness and decoding skills of these children as these two skills are often thought of as the building blocks

to reading and spelling. Moreover, research further suggests that, for school-aged children at least, "phonological awareness training in combination with letter-sound training is more effective than phonological awareness training alone" (Sawyer & Fox, 1991, p.26).

Finally, use of a method similar to that suggested by Broomfield & Combley (2003), in which laminated picture/word/sound cards are used to demonstrate paired associations was found to be extremely effective in helping the subject to read vowels correctly, even after a short (approximately 20 minutes) teaching time. This result is important because it showed that LS had the potential to make paired associations at the time of the teaching session. We are left to surmise whether he lacked adequate phonological awareness skills to make the associations when they were first taught formally, or whether the use of visual props was particularly effective with LS.

Word count: 9700

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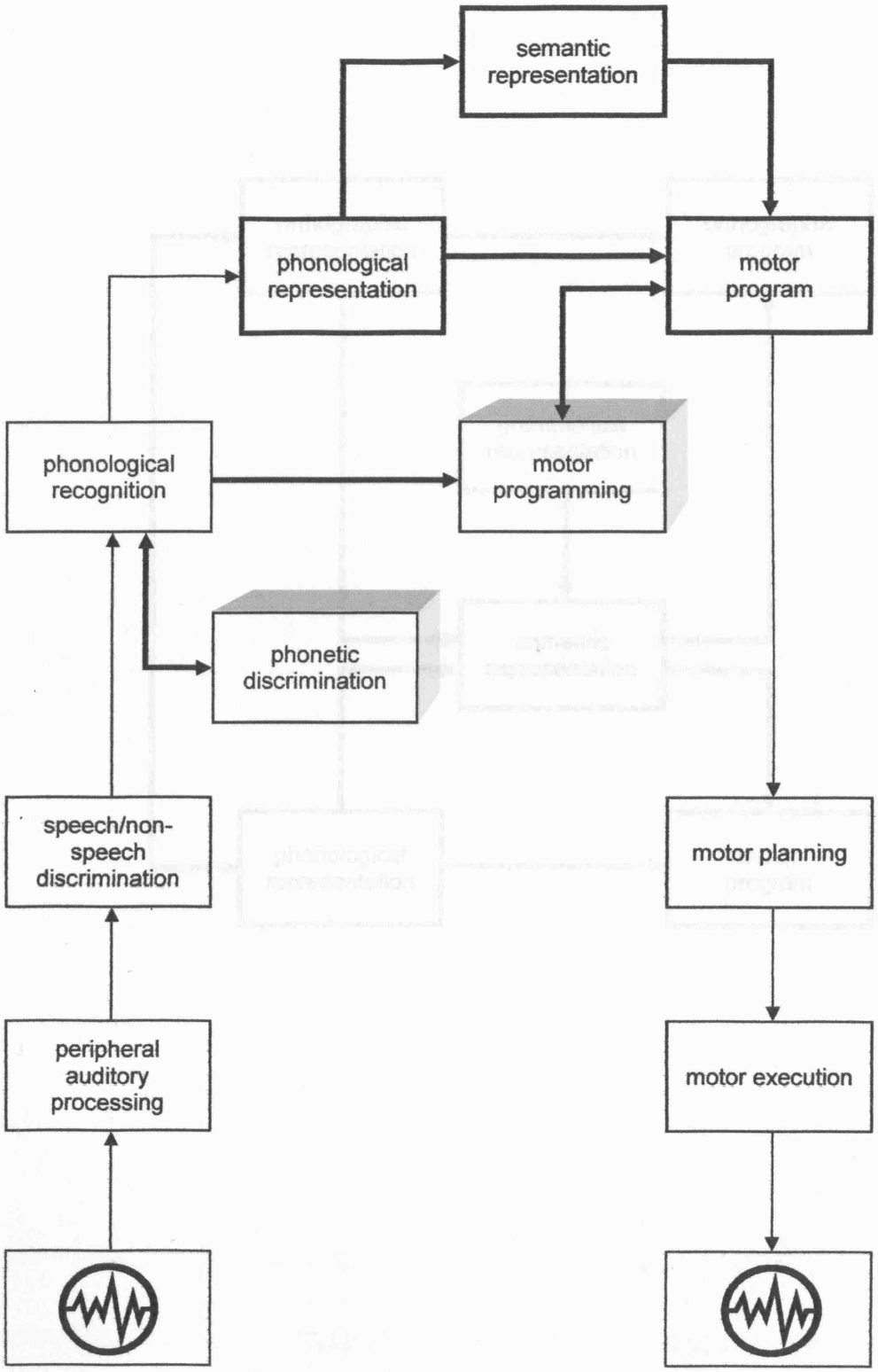
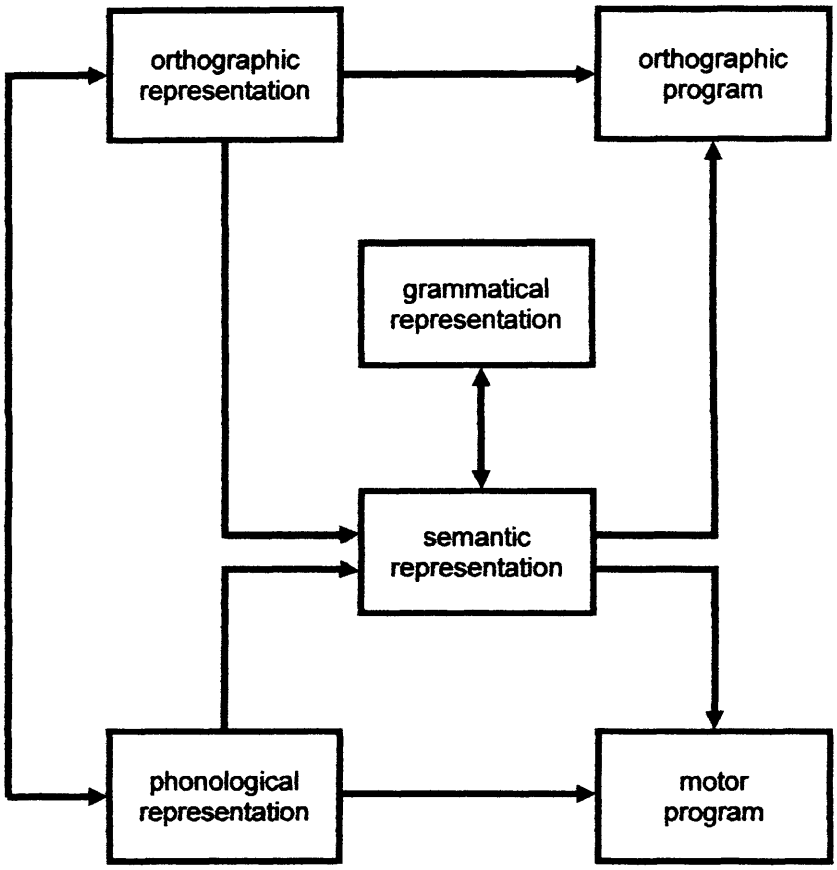
PSYCHOLINGUISTIC SPEECH PROCESSING MODEL FOR SINGLE WORDS (Stackhouse & Wells, 1997)

Notes: The broad arrows and shaded boxes represent processes hypothesized to occur offline.



APPENDIX 2

COMPONENTS OF THE LEXICAL REPRESENTATION (Stackhouse & Wells, 1997)



LS (CA 9;11) 31/10/05

Coloured Progressive Matrices APPENDIX 3

Sets A, Ab, B

A			Ab			B		
1	4	✓	1	4	✓	1	2	✓
2	5	✓	2	5	✓	2	6	✓
3	1	✓	3	1	✓	3	1	✓
4	2	✓	4	6	✓	4	2	✓
5	6	✓	5	2	✓	5	1	✓
6	3	✓	6	1	✓	6	3	✓
7	6	✓	7	3	✓	7	5	✓
8	2	✓	8	4	✓	8	6	✓
9	1	✓	9	6	✓	9	4	✓
10	3	✓	10	3	✓	10	3	✓
11	2	X	11	5	✓	11	4	✓
12	5	✓	12	5 (2)	X	12	1	X
		11			11			11

TOTAL	GRADE
33	II +

NOTES: 90th %ile

Tested by Jo Levett

APPENDIX 4

The British Picture Vocabulary Scale Second Edition

Performance Record

NFER-NELSON
INFORMING YOUR DECISIONS

Name (last) S (first) L Sex: (M) F (Circle)

School _____ Teacher _____

Home Address _____ Tel. _____

Reason for Testing _____

LANGUAGE OF THE HOME: ☑ Standard English ☐ Other _____ DISABILITY: ☐ None ☐ Suspected ☑ Confirmed

Type (if any): Hearing loss

(Specify foreign language or type of English dialect spoken.) *(Specify: hearing/vision loss, speech defect, etc.)*

Norms Table B

Conversion of Standardized Scores to Percentile Ranks

Standardized Score	Percentile Rank	Standardized Score	Percentile Rank
139+	99+	99	48
138-133	99	98	45
132-130	98	97	42
129-128	97	96	40
127-126	96	95	37
125	95	94	34
124-123	94	93	32
122	93	92	30
121	92	91	28
120	91	90	26
119	90	89	24
118	89	88	22
117	87	87	20
116	86	86	18
115	84	85	16
114	82	84	14
113	80	83	13
112	78	82	12
111	77	81	11
110	74	80	9
109	72	79	8
108	70	78	7
107	68	77-76	6
106	66	75	5
105	63	74-73	4
104	60	72-71	3
103	58	70-68	2
102	55	67-62	1
101	52	61	1–
100	50		

Dates	Year	Month	Day
Date of Testing	2005	10	31
Date of Birth	1995	11	25
Age in years and completed months	9	11	

Record of Scores

		Confidence Bands SS–6		SS+6
Raw Score	(62)			
Standardized Score	71 (From Norms Table A)	65	to	77
Percentile Rank	3	1 (From Norms Table B)	to	6
Age Equivalent	6;01	5;07 (From Norms Table C)	to	6;10

Please see Testbook for details of Calculation and Interpretation (pages 10 to 18)

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APPENDIX 4

Administering the Test Items

Caution: Before administering the actual test items, it is essential to begin the test session correctly, use the training plates appropriately, and only then introduce these test items. Instructions to carry out all three of these steps are found on the examiner's side of the training plates.

Where to start the Test
For a subject assumed to be of average ability, find the set corresponding with the person's age and begin the test with the first word in that set (otherwise consult the manual). Once you begin a set, always administer every item in it.

How to establish the Basal Set
If no more than one error is made in the Start Set, a basal is established. If more than one error is made, test backwards by sets in reverse order until no more than one error is made in a set. This becomes the Basal Set.

How to establish the Ceiling Set
Only after the Basal Set has been established, test forward by sets until eight or more responses are wrong in a set of 12 items. This is the Ceiling Set.

How to record the responses and errors
As illustrated below, record the subject's responses for each item administered and draw an oblique line through the circle (○) after the response if incorrect. If correct, leave the circle blank.

12 drum (3) 4 ⊘

Upon completion of each set, record the number of wrong responses in the space provided.

Remember these Rules

* Once a set is started, always administer *all 12 items* in that set.
* The Basal Set rule is *one or no errors* in a set.
* Use the *lowest* Basal Set to obtain the raw score.
* The Ceiling Set rule is *eight or more errors* in a set.
* Use the *lowest* Ceiling Set to obtain the raw score.

Set 1	↓Start – Ages 2½-3	Response
1	hand	(1) ____ ○
2	baby	(2) ____ ○
3	cat	(2) ____ ○
4	jumping	(4) ____ ○
5	bus	(4) ____ ○
6	drinking	(3) ____ ○
7	tractor	(4) ____ ○
8	running	(1) ____ ○
9	gate	(3) ____ ○
10	reading	(2) ____ ○
11	cow	(1) ____ ○
12	drum	(3) ____ ○
		No. of errors [ ]

Set 2	↓Start – Ages 4-5	Response
13	ladder	(2) ____ ○
14	plant	(1) ____ ○
15	circle	(4) ____ ○
16	candle	(2) ____ ○
17	wooden	(2) ____ ○
18	nest	(4) ____ ○
19	dancing	(4) ____ ○
20	tortoise	(1) ____ ○
21	farmer	(3) ____ ○
22	cobweb	(3) ____ ○
23	neck	(3) ____ ○
24	penguin	(1) ____ ○
		No. of errors [ ]

Set 3	↓Start – Ages 6-7	Response
25	wrapping	(4) 4 ○
26	fruit	(1) 1 ○
27	smelling	(3) 3 ○
28	arrow	(1) 1 ○
29	teacher	(2) 2 ○
30	full	(3) 3 ○
31	panda	(4) 4 ○
32	exercising	(4) 4 ○
33	coin	(2) 2 ○
34	claw	(1) 1 ○
35	measuring	(2) 2 ○
36	peeling	(3) 3 ○
		No. of errors [0]

APPENDIX 4

subject repeated as 'tangerine'

Set 4	↓Start – Ages 8-9	Response	
37	tambourine	(1) 4	Ø
38	castle	(2) 2	○
39	lock	(4) 4	○
40	telescope	(3) 3	○
41	dripping	(2) 2	○
42	huge	(3) 4	Ø
43	furry	(4) 4	○
44	nostril	(1) 2	Ø
45	roots	(1) 1	○
46	vegetable	(3) 3	○
47	diving	(2) 2	○
48	liquid	(4) 4	○

No. of errors: 3

Set 7	↓Start – Age 12	Response	
73	greeting	(4) 4	○
74	antlers	(1) 1	○
75	orbit	(1) 1	○
76	collision	(1) 4	Ø
77	inflated	(4) 2	Ø
78	applauded	(3) 4	Ø
79	nutritious	(3) 4	Ø
80	adjustable	(2) 3	Ø
81	scalp	(2) 3	Ø
82	reptile	(2) 1	Ø
83	resuscitation	(3) 3	○
84	links	(4) 1	Ø

No. of errors: 8

Set 10		Response	
109	detonation	(2)	○
110	summit	(4)	○
111	salutation	(1)	○
112	agricultural	(4)	○
113	geriatric	(3)	○
114	talon	(3)	○
115	consuming	(3)	○
116	dwelling	(1)	○
117	emaciated	(2)	○
118	lubricating	(1)	○
119	descending	(2)	○
120	spherical	(4)	○

No. of errors:

repeated as 'chew' but knew when word repeated

Set 5	↓Start – Age 10	Response	
49	luggage	(3) 4	Ø
50	dentist	(3) 3	○
51	weasel	(2) 2	○
52	tugging	(1) 1	○
53	hive	(1) 2	Ø
54	delighted	(4) 2	Ø
55	globe	(3) 4	Ø
56	furious	(4) 3	Ø
57	swamp	(1) 1	○
58	waiter	(2) 2	○
59	target	(2) 2	○
60	eagle	(4) 4	○

No. of errors: 5

Set 8	↓Start – Ages 13-15	Response	
85	arctic	(2)	○
86	glider	(2)	○
87	lecturing	(3)	○
88	engraving	(1)	○
89	co-operation	(2)	○
90	fictional	(3)	○
91	hoisting	(1)	○
92	isolation	(3)	○
93	syringe	(4)	○
94	composing	(4)	○
95	fern	(1)	○
96	weary	(4)	○

No. of errors:

Set 11		Response	
121	exterior	(1)	○
122	trestle	(2)	○
123	perforated	(2)	○
124	fowl	(3)	○
125	cascade	(4)	○
126	vagrant	(1)	○
127	trajectory	(1)	○
128	inoculating	(2)	○
129	arable	(3)	○
130	beacon	(4)	○
131	deciduous	(4)	○
132	submerging	(3)	○

No. of errors:

Set 6	↓Start – Age 11	Response	
61	pair	(2) 2	○
62	coming	(4) 4	○
63	tubular	(2) 1	Ø
64	interviewing	(1) 1	○
65	snarling	(1) 3	Ø
66	medication	(4) 2	Ø
67	pod	(1) 4	Ø
68	grain	(4) 3	Ø
69	pedal	(3) 3	○
70	predatory	(2) 2	○
71	balcony	(3) 4	Ø
72	polluting	(3) 3	○

No. of errors: 6

Set 9	↓Start – Ages 16-21	Response	
97	parallel	(4)	○
98	dilapidated	(3)	○
99	departing	(2)	○
100	easel	(4)	○
101	embracing	(3)	○
102	utensil	(2)	○
103	quartet	(4)	○
104	citrus	(3)	○
105	digit	(1)	○
106	feline	(2)	○
107	pillar	(1)	○
108	timer	(1)	○

No. of errors:

Set 12		Response	
133	physician	(1)	○
134	attire	(4)	○
135	converging	(2)	○
136	receptacle	(1)	○
137	festoon	(3)	○
138	incarcerating	(3)	○
139	incline	(4)	○
140	encumbered	(3)	○
141	caster	(1)	○
142	equestrian	(2)	○
143	convex	(4)	○
144	culinary	(2)	○

No. of errors:

APPENDIX 4

Set 13		Response
145	munificence (mew-**nif**-i-sens)	(1) ____ ○
146	nautical (**naw**-ti-kuhl)	(4) ____ ○
147	incertitude (in-**suhrt**-uh-tude)	(2) ____ ○
148	gaff (**gaf**)	(1) ____ ○
149	terpsichorean (tuhrp-sik-uh-**ree**-uhn)	(2) ____ ○
150	bovine (**boh**-viyn)	(3) ____ ○
151	pedagogue (**ped**-uh-gog)	(4) ____ ○
152	succulent (**suhk**-yuh-luhnt)	(3) ____ ○
153	altercation (ol-ter-**kay**-shon)	(3) ____ ○
154	copious (**koh**-pee-uhs)	(2) ____ ○
155	objurgating (**ob**-juhr-gayt-ing)	(4) ____ ○
156	cenotaph (**sen**-uh-taf)	(1) ____ ○

No. of errors

Set 14		Response
157	nidificating (**nid**-uf-fuh-kayt-ing)	(3) ____ ○
158	perambulating (per-**am**-bew-layt-ing)	(2) ____ ○
159	vitreous (**vi**-tree-uhs)	(3) ____ ○
160	supine (**soo**-piyn)	(4) ____ ○
161	osculating (**os**-kyuh-layt-ing)	(1) ____ ○
162	laciniated (luh-**sin**-ee-ayt-ed)	(1) ____ ○
163	lugubrious (luu-**goo**-bree-uhs)	(2) ____ ○
164	pachyderm (**pak**-i-duhrm)	(2) ____ ○
165	imbibing (im-**biyb**-ing)	(4) ____ ○
166	casement (**kay**-sment)	(3) ____ ○
167	tonsorial (ton-**sohr**-ee-uhl)	(4) ____ ○
168	calyx (**kay**-liks)	(1) ____ ○

No. of errors

Pronunciation key

ay = long a as in day
ee = long e as in feet
iy = long i as in vine
oh = long o as in road
oo = long u as in soup
a = short a as in man
e = short e as in leg
i = short i as in bit
o = short o as in dog
u = short u as in bun
j = short g as in jam
g = hard g as in gas
s = soft c as in sent
k = hard c as in cat
aw as in law
uh as in shove
uhr as in circle
ah as in lamb
ohr as in shore

Calculating the Raw Score

Record below the number of the Ceiling Item, which is the last item in the Ceiling Set. Subtract from it the total number of errors made by the subject from the Basal Set through to the Ceiling Set.
This is the Raw Score.

Ceiling Item 84

minus errors 22

Raw Score 62

Notes and Observations

For example, briefly describe the subject's test behaviour, such as interest in the task, quickness of response, signs of perseveration, work habits, disabilities, etc.

The subject's repetitions would suggest that he was mis-hearing some words. He tended not to look at the tester so the stimuli were auditory only.

APPENDIX 5

CELF® UK 3

Clinical Evaluation of Language Fundamentals
THIRD EDITION

Record Form

Name LS
Age 9;11 Gender M Year
School
Teacher
Examiner

Address

Age 7 to 7;11

	Year	Month	Day
Test Date	2005	10	31
Birth Date	1995	11	25
Chronological Age	9	11	6

Ages 6–8 Scoring Summary	Raw Score	Standard Score	Confidence Interval (___% Level)	PR	Difference from the mean of Subtest Standard Scores
Sentence Structure	17	6	to	9	
Concepts and Directions			to		
Word Classes	18	7	to	16	
Sum of 3 Raw Scores					
Sum of 3 Standard Scores					
RECEPTIVE LANGUAGE SCORE			to		
Word Structure			to		
Formulated Sentences			to		
Recalling Sentences			to		
Sum of 3 Raw Scores					
Sum of 3 Standard Scores					
EXPRESSIVE LANGUAGE SCORE			to		
Sum of RL and EL Scores					
Mean of 6 Subtest Standard Scores (Sum ÷ 6)					
TOTAL LANGUAGE SCORE			to		
Sum of 6 Raw Scores		Age Equivalents: Receptive: _____ Expressive: _____ Total: _____			

Ages 9 and above Scoring Summary	Raw Score	Standard Score	Confidence Interval (___% Level)	PR	Difference from the mean of Subtest Standard Scores
Concepts and Directions			to		
Word Classes			to		
Semantic Relationships			to		
Sum of 3 Raw Scores					
Sum of 3 Standard Scores					
RECEPTIVE LANGUAGE SCORE			to		
Formulated Sentences			to		
Recalling Sentences			to		
Sentence Assembly			to		
Sum of 3 Raw Scores					
Sum of 3 Standard Scores					
EXPRESSIVE LANGUAGE SCORE			to		
Sum of RL and EL Scores					
Mean of 6 Subtest Standard Scores (Sum ÷ 6)					
TOTAL LANGUAGE SCORE			to		
Sum of 6 Raw Scores		Age Equivalents: Receptive: _____ Expressive: _____ Total: _____			

Supplementary Subtests	Raw Score	Standard Score	Confidence Interval (___% Level)	PR
Listening to Paragraphs			to	
Word Associations			to	

Supplementary Subtests	Raw Score	Standard Score	Confidence Interval (___% Level)	PR
Listening to Paragraphs			to	
Word Associations			to	

		Percentage of Sample	Obtained Difference
Higher Score (Receptive or Expressive)		1%	≥31
		5%	≥23
Lower Score (Receptive or Expressive) minus	–	10%	≥20
		15%	≥17
		20%	≥14
Absolute Difference		25%	≥12
		50%	≥7

% Level	Core					
	Receptive			Expressive		
Subtest Name						
Subtest Standard Score						
17	•	•	•	•	•	•
16	•	•	•	•	•	•
15	•	•	•	•	•	•
14	•	•	•	•	•	•
13	•	•	•	•	•	•
12	•	•	•	•	•	•
11	•	•	•	•	•	•
10	•	•	•	•	•	•
9	•	•	•	•	•	•
8	•	•	•	•	•	•
7	•	•	•	•	•	•
6	•	•	•	•	•	•
5	•	•	•	•	•	•
4	•	•	•	•	•	•
3	•	•	•	•	•	•

Composite Standard Score	Receptive Language Score	Expressive Language Score
150	•	•
145	•	•
140	•	•
135	•	•
130	•	•
125	•	•
120	•	•
115	•	•
110	•	•
105	•	•
100	•	•
95	•	•
90	•	•
85	•	•
80	•	•
75	•	•
70	•	•
65	•	•
60	•	•
55	•	•
50	•	•

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APPENDIX 5

Sentence Structure (SS)

Use		Picture Stimuli	Start	Repetitions	Discontinue Rule
Ages 6–8	Required to compute Receptive Language score and Total Language score.	*Stimulus Manual 1*	Item 1 for all ages.	No repetitions are allowed.	None – administer all items.
Ages 9+	Supplementary, criterion-referenced subtest.				

Introduce each item by saying **'Point to…'** Circle the letter corresponding to the child's response. Then circle 1 for a correct response, 0 for an incorrect response, or NR for no response. Correct responses are in **colour.**

Trial 1. The boy has a ball. **C** **Trial 2.** The girl lost her balloon. **A**

		Score		
1. The boy is not climbing.	A B C D	1	0	NR
2. The girl has a big, spotted, black and white dog.	A B C D	1	0	NR
3. The boy who is sitting under the big tree is eating a banana.	A B C D	1	0	NR
4. The boy is pushing the baby.	A B C D	1	0	NR
5. The woman is putting up the tent and the man is chopping wood.	A B C D	1	0	NR
6. The woman who is holding a baby dropped her bag.	A B C D	1	0	NR
7. The duck is walking towards the girl.	A B C D	1	0	NR
8. The first two children are in the queue, but the third child is still playing.	A B C D	1	0	NR
9. Dad showed the baby the dog.	A B C D	1	0	NR
10. Mum asked, 'Shouldn't you wear your jacket?'	A B C D	1	0	NR
Subtotal				

		Score		
11. The boy is being followed by the dog.	A B C D	1	0	NR
12. She is going to help Dad make dinner.	A B C D	1	0	NR
13. The girl is wearing her new raincoat, even though she doesn't need it.	A B C D	1	0	NR
14. She drank the milk before she ate the biscuits.	A B C D	1	0	NR
15. The woman asked, 'How much does this chair cost?'	A B C D	1	0	NR
16. The boy is crying because he cut his finger.	A B C D	1	0	NR
17. The girls have dressed for the game.	A B C D	1	0	NR
18. The girl asked, 'Where did you hide the present?'	A B C D	1	0	NR
19. The girl is walking home from school.	A B C D	1	0	NR
20. The boy will feed the dog.	A B C D	1	0	NR
Raw Score		17		

Word Structure (WS)

Use		Picture Stimuli	Start	Repetitions	Discontinue Rule
Ages 6–8	Required to compute Expressive Language score and Total Language score.	*Stimulus Manual 1*	Item 1 for all ages.	One repetition is allowed.	None – administer all items.
Ages 9+	Supplementary, criterion-referenced subtest.				

Circle 1 for a correct response, 0 for an incorrect response, and NR for no response. Correct responses are in **colour.**

Trial 1. Here is a boy and here is a… **girl.**
Trial 2. Here is one bus and here are two… **buses.**
Trial 3. Lee said, 'Those shoes are yours and these shoes are… **mine.**'

	Score		
A. Objective Pronouns **Demonstration:** The boy has a new ball. The ball belongs to… **him.**			
1. The girl has a book. The book belongs to _____. **(her)**	1	0	NR
2. They have a new radio to share. The radio belongs to all of _____. **(them)**	1	0	NR
B. Possessive Nouns **Demonstration:** This is Jack. Whose dog is this? It is… **Jack's.**			
3. This is Paula. Whose boot is this? It is _____. **(Paula's)**	1	0	NR
C. Possessive Pronouns **Demonstration:** The girl has got a new teddy. The teddy is… **hers.**			
4. The man bought new glasses. The glasses are _____. **(his)**	1	0	NR
5. One boy said, 'This cap is mine and that one is _____'. **(yours)**	1	0	NR
Continued on next page **Subtotal**			

APPENDIX 5

Word Classes (WC)

Use	Picture Stimuli	Start	Repetitions	Discontinue Rule
Ages 6+ Required to compute Receptive Language score and Total Language score.	None	Ages 6–8 Item 1 Ages 9–12 Item 5 Ages 13+ Item 7	No repetitions are allowed.	5 consecutive zero scores.

Circle the words the child gives in response. Circle 1 for a correct pair, 0 for an incorrect pair, and NR for no response. If necessary, precede each item with, 'Listen.' Correct responses are in **colour.**

Trial 1. **fast** wet **quick** **Trial 2.** round **little** **big** **Trial 3.** **whisker** **cat** rock

					Score
1.	**button**	**shirt**	chair		1 0 NR
2.	**cup**	puppy	**plate**		1 0 NR
3.	**knife**	table	**fork**		1 0 NR
4.	tired	**angry**	**cross**		1 0 NR
5.	**simple**	happy	**easy**		1 0 NR
6.	**eagle**	**wing**	hand		1 0 NR
7.	fish	**pig**	**cow**		1 0 NR
8.	out	**on**	**off**		1 0 NR
9.	near	**late**	**early**		1 0 NR
10.	**flute**	lorry	**drum**		1 0 NR

Say, 'Now I will read four words. Listen to each set of four words and tell me the two words that go together best. Listen carefully because I can only say them once. Listen.'

Trial 4. **fish** **frog** bird horse
Trial 5. sigh sleep **giggle** **laugh**
Trial 6. dark **hot** hard **cold**

					Score
11.	road	**teacher**	biscuit	**school**	1 0 NR
12.	horse	plane	**ship**	**boat**	1 0 NR
13.	fence	**window**	**glass**	rug	1 0 NR
14.	**snail**	sock	straw	**shell**	1 0 NR
15.	strange	**sick**	**healthy**	shiny	1 0 NR
				Subtotal	12

					Score
16.	**garage**	cushion	**car**	kitchen	1 0 NR
17.	**town**	road	globe	**country**	1 0 NR
18.	lorry	**floor**	star	**broom**	1 0 NR
19.	**hour**	decade	**minute**	winter	1 0 NR
20.	thick	**empty**	hard	**full**	1 0 NR
21.	speedy	**rainy**	**windy**	dirty	1 0 NR
22.	**buy**	repair	deliver	**sell**	1 0 NR
23.	dancing	**hearing**	**seeing**	carrying	1 0 NR
24.	**longitude**	volume	altitude	**latitude**	1 0 NR
25.	courage	freedom	**wisdom**	**knowledge**	1 0 NR
26.	**smooth**	cold	**rough**	hard	1 0 NR
27.	crooked	**connected**	**joined**	slanted	1 0 NR
28.	**kind**	**cruel**	bright	sad	1 0 NR
29.	strengthen	maintain	**enclose**	**surround**	1 0 NR
30.	among	**ahead**	near	**front**	1 0 NR
31.	**inside**	bottom	**interior**	radius	1 0 NR
32.	noon	**sunrise**	**dawn**	evening	1 0 NR
33.	**private**	academic	national	**public**	1 0 NR
34.	**revive**	**resuscitate**	rescue	deliver	1 0 NR
				Raw Score	18

repeated as 'singing'

Recalling Sentences (RS)

Use	Picture Stimuli	Start	Repetitions	Discontinue Rule
Ages 6+ Required to compute Expressive Language score and Total Language score.	None	Ages 6–8 Item 1 Ages 9–12 Item 5 Ages 13+ Item 7	No repetitions are allowed.	3 consecutive zero scores.

Editing Symbols omission watched repetition Did the addition word the long film transposition Did the girl substitution word saw watched

Circle 3 if the sentence is repeated exactly, 2 if there is one error, 1 if there are two to three errors, 0 if there are four or more errors, and NR if there is no response. Mark errors on the stimulus sentence or write an incorrect response verbatim in the space provided. (See editing symbols in the *Examiner's Manual.*)

Trial 1. My sister is in year eight. **Trial 2.** Does Mr. Thomas teach reading?

	Exact Repetition	1 err	2–3 err	4+ err	No Response
8 1. Did the girl catch the netball?	3	2	1	0	NR
2. The tractor was followed by the bus.	3	2	1	0	NR
Column Totals					

APPENDIX 6

TROG form A

Name: surname S	first name L
Date: 21-11-05	
Date of birth: 25-11-95	
Age: 9;11	Sex: M
Tester: Jo Leveh	

Vocabulary check

	naming	pointing pre	pointing post
I 7 elephant			
4 hat			
3 bag			
6 book			
1 spoon			
5 sheep			
2 woman/lady			
8 table			
II 1 flower			
4 cat			
2 drink			
3 shoe			
8 girl			
7 chair			
6 horse			
5 ball			
III 7 dog			
8 circle			
4 square			
2 boy			
5 cup			
6 star			
1 wall			
3 apple			

	naming	pointing pre	pointing post
IV 7 food			
1 man			
4 bird			
6 knife			
5 box			
2 cow			
8 pencil			
3 tree			
V 1 dropping			
6 drinking			
8 jumping			
2 pushing			
5 carrying			
4 chasing			
3 standing			
7 looking			
VI 8 big			
4 red			
3 tall			
6 yellow			
2 fat			
7 brown			
5 blue			
1 black			

Total blocks passed: 11 Age equivalent: 5'1/2 Centile: 1st

A	1 shoe	2	✓
	2 bird	1	
	3 comb	3	
	4 apple	4	2134
B	5 eating	2	
	6 picking	3	✓
	7 sitting	1	
	8 running	4	2314
C	9 long	1	
	10 tall	2	✓
	11 red	2	
	12 black	3	1223
8–9 yrs start here			
D	13 the boy is running	3	
	14 the big cup	4	✓
	15 the dog is sitting	2	
	16 the red ball	1	3421
E	17 the boy is not running	3	
	18 the dog is not drinking	4	✓
	19 the girl is not jumping	2	
	20 the dog is not sitting	1	3421
F	21 the boy is jumping over the box	1	
	22 the girl is sitting on the table	4	✓
	23 the man is eating the apple	3	
	24 the woman/lady is carrying the bag	3	1433
G	25 they are sitting on the table	4	
	26 the cow is looking at them	2	
	27 they are jumping over the wall	2	
	28 the elephant is carrying them	2	4221
10+ yrs start here			
H	29 the girl is pushing the horse	4	
	30 the boy is chasing the sheep	3	✓
	31 the man is chasing the dog	2	
	32 the cow is pushing the woman/lady	4	4324
I	33 she is sitting on the chair	4	
	34 the woman/lady is carrying him	1	✓
	35 he is sitting in the tree	3	
	36 the horse is looking at her	4	4134
J	37 the cats look at the ball	2	
	38 the boy stands on the chairs	3	
	39 the boys pick the apples	4	
	40 the girl drops the cups	2	2133

APPENDIX 6

K	41 the knife is longer than the pencil	4	✓
	42 the box is bigger than the cup	1	
	43 the shoe is bigger than the bird	3	
	44 the horse is taller than the wall	1	4131
L	45 the girl is chased by the horse	3	
	46 the elephant is pushed by the boy	4	
	47 the horse is chased by the man	1	
	48 the cow is pushed by the man	1	1232
M	49 the cup is in the box	3	
	50 the pencil is on the box	1	✓
	51 the circle is in the star	2	
	52 the knife is on the shoe	4	3124
N	53 the boy chasing the horse is fat	4	
	54 the pencil on the shoe is blue	2	
	55 the cow chasing the cat is brown	2	
	56 the circle in the star is yellow	3	4123
O	57 the box but not the chair is red	1	
	58 the cat is big but not black	4	
	59 the horse but not the boy is standing	3	
	60 the boy is sitting but not eating	2	1422
P	61 the pencil is above the flower	4	
	62 the comb is below the spoon	3	✓
	63 the star is above the circle	4	
	64 the square is below the star	3	4343
Q	65 not only the bird but also the flower is blue	3	
	66 the box is not only big but also blue	4	
	67 not only the girl but also the cat is sitting	2	
	68 the girl has not only food but also a drink	4	1223
R	69 the pencil is on the book that is yellow	1	
	70 the girl chases the dog that is big	2	
	71 the square is in the star that is blue	3	
	72 the dog chases the horse that is brown	2	1243
S	73 neither the dog nor the ball is brown	3	
	74 the pencil is neither long nor red	2	
	75 neither the boy nor the horse is running	2	
	76 the boy has neither hat nor shoes	1	1422
T	77 the book the pencil is on is red	2	
	78 the cat the cow chases is black	3	
	79 the circle the star is in is red	2	
	80 the boy the dog chases is big	2	3144

Now recheck vocabulary if necessary

ACTION PICTURE TEST

Scoring Form

NAME L S

SCHOOL

ADDRESS

DATE OF BIRTH 25-11-95 | AGE 9;11

DATE OF TEST 21-11-05 | NAME OF TESTER Jo Levett

COMMENTS

⑨ Boy crying because the dog got his shoe. 4 5

⑩ A lady dropped her apple and the boy picking it up. The bag had a hole. 7 5

PICTURE NUMBER	RESPONSES	INFORMATION SCORE	GRAMMAR SCORE
①	Cuddle a teddy	2	0
②	The Mum putting the girl's boots on.	3	1
③	Someone tie the rope round the wood.	3	1
④	The man riding on a horsey and the horsey jumping over a fence ... gate.	4	1
⑤	The cat caught the mouse.	2	2
⑥	The girl fell off the step and her glasses broken.	4 1/2	5
⑦	The big girl picked the boy up and the boy post the letter in the box.	4	2
⑧	The man climbing up the ladder to get the cat.	4	3
	TOTAL	37 1/2	25 +6 6-11
	GRAMMAR SCORE EXPECTED (Ceiling age 8;05)		28-32

APPENDIX V

APPENDIX 8

Name..... I.D. .....

School.....

Date 18.10.05.....

Control / Intervention Pre / Post / Delayed

OXFORD READING COMPREHENSION

BEN'S MAGICAL DAY

Yesterday Ben walking / walks / walked to the shopping centre.

He went to the flower shop and asked the floral / florist / flower

for some float / flower. / flowers. They were for his teacher. / teaching. / teached.

Next, he went to the library and asked for book / books about History and Sport. / booked

Ben wants / want / wanted a book about Sir Isaac Newton,

the famous scenic, / science, / scientist, and another book about

Beckham the famous fight. / footballer. / football.

He also looked / look / looks at a book about

the artist / ant / art Van Gogh. When Ben came out of the library, he

saw his friend Mia. Mia was from Italy; she was Italian. / Italy. / Italic.

Mia had finished her dancing lesson. She was a good dancing. / dance. / dancer.

Mia ran into the road, and bumped into a circle. / cyclist. / clean.

"Be careful" / careless" / care" said the man as he fell over. Mia said "Sorry".

Ben and Mia helped the man stand up. The man said,

"Thank you, you are very helpless". / helpful". / help".

The man was Mr Magoo the magician. / magic. / magical.

Mr Magoo gave them both ticket / tickets / television for his magic show.

Ben and Mia took a taxi to the theatre. They were excited.

They bought some sweets / sweet / sweater and sat and watched Mr Magoo perform

magic with rabbits, hats, and lots of balloons. / bird. / box.

When Mr Magoo finished everyone clapped.

The taxi dive / drive / driver took them home. It had been a lovely day.

APPENDIX 9

Name..... ID .....

School..... Date 21.10.2005

Birthday 25.11.80 OP..... I am a (boy) / girl

Intervention / Control Pre / Post / Delayed Post

Oxford Brookes Word Spelling Assessment

1. These are w...orb.....
2. Now Sophie w...ars..... home.
3. Yesterday this man j...ineA..... over the babies.
4. A person who arranges flowers is a f.....
5. There are lots of c...ars.....
6. Bob was ill for 7 weeks; he had a long i...Utkes.....
7. A person who dances is a d...ars.....
8. Exhaust fumes can damage our e.....
9. There are lots of b...alls..... ✓
10. She ran fast and arrived out of breath; she was b...endkt
11. Everyone was confused; there was a lot of c...erty.....
12. Cars drive on the road, but people walk on the p...ersort
13. A pain that hurts a lot is p...ainsint
14. A person who works in a library is a l.....

APPENDIX 9

15. The dog did not harm people, he was h...armimn...

16. Now Goldilocks s...an..... in Mummy Bear's chair.

17. Our school competes in football; we won the football

c...ompeleste...

18. A knife can cause harm; it can be h...aretbe.....

19. A puppy that plays is p...layshers....

20. There are lots of d...at.....

21. Yesterday you w...orked..... hard at your homework.

22. When Donna passed all her exams she was satisfied; she

had a feeling of s.....

23. A person who writes is a w...oe itest

24. A person who plays football is a f...ootballher

25. The m...agicte...... did lots of magic tricks.

26. A king that has power is p...owerjne.....

27. We measured the table; the m...easured..... was

95cm X 60cm.

28. A person who eats vegetables, but does not eat

meat is a v.....

29. Now Bruno s...ats..... in a big bed.

30. Last Monday I k..ing..... my Mum 'good-bye'.

31. He drove the car with no care; he was a c..arlis..... driver.

32. Yesterday I w..anted..... to school.

33. Now Sam f..ings... with Tom.

34. The man who mended the electricity is an e.....

35. Van Gogh created art; he was a famous a..artyt.....

36. You shouldn't drive when you are tired; t...en..... can kill.

37. Tony Blair governs; he is the leader of our

g...overnsmn

38. A person who teaches is a t.....

39. A doctor who specialises is a s..ankl.....

40. Mother Teresa was kind; she was famous for her k..uing

41. A person who works at understanding science is a s..ngt scilhc

42. Tom was lazy, he was always in trouble because of his

l..anting.....

43. The injection gave no pain; it was p..ntnt.....

44. In English we learn to punctuate; we learn to use

p..unctuat marks.

APPENDIX 9

Oxford Brookes Word Spelling Assessment (teacher's script)

1. These are w.....	windows
2. Now Sophie w..... home.	walks
3. Yesterday this man j..... over the babies.	jumped
4. A person who arranges flowers is a f.....	florist
5. There are lots of c.....	clocks
6. Mandy was ill for 7 weeks; she had a long i.....	illness
7. A person who dances is a d.....	dancer
8. Exhaust fumes can damage our e.....	environment
9. There are lots of b.....	balls
10. She ran fast and arrived out of breath; she was b.....	breathless
11. Everyone was confused; there was a lot of c.....	confusion
12. Cars drive on the road, but people walk on the p.....	pavement
13. A pain that hurts a lot is p.....	painful
14. A person who works in a library is a l.....	librarian
15. The dog did not harm people, he was h.....	harmless
16. Now Goldilocks s..... in Mummy Bear's chair.	sits
17. Our school won the football c.....	competition
18. A knife can cause harm; it can be h.....	harmful
19. A puppy that plays is p.....	playful
20. There are lots of d.....	doors
21. Yesterday you w..... hard at your homework.	worked
22. When Donna passed all her exams she was satisfied; she had a feeling of s.....	satisfaction
23. A person who writes is a w.....	writer
24. A person who plays football is a f.....	footballer
25. The m..... did lots of magic tricks.	magician
26. A king that has power is p.....	powerful
27. The m..... of the table was 95cm X 60cm	measurement
28. A person who eats vegetables, but does not eat meat is a v.....	vegetarian
29. Now Ali s..... in a big bed.	sleeps
30. Last Monday I k..... my Mum 'good-bye'.	kissed
31. He drove the car with no care; he was a c..... driver.	careless
32. Yesterday I w..... to school.	walked
33. Now Sam f..... with Tom.	fights
34. The man who mended the electricity is an e.....	electrician
35. Van Gogh was a famous a.....	artist
36. You shouldn't drive when you are tired; t..... can kill.	tiredness
37. Tony Blair is the leader of our g.....	government
38. A person who teaches is a t.....	teacher
39. A doctor who specialises is a s.....	specialist
40. Mother Teresa was kind; she was famous for her k.....	kindness
41. A person who works at understanding science is a s.....	scientist
42. Tom was lazy, he was always in trouble because of his l.....	laziness
43. The injection gave no pain; it was p.....	painless
44. In English we learn p..... marks, for example !"?;:.	punctuation

APPENDIX 10

Schonnell Graded Word Spelling Test

Pre / Post / Delayed
Control/ Intervention
ID_____

I am a boy/ girl

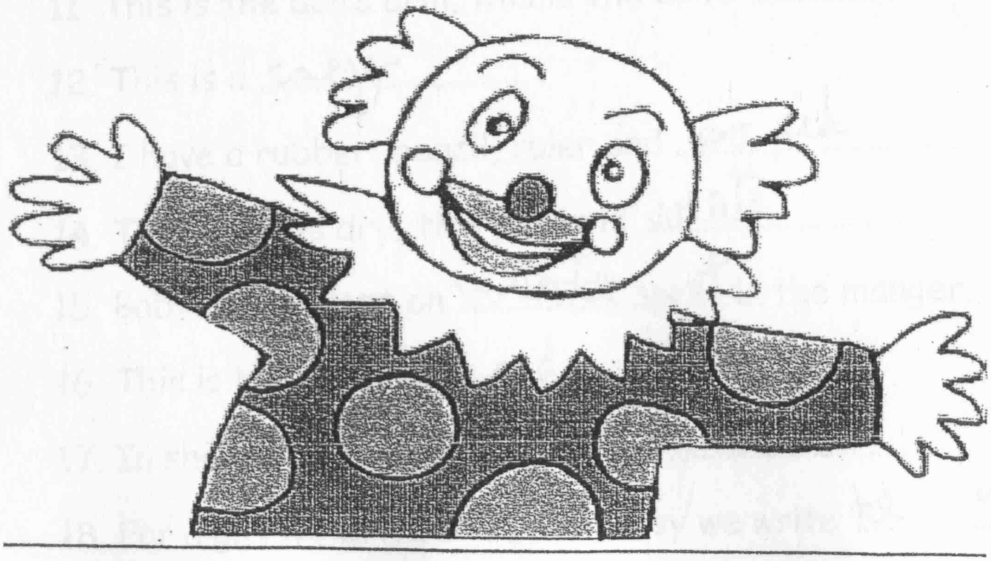
Today's date 18.10.05

Name _____

School _____

Class _____

Date of Birth _____



1. I can ...see... three clowns.

2. Yesterday I ...cerk... this square into two triangles.

3. We wiped our wet shoes on the ...meat... .

4. The water is ...in...the bottle.

5. At 12 o'clock Cinderella ...ran... home.

6. This is a plastic ...baru... .

7. We spell 8: eight
   9: nine
   10: ...ten...

8. This is my ...hare... .

9. This is the boy, this is the girl, this is the mum, this is the ...Dad... .

10. This is a doll's ...Bae... .

11. This is the doll's arm, this is the doll's ...lerk... .

12. This is a ...cary... .

13. I have a rubber, pencil, ruler and ...pa pik... .

14. This paper is dry; this paper is ...werte... .

15. Baby Jesus slept on ...werte wat... in the manger.

16. This is bad; this is ...good... .

17. In shops the money goes in the t...ute... .

18. For a girl we write 'she'; for a boy we write '...he...'.

19. Teddy played w**ar**t..... the sand

20. Dear Father Christmas,
I would like lots of presents please.
With love f**ov**e..... .
Me!

21. 10.30 is play - t**ur**l..... .

22. This is a b**all**..... .

23. The woman shouted " h**elp**..... !"

24. Monday, Tuesday, Wednesday, Thursday, Friday, Saturday and Sunday are all days of the w**eet**..... .

25. This is a t**eas**..... .

26. This is a b**oal**..... .

27. snow / sun / rain / cloud / fog / w**int**..... .

28. This is a s**atr**..... .

29. What y**ear**..... is it? 2004 / 2005 / 2006.

30. This is ice-c**ato**.....

31. You're not allowed to f**arg**..... at play-time.

32. 'eyes', 'ears', 'nose' 'm**ar**.....'.

33. 'S' = small; 'M' = medium; 'L' = l**tar**..... .

34. This is day; this is n**iet**..... .

35. Robert b**entr**..... his camera to school.

36. Whoops!! I made a m**aret**..... .

37. 'eyes', 'nose' 'ears' 'h**er**.....'.

38. 'dolphin' X 'shark' X 'w**ire**.....'

39. This is a s.art-board

40. Yesterday we ~~play~~ ~~playde~~ football.

41. This morning I was asleep. My mum w.otall me up.

42. Land surrounded by sea is called an i._____.

43. The Victorians had servants to cook, wash and

to s.aret food.

44. This machine takes 20p and 50p c.aet.

45. This is a circle. This is a Sart.

46. This is an i.eyeon.

47. The W.antra today is

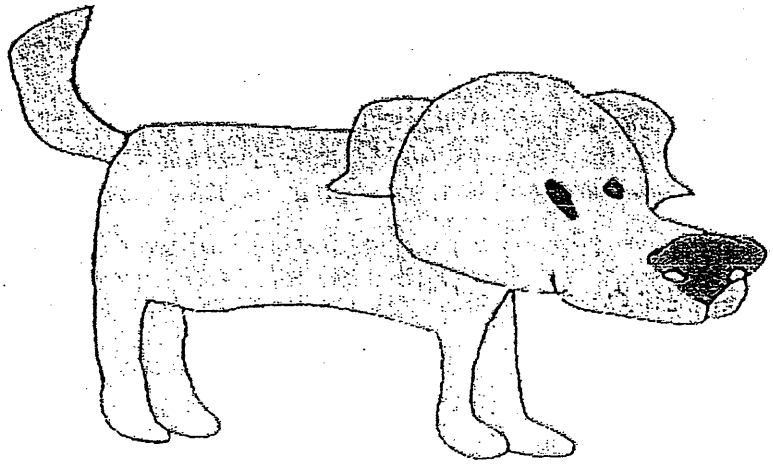
snow/sun/rain/cloud/fog/wind

48. This is an animal. This is a bird.

This is a fish. This is an i.wen.

49. This is a p.eat. tree.

50. I don't feel well. I have a h.stal.



WELL DONE! THANK YOU VERY MUCH.

APPENDIX 10

Schonnell: Graded Word Spelling Test

(teacher's script)

1. I can SEE three clowns.
2. Yesterday I CUT this square into two triangles.
3. We wiped our wet shoes on the MAT.
4. The water is IN the bottle.
5. When it was 12 o'clock Cinderella RAN home.
6. This is a plastic BAG.
7. We spell 8 'eight'; 9 'nine'; 10 'TEN'.
8. This is my HAT.
9. This is the boy, the girl, the Mum and the DAD.
10. This is a doll's BED.
11. This is the doll's arm; this is the doll's LEG.
12. This is a COT.
13. I have a pencil, rubber ruler and PEN.
14. This paper is dry; this paper is WET.
15. Baby Jesus slept on HAY in the manger.
16. This is bad; this is GOOD.
17. In shops the money goes into the TILL.
18. For a girl we write 'she'; for a boy we write HE.
19. Teddy PLAYED with the sand.
20. Dear Father Christmas, I would like lots of presents please. With love FROM me!
21. 10.30 is play-TIME.
22. This is a BALL.
23. The man shouted 'HELP!.
24. Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, and Sunday are all days of the week.
25. This is a TIE.
26. This is a BOAT..
27. The tree is being blown by the WIND
28. This is a SPOON.
29. This year is 2005.
30. This is ice-CREAM.
31. You're not allowed to FIGHT at play-time.
32. Eyes, ears, nose and MOUTH.
33. 'S' = small; 'M' = Medium; 'L' = LARGE
34. This is day; this is NIGHT.
35. Robert BROUGHT his camera to school.
36. Whoops! I made a MISTAKE.
37. Eyes, nose, ears, HAIR.
38. Dolphin? X. Shark? X. WHALE.
39. This is a SKATE-board.

40. Yesterday we PLAYED skipping games. APPENDIX 10
41. This morning I was asleep. My Mum WOKE me up.
42. Land surrounded by sea is called an ISLAND.
43. The Victorians had servants to SERVE food.
44. This machine takes 20p and 50p COINS.
45. This is a circle. This is a SQUARE.
46. This is an IRON.
47. The WEATHER today is rain/wind/sun....
48. This is an animal /bird /fish /INSECT.
49. This is a PALM tree.
50. I don't feel well; I have a HEADACHE.

APPENDIX 11 **T1**

PETAL SPEECH ASSESSMENT: PRECURSORS

NAME LS	RECORDING DATE 21/11/05 LOCATION H1U
TRANSCRIBER	HEARING AIDS/SETTINGS

COUNTING 1–10 wʌn tu: fɔi fɔ faɪ dɪʔ devən eɪʔ naɪ ten

DAYS OF THE WEEK ˈmʌn̪deɪ ˈtjuˀdeɪ ˈwenʔdeɪ ˈdʒdeɪ ˈfuəɪdeɪ ˈdætədeɪ ˈdʌndeɪ

NOTES

Word	Transcription
PIG	piʔ
apple	ˈæpʰʊ
CUP	kʌpˀ
CAR	ka:
cars	kaɸ
SOCK	dɒʔ
socks	gɒˀʃˢ
SHOE	ʃu
telephone	telɪbəʋ
bucket	bæˀkɪʔ
banana	manə
box	bɒʔ
boxes	bɒʔʃˢ
blue	blu:
balloon	blu:
balloons	bəluʃˢ
PAT	pæʔ
MIKE	maɪ
PAUL	pɔo
SUE	du, dzu, tʃdu
egg	edʒ
ear	ɪə
eight	eɪʔ
eye	aɪ
owl	aʋ

TO RECORD: VOWEL TESTS 1, 2 — MAIN TEST (a) T3, 4, 5 (b) T6, 7 — STORY 1, 2, 3 — INTONATION T8–T9 — CONVERSATION — OTHER

APPENDIX 11 T3

PETAL SPEECH ASSESSMENT: INITIAL PLOSIVES

NAME LS	RECORDING DATE 16/01/06 LOCATION HIU
TRANSCRIBER Jo Levett	HEARING AIDS/SETTINGS

Row	Items
1	pea bi · PIG pɪ · pen pen · PAT pæ · purse pɜ · PAUL pɔ
2	pear peə
3	bee bi · big bɪ · bed be · bag bæ · bird bɜ · bus bʌ · bath bɑ · ball bɔ · book bʊ · boot bu
4	bat bæ
5	bear beə
6	bike baɪ · boat bəʊt · boy bɔɪ
7	tea ti · ten ten · tap tæp˺ · two tu
8	D di · duck dʌ · dog dɒ · door dɔ
9	doll dɒo
10	key ki · cat kæ · CUP kʌp˺ · CAR kɑ
11	cake keɪ · kite kaɪ · coat kəʊ · cow kaʊ
12	girl gɜo
13	gate geɪ · goat gəʊt˺

APPENDIX 11 T4

PETAL SPEECH ASSESSMENT: INITIAL AFFRICATES AND FRICATIVES

NAME L S	RECORDING DATE 16/01/06 LOCATION HIU
TRANSCRIBER Jo Levett	HEARING AIDS/SETTINGS

jacket → tʃækɪʔ

Row	Words (target → transcription)
14	cheese → tʃi; chip → tʃɪp˺; church → tʃɜ
15	chair → tʃeə
16	jam → dʒæm; juice → dʒu
17	fish → fɪʃ; fan → fæn; four → fɔ; foot → fiʔ
18	fat → fæʔ; fork → fɔ
19	five → faɪ
20	fire → faɪə
21	van → pfæn
22	thin → tθɪn; thumb → fʌm
23	sea → di; sun → dʌnʃaɪ; SOCK → dɒ; SUE → du
24	zip → dɪ; zoo → du
25	ship → ʃɪɸ; shirt → ʃɜ; shop → ʃɒp˺; SHOE
26	hat → hæʔ; horse → hɔ
27	hair → heə; house → haʊ

APPENDIX 11 **T5**

PETAL SPEECH ASSESSMENT: INITIAL NASALS AND APPROXIMANTS

NAME L S	RECORDING DATE 16/01/06 LOCATION HIU
TRANSCRIBER Jo Levett	HEARING AIDS/SETTINGS

Column	Items (word: transcription)
28	moon: mu; mat: mæ; meat: mi
29	match: mætʃ; me: mi
30	man: mæn
31	mouse: maʊ
32	mouth: maʊ; MIKE: maɪkʔ
33	knee: ni
34	nose: nəʊ; knife: naɪ
35	(no): nəʊ; nine: naɪn
36	wool: wu; wall: wɔ; watch: wɒtʃ; one: wʌn; wing: wɪn
37	wood: wʊ; witch: wɪtʃ
38	white: waɪ; wheel: wɪo
39	rat: ɹæ; red: ɹe; ring: ɹɪn
40	light: laɪ; leg: le
41	you: ju; (yes): jes

PETAL SPEECH ASSESSMENT: INITIAL CLUSTERS

NAME	LS	RECORDING DATE 16/01/66	LOCATION HIU
TRANSCRIBER	Jo Levelt	HEARING AIDS/SETTINGS	

pram ɸɹæm prize fɹaɪ	plate pleɪʔ plant plan play pleɹjɪn	queen ɸʊin quack wæʔ quiet ɸʊaɪə	tree ɸʊi train tɹeɪn trick tɹɪʔ	crisp fɹɪ crab kɹæbˀ cross ɸɹɒ crane ɸɹeɪn cry ɸɹaɪ	clock kɪɒʔ clown klaʊn clean klin clap klæ climb klaɪm			
brush ɸɹɒʃ bread fʊe brick fʊɪʔ brown pʊaʊn	blue blu black blæ blow blaʊ		dress dɹe drum ɸʊʌm	green ɸʊin grass ɸʊa grape ɸʊeɪʔ	glove lʌf glass la glue gia			
		twig ʃswɪg twelve ɸweof twin ɸwɪn						
			frog fʊb fruit fʊu fright fʊaɪkən front fɹʌn	three fʊi throw fʊaʊ thread fʊed	fiy flaɪ flag pflæ			
	spoon bun spade bæy	swing ɸwɪŋ sweet ɸwi			slide ɸaɪ sledge leʔ	star da stairs deɸ stick gɪk stamp dæm stitch dɪʔʃ	school du skirt gɜ skate geɪ	
	smoke maʊ small mɔ smile maɪəl					snow neʊ snail neɪəo snake ueɪ		
spring ɸʊɪn	splash ɸlæʃ			straw ɸʊə string ɸʊɪn				
		square ɸʊeə squirrel ɸʊɪʊə		screw ɸʊu				

APPENDIX 12

Cluster Realizations

PACS

Published by
The NFER-NELSON Publishing Company Ltd.,
Darville House, 2 Oxford Road East, Windsor,
Berkshire SL4 1DF.

Name L S

		SIWI ✓	SIWI O	SIWI X	SIWW		
p	r			ɸr fr			
	l	III					
	j						
b	r			ɸr, fʊx2, pʊ			
	l	III					
	j						
t	w			ʃsw, ɸwx2			
	r	II		ɸʊ			
	j						
d	w						
	r	I		ɸʊ			
	j						
k	w			ɸʊx2, w			
	r	I		fr, ɸrx3			
	l	IIII					
	j						
g	w						
	r			ɸʊx3			
	l	I		I x2			
	j						
f	r	I		fʊx3			
	l	I		ɸ.l			
	j						
θ	w						
	r			fʊx3			
	j						
s	p			bx2			
	t			dx4, g			
	k			d, gx2			
	m			mx3			
	n			nx3			
	w			ɸwx2			
	l			¢, l			
	j						
ʃ	r						
m	j						
n							
v							
l							
h							
sp	r			ɸʊ			
	l			ɸl			
	j						
st	r			ɸʊx2			
	j						
sk	w			ɸʊx2			
	r			ɸʊ			
	l						
	j						

−CCC	SFWW			SFWF		

		SFWW			SFWF		
m	p						
	d						
	f						
	θ						
	z						
n	t						
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	tʃ						
	ʤ						
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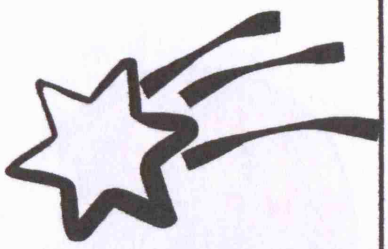
p	t						
	θ						
	s						
b	d						
	z						
t	θ						
	s						
d	z						
tʃ	t						
ʤ	d						
k	t						
	s						
g	d						
	z						
f	t						
	θ						
	s						
v	d						
	z						
θ	t						
	s						
ð	d						
	z						
s	p						
	t						
	k						
z	d						
ʃ	t						
ʒ	d						
l	m						
	n						
	p/b						
	t						
	d						
	k						
	tʃ/ʤ						
	f						
	v						
	θ						
	s						
	z						

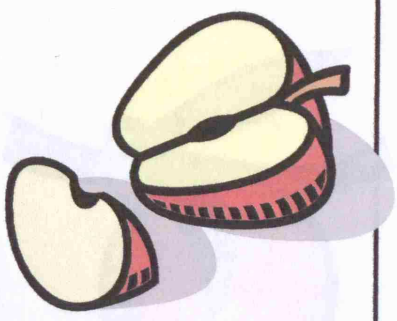
igloo

i



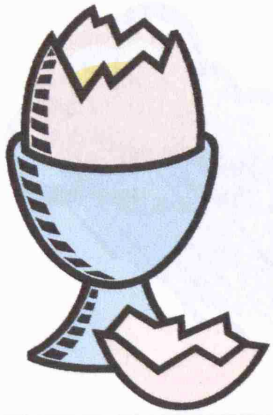
star

ar



apple

a

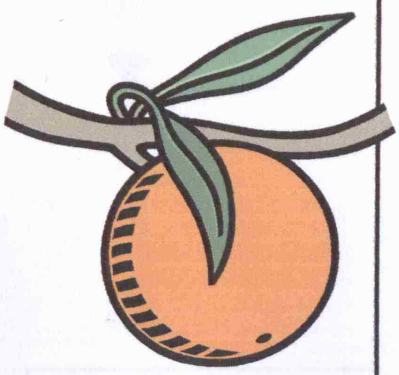


egg

e

umbrella

u



orange

o

rain

ai

goat

oa

fork

or

APPENDIX 14

Phonological Assessment Battery (PhAB)

RECORD FORM

Norah Frederickson, Uta Frith, Rea Reason

		Year	Month	Day
Name: L S	Date tested:	06	03	22
Address:	Date of birth:	95	11	25
	Age: 10;04			
	Sex: M			
First language:	School:			
Tested by: Jo Levett	Year:			
Position: Student SLT	Special Educational Needs STAGE:			

NFER-NELSON
INFORMING YOUR DECISIONS

Code: 009 000 6344

APPENDIX 14

The PhAB Profile Grid

PhAB Test	Raw score	Standardized score	PROFILE (70 85 100 115 130)
Alliteration Test	9	94	
Rhyme Test	8	77	
Spoonerisms Test	2	73	
Non-Word Reading Test	0	0	
Naming Speed Test (Pictures)	80	111	
Naming Speed Test (Digits)	66	87	
Fluency Test (Alliteration)	7	82	
Fluency Test (Rhyme)	1	69	
Supplementary Test Alliteration Test with Pictures	—	—	
Non-Phonological Test Fluency Test (Semantic)	13	72	x
Number of highlighted PhAB scores			5

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APPENDIX 14

Alliteration Test

Part 1 practice items				
A. shop	mat	shell	(sh)	✓
B. lot	mess	mud	(m)	✓
C. pick	pat	run	(p)	✓
Part 1 test items				**Score 0 or 1**
1. ship	fat	fox	(f)	1
2. mug	zip	men	(m)	1
3. bike	name	nose	(n)	1
4. dig	dot	pen	(d)	1
5. tin	sack	top	(t)	1
Part 1 total (3 or more needed to continue)				5

Part 2 practice items				
D. plum	crane	cloud	(c)	✓
E. brain	bleed	school	(b)	✓
Part 2 test items				**Score 0 or 1**
6. snake	clap	crawl	(c)	1
7. plate	pram	draw	(p)	0
8. sleep	clown	snail	(s)	1
9. cross	twig	truck	(t)	1
10. drip	skirt	dwarf	(d)	1
Part 2 total				4

ALLITERATION TEST TOTAL (Part 1 + Part 2: out of 10)	9

Supplementary Test: Alliteration Test with Pictures

Part 1 practice items				
A. road	light	rain	(r)	
B. well	peg	pot	(p)	
Part 1 test items				**Score 0 or 1**
1. sun	lid	sock	(s)	
2. jam	jug	bed	(j)	
3. ten	bus	tap	(t)	
4. web	lamb	leg	(l)	
5. man	mop	dish	(m)	
Part 1 total (3 or more needed to continue)				

Part 2 practice items				
C. slide	blot	scale	(s)	
D. blouse	brush	glass	(b)	
Part 2 test items				**Score 0 or 1**
6. stool	square	plant	(s)	
7. glove	brick	grass	(g)	
8. dress	flame	frog	(f)	
9. pram	fly	plug	(p)	
10. spade	crab	clock	(c)	
Part 2 total				

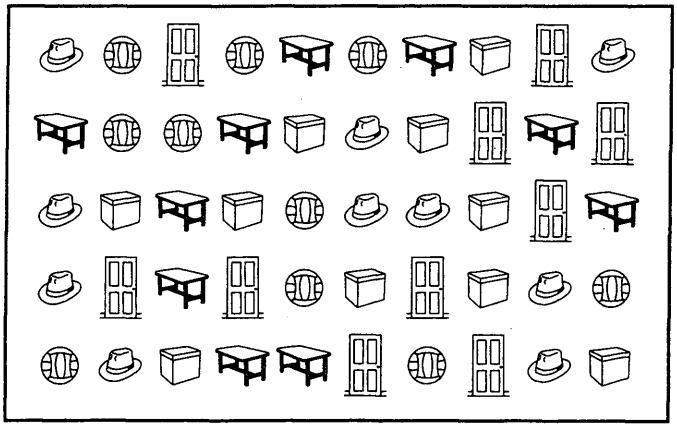
ALLITERATION TEST WITH PICTURES TOTAL (Part 1 + Part 2: out of 10)	

Comments:

APPENDIX 14

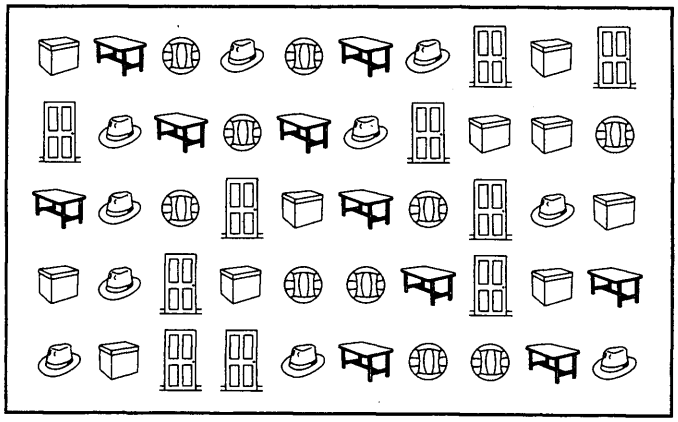
Naming Speed Test

Picture Naming Card 1



Time (to nearest second) 40

Picture Naming Card 2



Time (to nearest second) 40

PICTURE NAMING TOTAL (in seconds) = (Naming Cards 1 + 2)	80

Digit Naming

Digit Naming Card 1

23929
54635
55852
91549
12856
85811
45932
48431
83659
28896

Time (to nearest second) 32

Digit Naming Card 2

58869
29852
24651
54919
36849
49354
26892
12463
81845
29496

Time (to nearest second) 34

DIGIT NAMING TOTAL (in seconds) = (Naming Cards 1 + 2)	66

Comments:
(Please note if more than two uncorrected errors are made on any card.)

APPENDIX 14

Rhyme Test

Practice items				
A.	sail	boot	nail	✓
B.	red	fed	leg	✓
C.	big	hiss	miss	✓
Part 1 test items				**Score 0 or 1**
1.	made	hide	fade	0
2.	wig	fig	pin	1
3.	bus	harm	farm	1
4.	pack	lack	sag	1
5.	sap	hop	top	1
6.	nut	cut	pet	1
7.	sand	hand	cup	0
8.	cat	fan	mat	1
9.	dot	mop	top	1
10.	tub	mud	cub	0
11.	dog	man	fog	1
12.	sip	win	bin	0
Part 1 total (9 or more needed to continue)				8

Part 2 test items				Score 0 or 1
13.	badge	match	catch	
14.	fate	late	made	
15.	tease	geese	piece	
16.	lip	sip	rib	
17.	dog	sock	log	
18.	had	sad	mat	
19.	lick	big	tick	
20.	bead	wheat	seat	
21.	cob	hop	sob	
Part 2 total				

RHYME TEST TOTAL (Part 1 + Part 2: out of 21)	

Comments:

APPENDIX 14

Spoonerisms Test

	Part 1 practice items					
	A. cat	with a /f/	gives		(fat)	
	B. lip	with a /t/	gives		(tip)	
	C. dog	with a /l/	gives		(log)	
	Part 1 test items (Discontinue after three minutes)					**Score 0 or 1**
Time starts →	1. cot	with a /g/	gives		(got)	0
	2. fun	with a /b/	gives		(bun)	1
	3. red	with a /b/	gives	don't know	(bed)	0
	4. go	with a /s/	gives	" "	(so)	0
	5. might	with a /f/	gives		(fight)	1
	6. make	with a /t/	gives	/tɔk/	(take)	0
	7. need	with a /st/	gives	/nib/	(steed)	0
	8. gaze	with a /cr/	gives	don't know	(craze)	0
	9. stoke	with a /br/	gives	/gəʊt/	(broke)	0
	10. crime	with a /ch/	gives	/kɪaɪm/	(chime)	0
	Part 1 total (out of 10)					2

	Part 2 practice items				
	D. King John	gives		(Jing Kon)	
	E. lazy dog	gives		(daisy log)	
	F. snow black	gives		(blow snack)	
	Part 2 test items (Discontinue after three minutes)				**Score 0, 1 or 2**
Time starts →	1. sad cat	gives		(cad sat)	
	2. big pip	gives		(pig bip)	
	3. fed man	gives		(med fan)	
	4. boast core	gives		(coast bore)	
	5. riding boot	gives		(biding root)	
	6. float down	gives		(dote floun)	
	7. prickley man	gives		(mickly pran)	
	8. which brute	gives		(britch woot)	
	9. crowded ship	gives		(shouded crip)	
	10. plane crash	gives		(crane plash)	
	Part 2 total (out of 20)				

SPOONERISMS TEST TOTAL (Part 1 + Part 2: out of 30)	2

Comments:

APPENDIX 14

Fluency Test

SEMANTIC	
Practice item. things in your school chair, cupboard, table, door, paper, telly, toilet, alarm	
1. **things to eat** jaffa cake, jelly, apple pie, fish, ice cream	**S1: Score** 5
2. **animals** bird, tiger, elephant, giraffe, zebra, crocodile, fish, kangaroo	**S2: Score** 8
SEMANTIC FLUENCY TOTAL SCORE	13

ALLITERATION	
Practice item. /k/ Kangaroo, Kite	
1. /b/ ball, bird, Bek, Ben, Billy	**A1: Score** 5
2. /m/ mouse, Mick	**A2: Score** 2
ALLITERATION FLUENCY TOTAL SCORE	7

RHYME	
Practice item. bat fat, mat	
1. **more** floor	**R1: Score** 1
2. **whip**	**R2: Score** 0
RHYME FLUENCY TOTAL SCORE	1

APPENDIX 14

Non-Word Reading Test

Card 1 Practice items		
	Response	
A. tib		
B. lom		
C. rad		

Card 2 One-syllable items		
	Response	**Score 0 or 1**
1. pim	pɪɡ	
2. gat	ɡɒt	
3. fot	fɔ	
4. lub	lɪp	
5. hin	hɪp	
6. chog	tʃɔɪ	
7. trum	tɑɪɡ	
8. pran	pæm	
9. nabe	–	
10. leaze	leɪ	
Card 2 total		0

Card 3 Two-syllable items		
	Response	**Score 0 or 1**
11. haplut		
12. yutmip		
13. musnate		
14. pootfeg		
15. shendom		
16. ligtade		
17. cromgat		
18. ropsatch		
19. rissbick		
20. plutskirl		
Card 3 total		

NON-WORD READING TEST TOTAL (Card 2 + Card 3: out of 20)	

Comments: