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Phonological profile for the hearing impaired : manual

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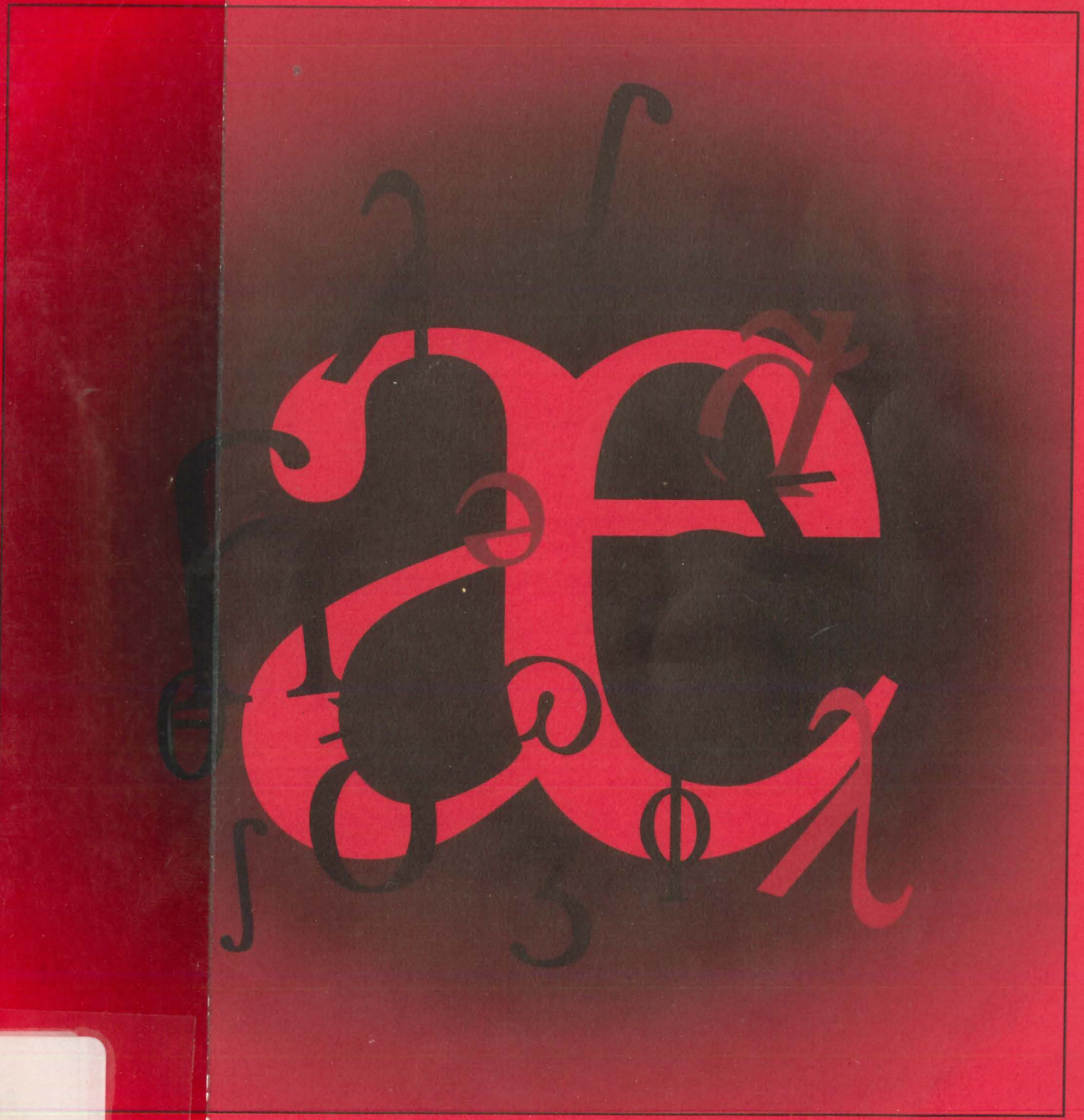
MANUAL

Phonological Profile for Hearing Impaired



IRIS VARDI

PHONOLOGICAL PROFILE FOR THE HEARING IMPAIRED

MANUAL

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CONTENTS

INTRODUCTION

Anyone who deals with the speech of the hearing impaired is only too well aware of the wide range of speech problems that can present. Many of these problems have been thoroughly researched and documented. Toni Gold (1980), detailed the following characteristics of hearing impaired speech as revealed by the literature to that date:

(1) intelligibility problems;
(2) consonant errors relating to voicing, consonant omissions, position of consonant error in word, difficulties with consonant blends, effects of place of articulation;
(3) vowel and diphthong errors;
(4) suprasegmental errors including problems with rate, increased duration of phonemes, timing, pausing;
and (5) voice problems, including their relationship to intelligibility.

The need for such a wide range of observations presents the assessor with difficulties in describing the speech of a given hearing impaired student accurately and inclusively for the purposes of remediation.

Added to this are the issues of the underlying theoretical model which should be used in any analytical procedure. Over the past twenty years phonological processes have been widely discussed and applied to the phonological problems of hearing children, though only a few studies have applied this knowledge to the analysis of hearing impaired speech.

One such study into the phonological processes of the hearing impaired was carried out by Oller, Jensen and Lafayette (1978) who evaluated the speech of a profoundly deaf six year old. They noted that this child used many of the same processes used by normal hearing children: cluster reduction; final consonant deletion; devoicing of final voiced consonants; fronting; stopping; gliding; and assimilation.

Whilst this case demonstrates how the speech of the hearing impaired can match the development of speech in the normal hearing child, albeit at a slower rate, Oller et al (1978, p 103) did note that their subject had a number of "strange processes" upon which they did not elaborate.

So it would appear, not only from the literature but also from assessors' experience, that while a processes model and a normal developmental model can account for some of the problems noted, it does not account for all the characteristics of the speech of the hearing impaired.

Given the wide range of speech problems and suggestions for assessment and remediation documented in the literature (e.g. Dancer & Bradley, 1986; Dunn & Newton, 1986; Gold, 1980; Ling, 1976; Kelly, West & Weber, 1973; Angelocci, Kopp, & Holbrook, 1964; Hudgins & Numbers, 1942), coupled with the latest research into the phonological development of hearing children and its application to their remediation (e.g. Hodson, 1986; Creaghead, 1985; Creaghead & Newman, 1985; Grunwell,1982; Ingram, 1981 Schriberg & Kwiatkowski, 1980;) this profile has been designed to fulfill many aims.

AIMS OF THE PROFILE

This profile has been designed to:

(1) be suitable for use with the full range of hearing impairment, including the profoundly deaf;
(2) reflect all the various speech aspects revealed by the literature on the speech of the hearing impaired including: vowels, voiced/voiceless distinction, place, manner, position in word, blends/clusters, voice and suprasegmental problems;
(3) provide information about the child's underlying rule system through the use of processes;
(4) provide developmental information so that the assessor can compare and contrast the presenting speech with that of a normal hearing child;
(5) allow for the transcription of sound distortions and approximations;
(6) provide a measure of intelligibility;
(7) present information in a format which makes goal selection clear.

This wide range of aims has resulted in a multilayered profile and as such, users must familiarize themselves with the various ways the profile allows the data to be viewed.

The initial form of the profile was trialled by teachers of the deaf with their profoundly deaf students, and the results coupled with their invaluable feedback, were used to modify and refine the profile and assessment procedures.

CONTENTS

In addition to this manual, this kit contains twenty-five copies of the profile, twenty-five recording sheets with the transcriptions of fifty-four stimuli words, as well as a booklet depicting these same fifty-four stimuli words.

PROFILE OVERVIEW

THE INVENTORY

The inventory covers vowels, consonants and clusters (blends) and is divided into developmental stages. This allows an assessor to see whether or not the child is following a normal hearing developmental pattern as this information has implications for goal selection.

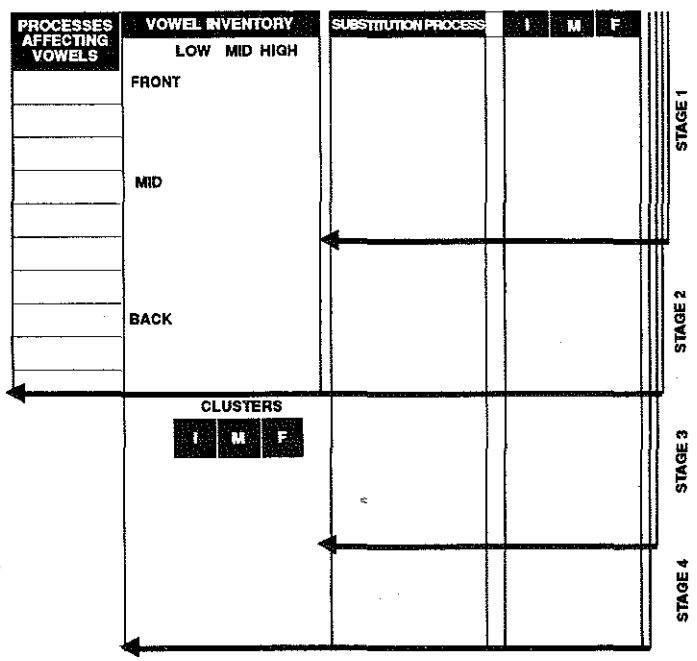
THE DEVELOPMENTAL STAGES

These stages are NOT discrete, but rather grouped as such for ease of usage. The approximate age equivalents (+/- 6 months) for the normal hearing child are as follows.

STAGE	APPROXIMATE AGE OF DEVELOPMENT
1	2.06 years
2	3.06 years
3	4.06 years
4	>4.06 years

Figure 1 highlights the cumulative nature of the stages.

Figure 1.
Cumulative Stagewise Development of the Profile



THE CONSONANTS

The consonants are analysed in three ways:

(1) according to position in the word;

(2) according to a place/manner analysis

and (3) this information is embedded within a developmental model.

The analysis of position in the word is divided into initial, medial and final positions, with medial including all intervocalic consonants.The place and manner analysis is accomplished through the use of consonant grouping for manner and colour coding for place.

This is NOT a right/wrong system. The assessor notes all the substitutions, distortions or omissions that occur when the child attempts to produce the target sound. Figure 2 (overleaf) illustrates the consonant analysis.

THE CLUSTERS

The clusters are simply divided into two and three consonant cluster categories as follows:

/s/ (CC) = /s/ clusters e.g. /st/, /sn/, /ts/

/l/ (CC) = /l/ clusters e.g. /bl/, /fl/, /lz/

other (CC) = any other 2 consonant clusters which do not fit into any other categories e.g. /tw/, /vz/

/r/ (CC) = /r/ clusters e.g. /br/, /pr/

other (CCC) = any 3 consonant cluster combinations e.g. /str/, /ntz/

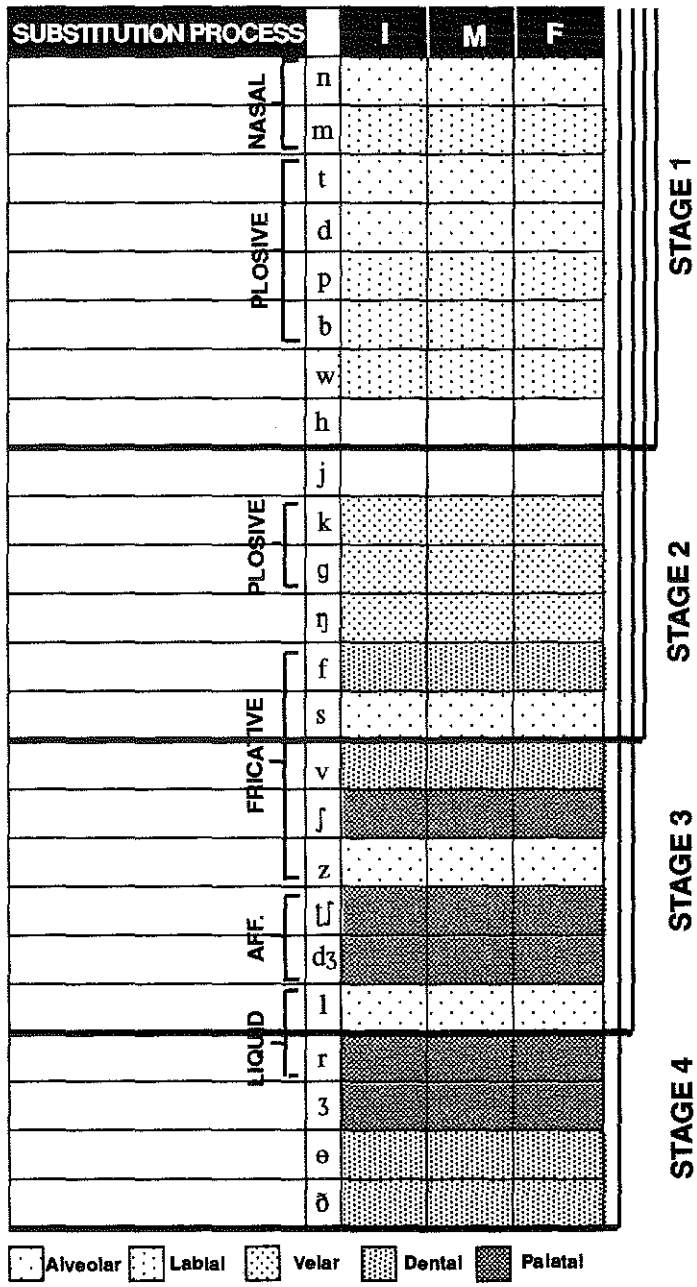
The cluster analysis is also divided into initial, medial and final positions. See Figure 3.

Figure 3.
Cluster Analysis Section of the Profile

CLUSTERS

	I	M	F
/s/ (CC)			
/l/ (CC)			
OTHER (CC)			
/r/ (CC)			
OTHER (CCC)			

Figure 2.
Consonant Analysis Section of the Profile



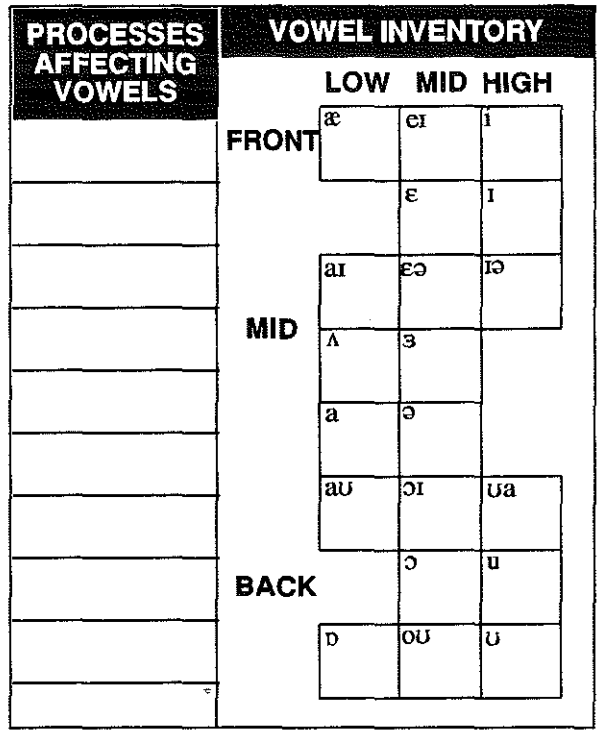
THE VOWELS AND DIPHTHONGS

The vowels were difficult to place into developmental order as there were very few studies into normal vowel acquisition. According to Ingram (1976) the vowels are acquired by age three and hence they are shown to have been fully acquired by the end of Stage 2 of the profile. This is NOT to imply that vowels are not acquired in Stage 1. Obviously they are, but it is difficult to state which body of vowels are acquired first.

The vowels are classified according to low/high and front/back (Ladefoged, 1982; Minifie, 1973) and reflect Australian vowels as described by Saunders (1989). The diphthongs are placed according to their starting point. This manner of vowel and diphthong representation proved useful during trialling and clearly identified the problems of some children.

As with the consonants and the clusters, the boxes allow for the transcription of what the child actually produced. See Figure 4.

Figure 4.
Vowel Analysis Section of Profile



PHONOLOGICAL PROCESSES

Figure 5 clearly shows that next to each consonant in the consonant inventory, there is a line. This allows for the recording of the substitution processes that occur for THAT PARTICULAR CONSONANT. These processes may be similar to those that occur in normal development (e.g. fronting, stopping, gliding) OR they may reflect other processes peculiar to the deaf (e.g. bilabialization, nasalization).

Figure 5.
Analysis of Substitution Processes on Profile

SUBSTITUTION PROCESS		I	M	F
	n			
	m			
	t			
	d			
	p			
	b			
	w			
	h			
	j			
	k			
	g			
	ŋ			
	f			
	s			
	v			
	ʃ			
	z			
	ʧ			
	ʤ			
	l			
	r			
	ʒ			
	θ			
	ð			

Figure 6.

PROCESSES IN NORMAL DEVELOPMENT

STAGE I

with its minimal phoneme representation, is normally characterized by the following-
simple syllabic structures - CV, VC ,CVCV
final consonant deletion -dog --/ dɒ /
unstressed syllable deletion - (U.S.D.) (- weak syllable deletion) -
banana --/ nana / telephone --/ tɛfoʊn /
cluster reducation (simplification of a consonant cluster) -
bread --/ bɛd / string --/ trɪŋ / or / srɪŋ / or / tɪŋ /
assimilatory processes - (phoneme takes on characteristic of another sound) -
tag --/ kæg / velar assimilation
pin --/ pɪm / labial assimilation
foot --/ sʊt / alveolar assimilation
thumb --/ nʌm /
reduplication- (one syllable is reduplicated) bottle --/ bɒbɒ /
velar fronting - cap --/ tæp / go --/ doʊ /
gliding - (substitution of a glide for another sound) -
red --/ wɛd / light --/ waɪt / or / jaɪt / fork --/ wɔk /
stopping - (stopping of airflow) fork --/ pɔk / sew --/ toʊ /
voicing - (prevocalic and postvocalic voicing) two--/ du / leaf --/ liv /

STAGE II

the following processes normally disappear and are therefore good goals for moving a student into stage II -

assimilatory processes	final consonant deletion
reduplication	fronting of velars
voicing	stopping of / f, s /

the following processes normally persist -
cluster reduction stopping of / v z ð ʃ ʤ /
some unstressed syllable deletion gliding
the following processes may emerge -
depalitization - (palatal sounds shift forward) - shoe --/ su /

STAGE III

the following processes normally disappear and are therefore good goals for moving students into stage III -

unstressed syllable deletion	depalitization
stopping of / v z ʃ ʤ /	gliding of / l /

the following processes normally persist -
gliding of / r /
some cluster reduction still occurring.

the following processes may emerge -
deaffrication - (substituting a fricative or a stop for a affricate)
chair --/ ʃɛə/ or / tɛə /
affrication (substituting a fricative or a stop for a non-affricate)
soup --/ tsup / shoe --/ tʃu /

STAGE IV

remaining processes are resolved.

OTHER PROCESSES COMMONLY SEEN IN DEAF SPEAKERS

backing - (front sounds are replaced by velars or glottals) -
deep --/ gip / / hip / or / ʔip /
devoicing - (pre-and postvocalic) -
dog --/ dɒk /
palatalization - (alveolar sounds shift backward to become palatal) -
soup --/ ʃup /
nasalization - (a non-nasal sound is nasalized.)
denasalization-
mat --/ bæt /
bilabiaization- (substitution of bilabial sounds.)
toe --/ boʊ / / poʊ / or / moʊ/
sound intrusion - (addition of a sound) -
back --/ bʔæk / sing --/ skɪŋ /
initial consonant deletion -
dog --/ ɒg / cat --/ æt /
glottal replacement - (substitution of a glottal)

For those unsure of processes and what happens as the child develops, the back page of the profile details a range of processes. They have been arranged developmentally (Grunwell, 1982; Ingram, 1976; Stoel-Gammon & Dunn, 1985) so that they match the stages of the inventory. For each stage the following is detailed: processes which normally persist or are present in that stage; processes which normally disappear; as well as processes which may newly emerge.

Also defined are other processes which do not usually occur in normal development. Of course, processes separate to those already mentioned may occur and users are not restricted to this particular range. Figure 6 (previous page) shows the developmental arrangement of the processes as well as the other defined processes.

The lines next to the vowel inventory are used similarly, except that a line does not exist for each vowel. These appear to be more than sufficient as most of the information is derived from the layout of the inventory itself.

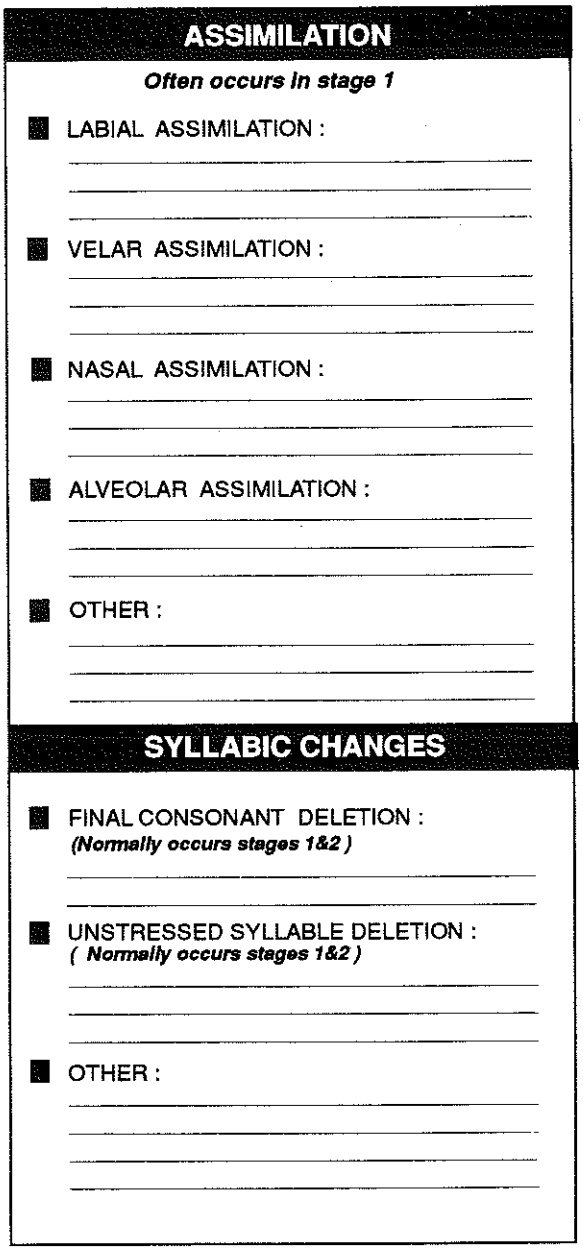
Figure 7 highlights the separate sections for assimilation and syllabic processes. Assimilation generally occurs very early on in the normal hearing child's phonological development and then disappears with only a few instances of recurrence. This section was expanded after trialling as it was found that this phenomenon was sometimes ignored when it could explain those productions that appeared to be inconsistent.

Assimilation allows the assessor to look more closely at the effects of context. During trialling we found several hearing impaired children who had acquired a wide range of phonemes and yet were quite unintelligible as assimilatory changes which would normally have disappeared by that stage were still taking place.

Another section deals with syllabic processes. These are the ones that affect syllable size and shape. A separate space exists for each of the common processes of final consonant deletion and unstressed syllable deletion.

A separate "other" heading allows for those processes which do not normally occur in the hearing population but have been noted in the literature e.g. initial consonant deletion and sound intrusion. Cluster reduction is not listed here simply to avoid redundancy: the cluster inventory clearly details what is happening to the clusters.

Figure 7.
Assimilation & Syllabic Processes Sections of the Profile



VOICE AND SUPRASEGMENTALS

Figure 8 shows the qualitative section which covers areas other than phonology and which has been included on the front page of the profile recording sheet.

Figure 8.

PHONOLOGICAL SUMMARY

(1) Student is at stage :

(2) The following need addressing

(a) consonants :.....

(b) place of production: .....

(c) manner of production:.....

(d) processes:.....

(e) vowels: .....

(f) clusters:.....

(3) Intelligibility Rating : .....

OTHER FACTORS AFFECTING INTELLIGIBILITY

COMMENT ON :

(1) VOICE (pitch, volume, nasality, tongue position etc)

(2) PROSODY (stress, intonation, pausing, rate etc)

(3) FACTORS AFFECTING ACQUISITION OF SPEECH (listening skills, use of aids etc)

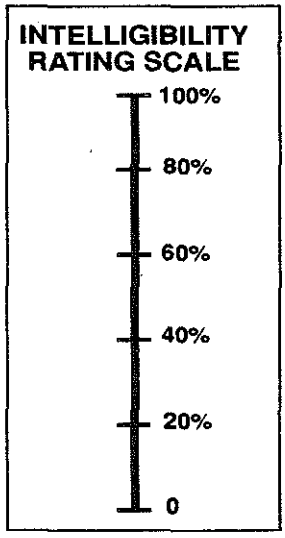
Under the headings of voice and suprasegmentals, an assessor can note overall faulty positioning of the articulators, problems with pitch, increased/decreased rate, poor prosody and so forth.

There is also a section to note any other factors a teacher may feel are interfering either with intelligibility or speech acquisition such as poor listening ability or inadequate language skills.

INTELLIGIBILITY

The intelligibility rating scale helps put the analysis into perspective. Whilst several ways of evaluating intelligibility exist (e.g. Monsen, Moog & Geers, 1988; Subtelny, 1977), this scale allows for an expedient indication of intelligibility. The scale simply reflects the number of words which could be accurately understood over the total number of words spoken. The resulting percentage is then transferred to the scale depicted in Figure 9.

Figure 9.



The intelligibility scale also helps the assessor to focus on the underlying reasons for unintelligibility. Some children are unintelligible because of their suprasegmental or voice problems rather than phonological problems.

Simply looking at a phonological profile may result in only selecting phonological goals rather than addressing these other speech areas. Some children may not progress phonologically until the teacher has addressed an obstructive voice problem. For instance, those children who exaggerate their production and become overly "plosive" thus preventing appropriate acquisition of their fricatives.

ASSESSMENT PROCEDURES

OVERVIEW

As this is a phonological profile it is important to collect a spontaneous speech sample for analysis. However, assessors do not want to spend hours collecting speech samples, transcribing them and then transferring information to the profile.

In 1988, Abraham, Stocker & Allen showed that professionals' preferences for assessment procedures are heavily influenced by the amount of time they need to spend on the whole process and the researchers commented that there was a need for a speech evaluation instrument designed for hearing impaired children and youth that demands single word responses to meaningful stimuli.

As such, there is an attempt to meld the best of both worlds: single word stimuli covering all the vowels and consonants in monosyllabic words as well as samples of clusters and polysyllabic words. This is accompanied by a recommendation to augment this single word sample with a short spontaneous sample of somewhere between fifteen to twenty-five utterances (depending on the child's length of utterance).

This pragmatic approach appears to yield a representative profile. Such a combination of meaningful single word stimuli and spontaneous sampling has been recommended by Dyson & Robinson (1987) in their evaluation of phonological analysis procedures.

The profile is not dependant upon the use of single word stimuli: they are there to reduce data collection and transcription time. An assessor could choose to use only a spontaneous sample with for instance, the older child who might find the single word stimuli unexciting.

Those assessors very pressed for time who choose to use the phonological data only from the single word stimuli, are strongly advised to use a short spontaneous sample for the voice and suprasegmental evaluation and the intelligibility rating. In such a sample the child should speak about a subject with which the teacher is not familiar in order to best reflect the child's abilities.

PROCEDURE

(1) Preparation

Have ready: stimuli word picture booklet; stimuli word recording sheet; audio tape-recorder with body microphone; a blank audio cassette tape; any games/toys/

pictures required for a short spontaneous sample; and a quiet undisturbed environment.

Be prepared to transcribe as you go; the tape is there for back-up if you need it. Set aside approximately twenty minutes for data collection.

(2) Elicitation of the stimuli words.

There are picture cards in the kit to aid elicitation for all the stimuli words EXCEPT the first word. An assessor could, of course, collect appropriate objects for those children who would respond better to them. As the words are to be elicited, try NOT TO MODEL the target word for the child. Figure 10 (overleaf) depicts the stimuli word list.

The first target word is "yes", for which there is no picture. An appropriate yes/no question should yield the required result e,g, "Is your name _____?"; "Do you like chocolate?".

All the remaining words can be elicited through the pictures or objects. If the child does not supply the desired target word, then the following general elicitation techniques could be useful:

"What's this?"
"This is a _____"
"What colour is that?"
"What's this animal called?"
"Where does a _____ live?"
"Yes, but it's also called a _____"
"What's s/he doing?"

Background information could be helpful for the child who is unable to provide the target word e.g. for clowns: "We see them at the circus"; for treasure:"This is a pirate's _____".

Not all words need to be elicited for each child. For instance, a younger child who just manages the vocabulary up to word thirty need not continue. Further data can be gleaned from the spontaneous sample.

Alternatively, a child whose phonological system and vocabulary is better developed, may need only to do the words containing the blends and the polysyllabics.

STIMULUS WORD LIST

Phonological Profile for Hearing Impaired

CHILD'S NAME: _____ DATE: _____

TESTER: _____ SCHOOL: _____

yes 1 / jɛs /	**moon** 2 / mun /	**bird** 3 / bəd /
kite 4 / kaɪt /	**mouse** 5 / maʊs /	**foot** 6 / fʊt /
fan 7 / fæn /	**zip** 8 / zɪp /	**dog** 9 / dɒg /
farm 10 / fam /	**thumb** 11 / ɵʌm /	**duck** 12 / dʌk /
knife 13 / naɪf /	**sun** 14 / sʌn /	**gate** 15 / geɪt /
pig 16 / pɪg /	**ring** 17 / rɪŋ /	**cage** 18 / keɪdʒ /
leaf 19 / lif /	**van** 20 / væn /	**teeth** 21 / tiɵ /
sheep 22 / ʃip /	**bell** 23 / bɛl /	**soap** 24 / soʊp /
horse 25 / hɔs /	**nose** 26 / noʊz /	**cake** 27 / keɪk /
feather 28 / fɛðə /	**chair** 29 / tʃɛə /	**watch** 30 / wɒtʃ /
web 31 / wɛb /	**boys** 32 / bɔɪz /	**jumper** 33 / dʒʌmpə /
stamp 34 / stæmp /	**spoon** 35 / spun /	**skipping** 36 / skɪpɪŋ /
sleeping 37 / slipɪŋ /	**snake** 38 / sneɪk /	**crayon** 39 / kreɪɒn /
clowns 40 / klaʊnz /	**plate** 41 / pleɪt /	**frogs** 42 / frɒgz /
treasure 43 / trɛʒə /	**camel** 44 / kæməl /	**kitten** 45 / kɪtən /
chicken 46 / tʃɪkən /	**rabbit** 47 / ræbət /	**fishing** 48 / fɪʃɪŋ /
balloon 49 / balun /	**kangaroo** 50 / kæŋgəruˑ/	**elephant** 51 / ɛləfənt /
aeroplane 52 / ɛrəpleɪn /	**triangle** 53 / traɪæŋgəl /	**television** 54 / tɛləvɪʒən /

(3) Elicitation of a spontaneous sample

If the word stimuli are used then an additional fifteen to twenty-five spontaneous utterances should be sufficient. These could be gained through discussion or play after the stimuli words were elicited OR they could be gained during stimuli word elicitation.

The following stimuli word cards have been found to be useful for eliciting further spontaneous utterances.

10. farm e.g. "Have you ever been on a farm? When? Tell me about it.

27. red e.g. "What's your favourite colour? Mine is ____. I see you've got some on your ____"

40. clowns e.g. "I saw some funny clowns at the circus. They ..... Have you seen any? Where? What did they do?"

42. frogs e.g."I used to love collecting tadpoles and watching them grow into frogs. Have you ever collected any? What do you like to collect? Tell me about it."

54. television e.g. "What's your favourite television show? Tell me about it. What happened in the last episode?"

All spontaneous utterances used, need to include utterances about a subject matter UNFAMILIAR to the assessor. This aids in the intelligibility rating as well as the voice and suprasegmental evaluation. For instance: "What did you do on the week-end?"; "Tell me what your Uncle does for a living"; "What after-school activities does your sister/brother do?" etc.

(4) Completion of the transcription

Using the stimulus word scoring sheet simplifies the transcription process. Each word is accompanied by its Australian transcription and the assessor simply marks a tick if all aspects of phonology are correct. If not, then the entire word is transcribed as per Example 1 (overleaf).

Example 1.
Recording on the Stimulus Sheet

yes ✓ (jɛə) 1 / jɛs /	**moon** ✓ 2 / mun /	**bird** bɜ 3 / bəd /
kite ka 4 / kaɪt /	**mouse** mows 5 / maʊs /	**foot** fʊ 6 / fʊt /
fan ✓ 7 / fæn /	**zip** zɪp 8 / zɪp /	**dog** dɒ 9 / dɒg /
farm ✓ 10 / fam /	**thumb** fʌm 11 / θʌm /	**duck** dʌ 12 / dʌk /

The spontaneous sample may well contain more than the required number of utterances for analysis. In selecting the body of utterances to be used, ensure that it is a representative series of CONSECUTIVE utterances. This helps avoid any bias in the sampling which may occur when utterances are selected from different locations in the sample.

The body of utterances for phonological transcription must first be glossed, i.e. what the child INTENDED TO SAY, before the utterances are then transcribed.

Each unintelligible syllable should be glossed through the use of "X" and need not be transcribed.

E.G. GLOSS: XX goed home

TRANSCRIPTION: / doʊd hoʊm/

Noting unintelligible syllables and words is useful, particularly for computing the intelligibility score, which in this example would be 2/3 or 66%.

Deviant productions can be transcribed through the use of diacritics and additional phonetic symbols such as those described in Tables 1 and 2. These particular symbols have been derived from Wise (1957) as described by Creaghead and Newman (1985,p 98).

TABLE 1

DIACRITICS

Aspirated sound [ʰ] as in [pʰ]
Nasalized sound [̃] as in [ũ]
Denasalized sound [̋] as in [n̋]
Lateralized sound [̴] as in [s̴] [ʃ̴]
Dentalized sound [̪] as in [t̪] [b̪]
Plosives with simulataneous
glottal stops [ˀ] as in [pˀ] [tˀ]
Retroflexed sound [̢] as in [t̢]
Lengthened segment [ː] as in [mː] [aː]
Weakened articulation e.g. [ᵖfu]
One sound that has elements of another e.g. [ʃˢ]

TABLE 2

ADDITIONAL SYMBOLS

[q] uvular stop, - voice
[G] uvular stop, + voice
[x] velar fricative, - voice
[ɣ] velar fricative, + voice
[χ] uvular fricative, - voice
[ʁ] uvular fricative, + voice
[ʔ] glottal stop
[ħ] pharyngeal fricative, - voice

To aid in later suprasegmental evaluation, it may be helpful to include, as part of your spontaneous utterance transcription, intonation contours. These can provide extremely valuable information in terms of assessment and remediation decisions.

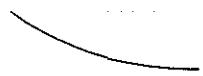
For e.g.

INTONATION CONTOUR: __ __ __

GLOSS: XX goed home

TRANSCRIPTION: / doʊd hoʊm/

versus

INTONATION CONTOUR: 

GLOSS: XX goed home

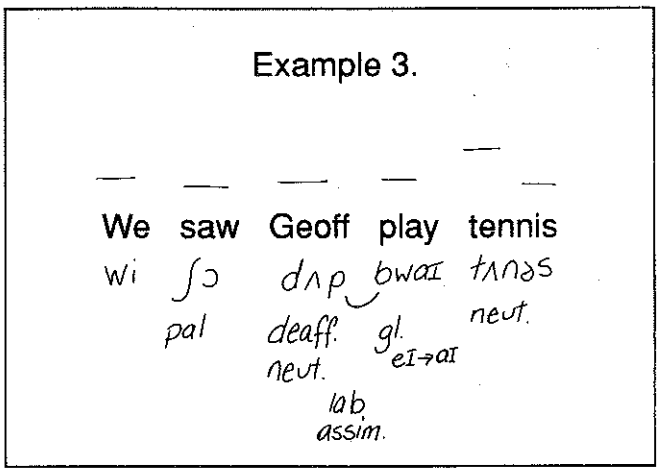
TRANSCRIPTION: / doʊd hoʊm/

Next, a small preliminary phonological analysis on the data needs to be completed. The back page of the profile provides definitions and examples of phonological processes.

Any processes that have occurred in production of the stimuli words can be noted directly on to the stimuli word recording sheet as per Example 2. Any processes which may have occurred in the spontaneous sample can also be noted directly on to the transcription sheet. See Example 3.

Example 2.
Preliminary Analysis of Stimulus Data

yes ✓ (jɛs) 1 / jɛs /	**moon** ✓ 2 / mun /	**bird** bɜ 3 / bɜd / F.C.D.
kite ka 4 / kaɪt / F.C.D. aɪ→a	**mouse** moʊs 5 / maʊs / pal	**foot** fʊ 6 / fʊt / F.C.D.
fan ✓ 7 / fæn /	**zip** zɪp 8 / zɪp / pal	**dog** dɒ 9 / dɒg / F.C.D.
farm ✓ 10 / fam /	**thumb** fʌm 11 / θʌm / θ→f	**duck** dʌ 12 / dʌk / F.C.D.



Now information is ready to be transferred directly on to the profile.

(5) Transference of information to the profile

The voice and suprasegmental sections on the cover page of the profile should be completed prior to filling out the phonological section. Suggestions for the type of areas to consider in these sections are outlined below.

(a) Voice Problems

Voice problems need to be evaluated in terms of the entire VOCAL TRACT, not just in terms of what is happening at vocal cord level. This allows for a total view of what is occurring in speech production as opposed to the highly specific view of the phonological analysis.

So note positioning and use of:

- the lips e.g. is use exaggerated?
  is the range of movement minimal or excessive?
- the tongue e.g. is the body of the tongue too far retracted or advanced?
  is use of the tongue exaggerated?
- the nose e.g. does the speech have a nasal quality?
- the larynx e.g. is the throat too tense or lax?
  is the larynx raised or lowered?

Also note how the overall quality of the voice sounds:

- the phonation e.g. is it harsh, breathy, creaky?
- the pitch e.g. is there sufficient range?
  is it too high or too low?

- the volume e.g. is it too loud or too soft?
  is there a restricted volume range?

(b) Suprasegmental Problems

In looking at suprasegmentals, use the spontaneous sample to note:

- rate e.g. is it too fast or too slow?
  is it highly variable?
- duration e.g. are words/word segments dragged out?
- intonation contours e.g. are intonation contours used appropriately to convey meaning?
  is there a restricted range of intonation contours?
  are the same small body of intonation contours used repeatedly?

Example 4 shows how this could be done.

Example 4.
Detailing Voice & Suprasegmental Information

OTHER FACTORS AFFECTING INTELLIGIBILITY

COMMENT ON :

(1) VOICE (pitch, volume, nasality, tongue position etc)

Nasal

Tongue high and back

(2) PROSODY (stress, intonation, pausing, rate etc)

Equal stress monotone

limited range of intonation contours

(3) FACTORS AFFECTING ACQUISITION OF SPEECH (listening skills, use of aids etc)

(c) Phonological Details

Next, phoneme and process information should be transferred to the phonological analysis section of the profile. Information about every glossed phoneme must appear on the profile.

In filling in the inventory (both consonant and vowel) use the following conventions.

IN BLUE OR BLACK PEN NOTE:

1. ✓ = correct sound usage;
2. NDA = no data available.

IN RED PEN NOTE:

1. any substitutions used;
2. ∅ = deletions;
3. any sound distortions.

Using the red pen really makes the profile much easier to read, as the assessor can see at a glance, whether or not the student is following a normal developmental pattern, or whether the errors fall into a particular place/manner or front/back, high/low pattern.

A tally of the occurrence of each sound production should be included. For e.g. Your student may have produced initial /k/ as: /t/ (4 times), /x/ (once), /g/ (twice) and /kx/ (twice) in the nine examples of intended /k/ from the data you had. All of this needs to be noted on the inventory.

Whilst filling out the inventory, the processes sections can also be completed. The consonant inventory includes a line for each consonant's substitution processes. So, more than one process may be listed on the one line. For e.g. The student who produces /s/ 5 times as /t/ and 3 times as /ʃ / is showing the processes of both stopping and palatalization for the phoneme /s/ both of which should be noted on the relevant line.

Consider whether the substitution used is due to assimilation. The sample should be scanned to see if there are certain contexts producing this change. For example, a student who produces /f/ correctly except when in the presence of a back vowel or a velar sound thus resulting in a production of /g/, is governed by the process of velar assimilation and this needs to be noted in the ASSIMILATION SECTION.

Consonant deletions need to be carefully considered to determine if they are due to syllabic processes and need to be noted in the SYLLABIC PROCESSES SECTION. In particular, take care with unstressed syllable deletion. The student may well be able to use certain medial sounds except when they are part of an unstressed syllable.

Example 5 shows how a sample of raw data was coded on to the inventory. Note the use of substitution, assimilation and syllabic processes as well as the use of diacritics and additional symbols for the deviant productions. If the assessor is unfamiliar wuth diacritic usage, then noting that the production was deviant should suffice in the absence of symbol usage.

(d) Summarizing the Phonological Data

The phonological summary helps the assessor to examine the various views of the data that the profile provides.
The summary is NOT intended as a list of all the student's problems, but rather as a shortened list of POTENTIAL goals as the student is viewed from different perspectives.

First, the assessor is asked to determine the stage the student is at. This is usually the stage in which the student has acquired some of the phonemes and is working to complete the stage phonologically. Assigning a given stage to a student, implies that previous stages have been acquired in terms of normal phonological development.

Next, the summary asks the assessor to focus on the most appropriate consonants the assessor feels the student needs to work on. These may be chosen according to a developmental rationale or according to any other rationale.

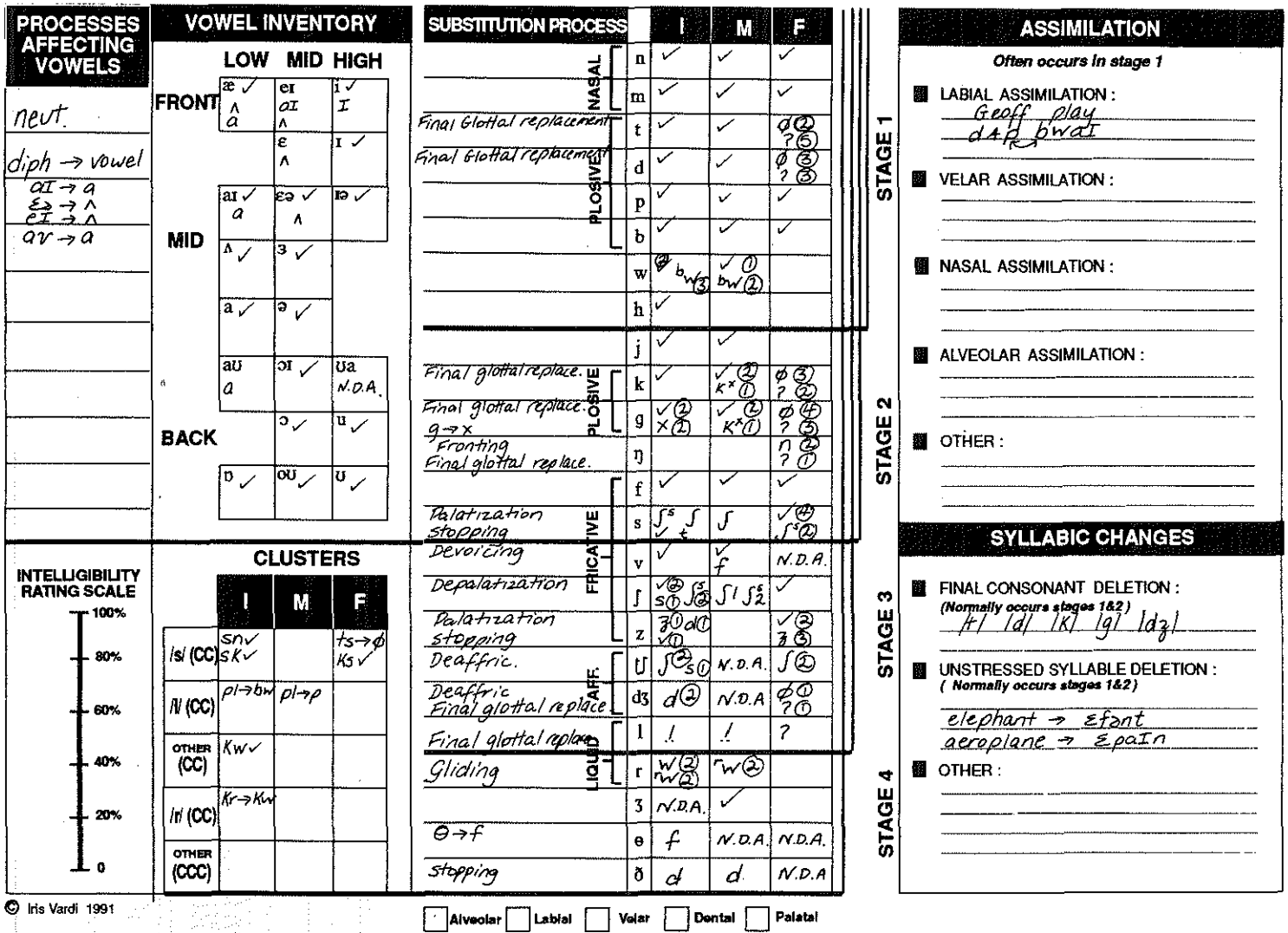
So, the assessor may, for instance, choose consonants which the student needs to acquire next or may choose to improve the production of a consonant, for example, the production of an /l/ where the tongue flicks out, or a deviant lateralised /s/.

The assessor is also asked to examine place of production to determine whether a specific place is causing particular difficulty to the student. This is where the assessor uses the colour coded aspect of the profile and examines all the yellow boxes, then all the green boxes and so forth to see if that reveals any pattern.

The pattern does not simply need to be, for example, that all velars are fronted, (something which would be revealed through examination of the substitution processes) but may reveal that the velars are highly unstable with many different productions occurring at the velar position.

Manner of production is similarly examined to see if this different grouping of the data reveals any patterns of error in phonological production. Alternatively it may show clearly that a group such as fricatives has not been acquired at all and that these may be the next appropriate area on which to concentrate.

The processes section encompasses all the processes: substitution, assimilatory and



Example 5.
Profiling the Data

syllabic. The assessor notes the most appropriate appropriate processes to work on first. Again, the rationale may be based on a developmental model (the back page of the profile deals with the developmental aspects), or there may be a decision to work on the elimination of processes which do not occur in normal hearing development (e.g. bilabialization, initial consonant deletion, sound intrusion etc.) as these may be obstructing intelligibility or further phonological progress.

The vowels then need to be examined separately. The layout of the vowel information allows for a high/low and front/back examination of error pattern. Remember, the diphthongs have been included here, but for some students it may be useful to look at the diphthongs separately in attempting to ascertain error patterns. Again, a decision must be made as to the most urgent vowels needing attention and these are noted on the summary.

The clusters are also examined separately. Remember, when examining the clusters, that normally developing children do not start to acquire clusters until approximately Stage 3. So, a student functioning at Stage 1 or 2 may well have no need for any goals that address cluster production.

Alternatively, a teacher may choose to teach a single phoneme, such as /s/, through the use of clusters, particularly for the student who produces /st/ as a substitution for /s/ or the student who produces /s/ in clusters correctly but not the single /s/.

Example 6 demonstrates how the data from Examples 1 through to 5 was summarized.

(e) Computing the Intelligibility Rating

In order to compute the intelligibility rating, the assessor MUST use the SPONTANEOUS SAMPLE, as the target words are known to the assessor when the stimuli words are used.

The intelligibility score is obtained by the equation:

number of glossed words/number of words spoken.

In other words, a student who says 60 words which the assessor could understand, out of a total of 85 words spoken has a score of 60/85 = 70.6% This score is then marked on the intelligibility scale and noted in the phonological summary section. The score can vary markedly for a student depending upon the type of spontaneous sample which is elicited.

Example 6.
Summarizing the Phonological Data

PHONOLOGICAL SUMMARY

(1) Student is at stage : 2

(2) The following need addressing

(a) consonants : /k/ or /g/ , /s/ or /ʃ/ , /l/

(b) place of production: Palatals

(c) manner of production: Fricatives. Sort out fricatives v/s stops in velars.

(d) processes: Neut., Final consonant deletion, Final glottal replacement

(e) vowels: /ɛ/, /æ/, /i/ (front vowels)

(f) clusters: -

(3) Intelligibility Rating : 76 %

If, for instance, the spontaneous sample is elicited in a tightly controlled situation where the assessor is asking closed questions or where the questions are based in the "here and now" with many contextual clues available to the assesor, then the student will obtain a relatively high score.

Conversation about past events, postulation about thoughts and future events or conversation with open questions is more likely to result in a more realistic score as the assessor will be less likely to be able to predict what the student will say.

(6) Selecting Goals

Goals are selected from a synthesis of the summarized data on the cover page of the profile. This allows for attention to and a balance between the phonological data, voice and suprasegmental information and any other factors affecting speech acquisition.

The profile allows for selection of goals to meet which ever philosophy of speech remediation an assessor may subscribe to. So several goals can be selected if using a multiple-phoneme or cyclical type approach as advocated respectively by Bradley (1985) or Hodson (1986). Alternatively, a more traditional articulatory approach (e.g. Secord, 1985) or a voice or suprasegmental programme (e.g. Boone, 1977; Moncur & Brackett, 1974) can be used and so forth. With the complex problems exhibited by some of the profoundly deaf, an eclectic approach may well

be indicated.

Often goal selection is made easier and clearer as connections between the various views of the data become apparent. For instance, a child who has unstable alveolar production, accompanied by problems with front vowels and a voice problem described as a tongue held too far back in the oral cavity has problem areas which are related and these observations can clearly aid in determining the course of intervention.

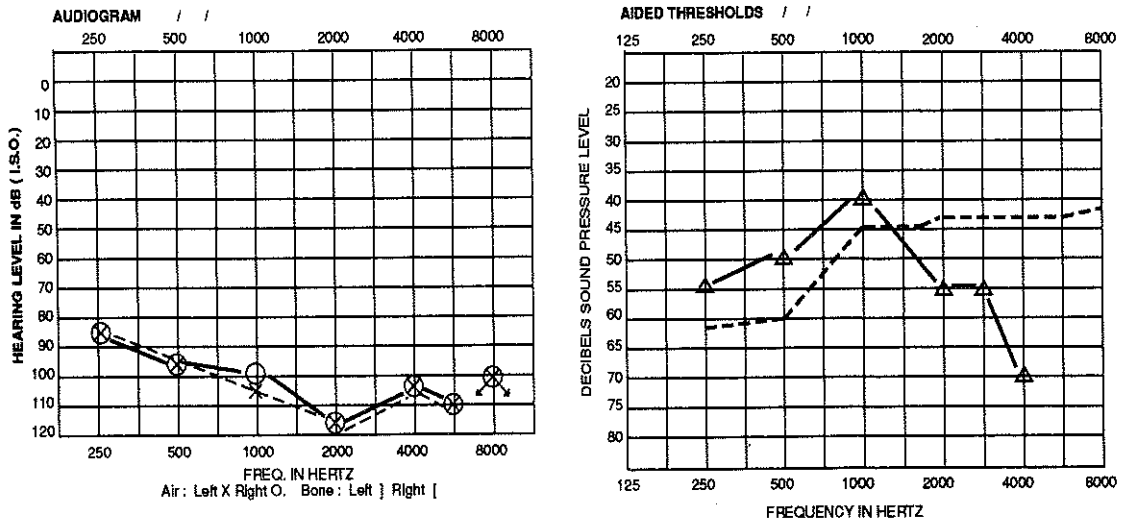
Goal selection can be more clearly understood through the examination of case studies.

CASE STUDIES

CASE STUDY 1

J.B. is a profoundly deaf nine year old who was assessed by a teacher of the deaf. Figure 11 shows both unaided and aided audiograms.

Figure 11



The spontaneous productions of this girl were recorded on the profile and the results are shown in Example 7.

The profile revealed the following.
(1) Of the consonants she could produce (albeit inconsistently) her alveolar sounds evidenced the most confusions.

PROCESSES AFFECTING VOWELS

VOWEL INVENTORY

	LOW	MID	HIGH
FRONT	æ ✓	eɪ ✓	i ✓
		ɛ ✓	I ✓ i
MID	aɪ ✓ ɑ	ɛə	ɪə
	ʌ ✓	ɜ ✓	
	a ✓	ə ✓	
	aʊ ✓	ɔɪ	ʊə
BACK		ɔ ✓	u ✓
	ɒ ✓	oʊ ✓	ʊ ✓

SUBSTITUTION PROCESS

			I	M	F
Denasalization back vowel ⇒ velar	NASAL	n	✓⑤ g① d②	N.D.A	✓ ϕ
		m	✓	✓	✓
Backing	PLOSIVE	t	✓② k② g①	g①	ϕ
		d	✓	✓	✓ ϕ
		p	✓	✓	✓
		b	✓	N.D.A.	✓
		w	✓		
		h	✓		
		j	N.D.A.		
Voicing	PLOSIVE	k	✓① g② h①	✓	ϕ
		g	✓	✓	ϕ
		ŋ		✓	✓① ϕ①
Stopping, backing Palatization	FRICATIVE	f	✓	✓	
		s	d k ϕ ʃ g	N.D.A.	ϕ
Stopping affrication affric. + devoicing		v	N.D.A.	N.D.A.	N.D.A.
		ʃ	t② d① approx.	N.D.A.	tʃ ı
		z	ts①	N.D.A.	ϕ
	AFF.	tʃ	✓	N.D.A.	ϕ
		dʒ	N.D.A.	N.D.A	N.D.A.
Velar addition	LIQUID	l	✓② k①	✓	✓
Velar addition alveolar addition gliding		r	g r① tw① h①	✓	
		ʒ		N.D.A	
		ɵ	N.D.A	N.D.A.	ϕ
Backing		ð	✓② g①	✓	N.D.A.

CLUSTERS

	I	M	F
/s/ (CC)	sl → kl sn → n		Ks → ϕ
/l/ (CC)	pl ✓ kl ✓ fl ✓		
OTHER (CC)			
/r/ (CC)	tr ✓ tr → kw kr → tr fr → fr		
OTHER (CCC)			

INTELLIGIBILITY RATING SCALE

100% — 80% — 60% — 40% — 20% — 0

STAGE 1

ASSIMILATION

Often occurs in stage 1

- LABIAL ASSIMILATION :
- VELAR ASSIMILATION :
  e.g. hot today /hɔgʌdaɪ/ go fishing /gergɪgɪŋ/ watch the T.V. /wɔ gɪ gi vi/
- NASAL ASSIMILATION :
- ALVEOLAR ASSIMILATION :
- OTHER :

STAGE 2

SYLLABIC CHANGES

- FINAL CONSONANT DELETION :
  (Normally occurs stages 1&2)
  Across most sounds bar labials and liquids
- UNSTRESSED SYLLABLE DELETION :
  (Normally occurs stages 1&2)
  dangerous → /daengɛ/
  Kangaroo → /aenwu/
  Elephant → /ɛfən/

STAGE 3

- OTHER :
  Velar addition/sound intrusion
  e.g. horse riding /hɔgraɪdɪn/ ring /grɪ/

STAGE 4

Example 7

Alveolar ☐ Labial ☐ Velar ☐ Dental ☐ Palatal

(2) Final consonant deletion was a prominent process
(3) Velar assimilation was extremely prevalent, accounting for many of the inconsistencies, not only with the alveolar sounds but also with other sounds.
(2) Final consonant deletion was a prominent process.
(3) Velar assimilation accounted for many of her inconsistencies.
(4) Most of her fricatives were yet to be acquired
(5) Unstressed syllable deletion was occurring in polysyllabic words
(6) Velar sound intrusion was adding to listener confusion and particularly affected the liquids.

So which goals to choose?

From a place/manner point of view, the alveolars need attention before one considers the acquisition of new features. Given the confused nature of her phonological system it would be best to remediate the difficulties with the sounds she has before adding new phonemes.

From a processes point of view, the assimilation needs to be dealt with so that the effect of context is eliminated. This velar assimilation matches closely with her velar sound intrusion and could be dealt with at the same time. It also accounts for much of the alveolar confusion.

From a developmental point of view, it might be easier to start with the Stage 1 sounds and both her Stage 1 sounds with problems are the alveolar sounds:/n/ and /t/ ! Dealing with these may also have ramifications on the other alveolars and their production may become more consistent without specific intervention.

Developmentally, the processes of assimilation and final consonant deletion disappear early on in development and hence would be appropriate to choose. With fricatives and affricates occurring in later stages and unstressed syllable deletion often still occurring in stage 2, these goals could be left till later.

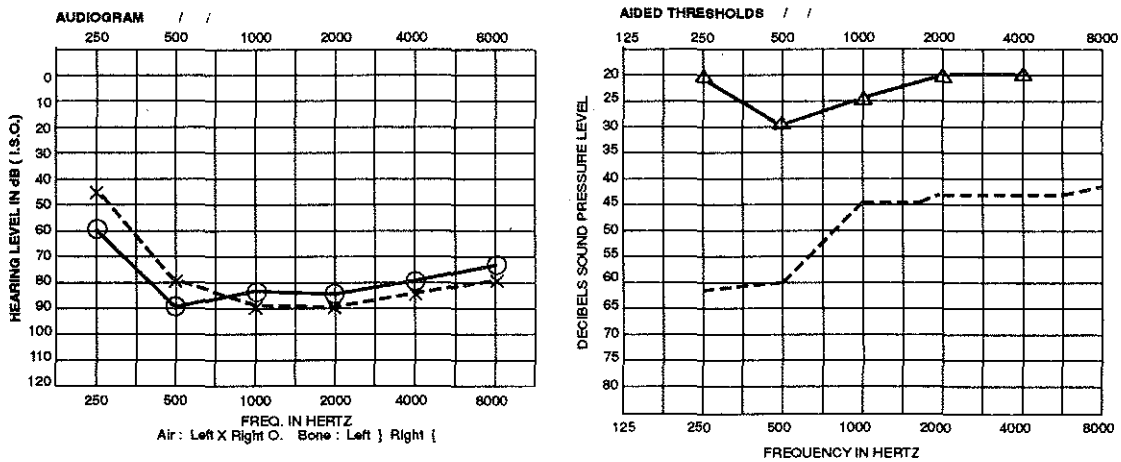
So the initial goals for J.B. would be:
(1) Stabilize alveolar production by starting with /n/ and /t/.
(2) Eliminate the effects of context by dealing with the velar assimilation (this would support the first goal)
(3) Eliminate the velar sound intrusion (this supports the second goal)
(4) Eliminate the process of final consonant deletion.
* Simple syllabic structures would be used to achieve these goals due to J.B.'s process of unstressed syllable deletion.
Note that the nature of the profile allows the assessor to deal with both "normal" aspects of speech development as well as "deaf" aspects and can, as in this example, be quite complementary. These goals are also quite different from goals chosen on the basis of looking at vowel and consonant acquisition alone. The use

of processes and place/manner information permits convenient grouping of phonemes as well as attention to syllable shapes in speech lessons.

CASE STUDY 2

L.S. is a profoundly deaf seven year old who was assessed by a teacher of the deaf. Figure 12 shows both his unaided and aided audiograms.

Figure 12



His profile results are detailed in Example 8 (overleaf) and reveal the following.

(1) In terms of individual consonant and vowel acquisition, L.S. appears to be following a normal developmental model (albeit at a slower rate), having acquired all Stage 1 consonants in the initial position (remember final consonant deletion is normal in Stage 1) as well as the majority of his vowels and diphthongs.

(2) His substitution processes in later stages reveal both "normal" processes (fronting, stopping, F.C.D., gliding, deaffrication) as well as "deaf" processes (final consonant glottal replacement, final consonant backing). So phonological development is NOT in fact like normal development despite the initial impression gained by looking only at the consonant and vowel inventories.

(3) Whilst he is showing partial acquisition of velars, this is hampered from consistent usage by his process of alveolar assimilation.

(4) In terms of his voice, his tongue is often retracted and very tense (interestingly the vowels he has not acquired consistently are front ones) and he often pulls strange faces whilst speaking (perhaps resulting in that "plosive" quality to the /f/ and reinforcing his process of stopping)

PROCESSES AFFECTING VOWELS

neut.

diph. → vowel

aɪ → a
ɛə → ɛ

aʊ → a

VOWEL INVENTORY

	LOW	MID	HIGH
FRONT	æ ✓ ʌ ɛ	eɪ ✓	i ✓ ɪ
		ɛ ✓	ɪ ✓
MID	aɪ ✓ ɑ	ɛə ✓ ɛ	ɪə ✓
	ʌ ✓	ɜ	
	a ✓	ə ✓	
BACK	aʊ ✓ ɑ	ɔɪ	ʊa
		ɔ ✓	u ✓
	ɒ ✓	oʊ ✓	ʊ ✓

INTELLIGIBILITY RATING SCALE

100% · 80% · 60% · 40% · 20% · 0

CLUSTERS

	I	M	F
/s/ (CC)	sp ✓ sk → g st → d sn → n		st → ? ks → ? ns → ?
/l/ (CC)			
OTHER (CC)	kw → w		mp → mb nd → n
/r/ (CC)			
OTHER (CCC)			nts → n

SUBSTITUTION PROCESS

			I	M	F
	NASAL	n	✓	N.D.A.	✓ ② ∅ ①
		m	✓	N.D.A.	✓
Final glottal replace. voicing	PLOSIVE	t	✓	∅ ① d ①	d ② ? ② d ①
Final glottal replace. Med.+Final backing Nasalization-Final		d	✓	g	g ② ? ③ n ①
		p	✓	✓	✓
Final consonant nasalization		b	✓	N.D.A.	✓ ① mb ① m ①
		w	✓		
		h	✓		
		j	✓		
I.C. fronting Final glottal replace. voicing	PLOSIVE	k	✓ ② ∓ g ①	✓	? ② ∅ m
fronting final glottal replace.		g	✓ ① d ②	d	? ② d ②
fronting		ŋ		N.D.A.	ŋ
voicing stopping	FRICATIVE	f	✓ ② v ①	✓	✓ ① v ①
stopping + voicing final glottal replace.		s	d	N.D.A.	?
stopping		v	✓ ① b ①	N.D.A.	✓
affrication		ʃ	✓	✓ tʃ	✓
stopping		z	d	d	∅
Deaffrication final glottal replace.	AFF.	ʧ	ʃ	ʃ	ʃ ? z
Deaffrication		ʤ	ʒ	N.D.A.	ʒ
	LIQUID	l	✓	N.D.A.	✓ ∅
Gliding		r	w	w	
		ʒ		N.D.A.	
final glottal replace.		θ	N.D.A.	N.D.A.	?
med. + final stopping		ð	✓	d	d

Alveolar · Labial · Velar · Dental · Palatal

ASSIMILATION

Often occurs in stage 1

- LABIAL ASSIMILATION :
- VELAR ASSIMILATION :
- NASAL ASSIMILATION : wedding ring /wɛnɪŋɪn/
- ALVEOLAR ASSIMILATION : tiger → /tadʌ/ Kangaroo /kandany/ triangle → /twaɛndu/ kitten → /tɪdan/
- OTHER :

SYLLABIC CHANGES

- FINAL CONSONANT DELETION : *(Normally occurs stages 1&2)* /n/ /t/ /k/ /z/ /l/
- UNSTRESSED SYLLABLE DELETION : *(Normally occurs stages 1&2)*
- OTHER :

STAGE 1 · STAGE 2 · STAGE 3 · STAGE 4

Example 8

L.S.'s goals should be consistent with completion of Stage 2 and preparation for successful acquisition of Stage 3. As such goals are as follows.
(1) Consolidate acquisition of velars.
(2) Eliminate alveolar assimilation (this supports the first goal)
(3) Eliminate facial tension in speech as a precursor to fricative acquisition and deal with tense retracted tongue through acquisition of front vowels.
(4) Elimination of final consonant deletion and final consonant glottal replacement through the teaching of final consonants already acquired in the initial position.

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