

# A CASE STUDY OF LINGUISTIC/ SPEECH PATHOLOGY COLLABORATION

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This paper demonstrates how collaboration, integrating speech pathology and linguistic perspectives, can clarify the nature of speech breakdown in a child manifesting unintelligibility. Using extracts from a case study together with theoretical perspectives, we suggest ways to construe seemingly idiosyncratic and inconsistent speech "errors". The relatively new field of non-segmental phonologies is utilised to illustrate the need to extend analyses and appraisals of paediatric speech disorders. Via discussion of one child's segmental phonology together with his non-segmental stress patterns, we highlight the possibility of a single underlying deficit. We demonstrate how the phonologist's and the speech pathologist's approaches during the data analysis prove to be complementary in a mutually beneficial way.

## Keywords:

collaboration,  
inconsistency,  
intelligibility,  
non-segmental phonologies,  
paediatric speech disorders,  
segmental phonology

Interaction between the speech pathology profession and specialists in linguistics is not unprecedented. After all, describing disordered speech requires knowledge of phonetics, while research in psycholinguistics benefits from the detailed knowledge of disordered populations that a speech pathologist (hereafter clinician) can provide. However, it is fair to say that clinician-linguist interaction of this kind is certainly not routine and not even especially frequent. In this article we argue (on the basis of one case study that is part of a larger project) that both speech pathologists and phonologists stand to gain from increased cooperation. Our larger research project, which is funded by a grant received from the Faculty of Health Sciences at La Trobe University in Melbourne (Australia) in November, 2003, explores the nature of breakdown in Childhood Apraxia of Speech (CAS). Data collection for the project, entitled "Temporal and Spatial Aspects in CAS", is currently under way. The team of researchers includes Joffe, Kipka, Ozanne and Wakefield.

The need for extending analyses and appraisals of speech disorders has previously been raised and continues to be an issue (Duck & Joffe, 2004; Joffe, 2002; Joffe & Heine, 2004). Although clinician decisions to adopt particular appraisals may potentially be influenced by time and caseload constraints (Serry & Joffe, 2004), it is accepted that clinicians recognise the need for professional development and keeping abreast of new developments. An opportunity to explore novel and different perspectives could contribute to new creative problem-solving and, in turn, reinvigorate approaches to dealing with the area of paediatric speech breakdown. This paper aims to offer an insight into some such perspectives.

Linguists (phonologists in particular) also stand to benefit from the sort of interaction we document. Most phonologists

continue to deal exclusively with normal adult populations. Interestingly, this normal data base typically proves insufficient information to adjudicate between phonological theories in such a way as to establish large-scale consensus. Among modern phonologists, division reigns. The time is ripe for data from child speech development and from speech disorders to play a larger role in trying to sort out current theoretical controversies.

This article documents interaction between a speech pathologist and a phonologist based on the case study of a 5 year old boy, Sam, who in connected speech can be totally unintelligible. Sam was born and raised in Australia in a home with English as a first language. His hearing is adequate and he is coping socially and academically with his peers in a preparatory grade. Although he has previously had therapy for speech and language problems, there is evidence of persisting speech errors, with some syntactic problems, depending on linguistic context.

## Segmental features

Sam's segmental phonology reveals numerous errors. A few late-developing consonants are missing from his phonetic inventory (*r* and *th*). Although he is capable of producing most phonemes, he has difficulty using many of these in particular lexical contexts. Speech sounds within monosyllabic words are articulated more clearly than those in words containing two or more syllables. For example, despite the voiceless velar stop /k/ being correct in the word *car*, it is omitted in syllable initial within word position (SIWW) in the word *cooking*. Another variation of production of the /k/ phoneme occurs in monosyllabic words, where a process of assimilation occurs when Sam produces *tat* instead of *cat*. A similar assimilatory process occurs when he produces *guk* instead of *duck*. A more unusual assimilatory phenomenon occurs for a word like *orange*, where /r/ is replaced with /n/.

In many contexts, and particularly in words that have more than one syllable, Sam defaults to a glide. For example, when Sam tries to say the word *bombers*, although he produces the syllable initial word initial (SIWI) voiced stop /b/, he produces the glide /j/ instead of the nasal /m/ in word medial position. Sam simplifies the articulation of this word further by omitting the word final plural morpheme. Similarly in the word *vacuum*, both voiced labiodental fricative /v/ and voiceless velar stop /k/ become a /w/. However, when attempting the full name *vacuum cleaner*, he uses another glide (in this instance /j/) for all consonants except for the cluster /kl/, for which he substitutes /t/.

A similar combination of defaulting to glide with total assimilation arises when two different fricatives occurring in a target word are both replaced with a glide. This occurs in a word like *shovel*, for instance, where both the grooved palato-alveolar fricative and the voiced labiodental fricative are pronounced as /w/. One theoretical framework that could elegantly account for what is happening when such substitutions manifest is presented in Dinnsen (1997, p. 84), where the phenomenon of "neutralization (delinking)" is discussed. It is also likely that the challenge to produce particular word shapes and place sequences (Bernhardt &

Holdgrafer, 2001) could be influencing types of omissions or substitutions that occur. In the word *shovel*, Sam also omits the final liquid /l/. Interestingly, however, Sam is capable of producing the labiodental /v/ correctly in the word *feather*, where he substitutes /v/ for the voiced interdental fricative.

There are also other substitutions and omissions. Sam substitutes the phoneme /s/ for /f/ in some word final positions of monosyllabic words, e.g., in the word *knife*. It is interesting that by using this substitution, he renders both consonants alveolar. In general Sam's speech is characterised by the stopping of affricates (e.g., *chips*, pronounced with initial /t/), yet he manages to produce affricates in the word *church*. This phenomenon could be explored via Bernhardt's (1994) proposition that there may be an upper limit for number of segments within a word for some children, and may account for seeming inconsistencies of why some children can produce certain sounds in some contexts and not others. Sam does, however, also reveal inconsistent repetitions of his own attempts, e.g., saying *dun* for *gun* immediately followed by the correct target (which may reveal increasing awareness). Whereas Sam generally retains anterior coronal (e.g., alveolar) stops, he tends to omit the /t/ phoneme in multisyllabic words. In words like *octopus* for instance he retains vowels, but omits all consonants with the exception of the /p/. This word requires articulatory movement for consonants in a dorsal-coronal-labial-coronal direction and highlights challenges involved in articulation of words that have multiple place sequences. Consonant cluster reduction, e.g., in words like *plane* and *star*, is frequent in Sam's speech. However, when he tries to imitate the word *hippopotamus* (a CVCVCVCVCVC word without clusters), Sam deletes whole syllables (here, the second and the fourth).

Overall, Sam's speech is easier to understand when the topic of discussion is known. In rapid, connected communication, his speech can be difficult to understand. Intelligibility of Sam's speech is considerably influenced by the types of omissions and substitutions of consonants in various linguistic contexts; and is also exacerbated by vowel distortions (to be presented in future papers). However, consonants are but one aspect of speech.

## Suprasegmental features

Unusual suprasegmental features (e.g., stress or intonation) can also make intelligibility challenging, especially in combination with non-normal articulation. In tasks where we elicited isolated words or short phrases, Sam's prosody is often not age appropriate. When he deliberately focuses on his consonants, Sam tends to pronounce multisyllabic words with all syllables receiving (approximately) equal stress, and sometimes with pauses between syllables. Thus *blackbird* was imitated as indistinguishable from *black bird*; Sam's pronunciation of *crocodile* sounded like three equally stressed syllables, with a pause after the first and the diphthong /oU/ in the second. Normally we would expect even four year olds not to have such difficulties (Velleman, 2003).

Does Sam produce any stress contrasts? At times, he does. In connected speech, unintelligible though he is, Sam does not always place deliberate stress on every syllable. Even the short phrase *this one*, while simplified segmentally (no fricatives; an initial stop), exhibits normal main stress on the determiner.

Let us compare how well two different theoretical perspectives handle Sam's speech data. The first perspective is IPA-based and focuses on phonetics. Given that the International Phonetic Alphabet provides symbols for primary stress and for secondary stress (which can readily be

extended to tertiary and subsidiary stress as well), Sam's speech can be analysed by recording the level of stress on each syllable. Multisyllabic words or utterances pronounced by normal English-speaking adults typically contain many stress levels and can thus be quite challenging to notate. But Sam's speech is not. Three equal primary stresses for *crocodile*, or simple primary–nonprimary contrasts (as in this one) can be readily transcribed. The IPA-based view leads one to hypothesise that Sam has a simplified non-segmental phonology: essentially, he lacks secondary or tertiary stress. The easiest way for him to handle longer words where consonant combinations present a challenge – be they bisyllabic compounds (*blackbird*) or trisyllabic words (*crocodile*) – is to stress each syllable equally.

This, however, is not the only possible approach. We will argue, in fact, that the preceding paragraph is not the best or fairest way to characterise Sam's non-segmental strengths and weaknesses. We therefore briefly turn to a different view of stress in normal adult English, based on Ladefoged (2001). In contrast to the multilevel, IPA-based approach, we will call the alternative the triple strong-weak theory. In a nutshell, this view claims that when normal English-speaking adults pronounce words like *exploitation* with four different levels of stress, they do so because they are simultaneously satisfying three strong-weak distinctions.

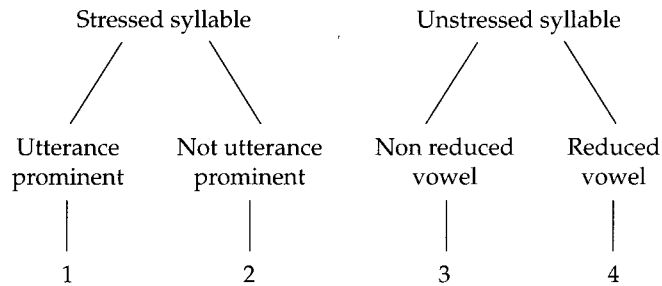
Before deriving this cumulative interactive effect, let us present the three basic contrasts in turn. The first strong-weak distinction is lexical. Thus some bisyllabic words come out as strong-weak, while others are weak-strong. The word *export* is strong-weak when retrieved from memory as a noun, and weak-strong when a verb. Syllables that are not lexically strong are of two kinds: reduced (pronounced as schwa) or non-reduced. This is a second and different type of prominence contrast, i.e., a second and different type of strong-weak contrast. To exemplify, *support* (with a schwa in the first syllable) has a somewhat different stress profile to the verb *export*, at least for normal adults.

The final strong-weak contrast pertains to the syllables that have already been lexically stored as strong. Basically, some of them are pronounced stronger than others because of extra utterance-level emphasis. Thus the adult phrase *black birds*, contains two stressed words, but the noun is usually perceived to be more prominent than the preceding adjective.

As alluded to earlier, secondary and tertiary stresses emerge as the phonetic by-product of this underlying phonology. When a word is pronounced in isolation in citation form, it is a one-word utterance. It is therefore subject to both lexical and utterance-level stress. If the cited word is sufficiently long, it can be perceived with four different levels of prominence. Thus, for normal English-speaking adults, *exploitation* can be represented as follows:

		*	
*		*	
full	full	full	schwa
ex	ploi	ta	tion

Two syllables – those that are asterisked – are lexically strong. Following the standard rule of English phonology, the last of the lexically strong syllables receives extra utterance-level prominence – hence the topmost asterisk. The non-asterisked syllables are lexically weak – but, being a reduced schwa, the final syllable is the least prominent in the whole word. In short, primary stress falls on syllables that are strong from the point of view of all three strong-weak contrasts. So-called “secondary stress” arises when a lexically strong syllable is not the most prominent syllable in an utterance. We can show this diagrammatically as follows:



(Recall that in *exploitation*, *ta* shows level 1 stress, *ex* level 2, *ploi* level 3 and *tion* level 4.)

This triple strong-weak theory casts interesting light on Sam's non-segmental phonology. Basically, it leads us to ask: how many types of strong-weak contrast has Sam acquired? It turns out that he has acquired all three. Sam's phrase *this one* demonstrates the utterance-level strong-weak pattern. Within words, Sam can also produce a strong-weak pattern. We heard this especially in connected speech when Sam names his playmates Matthew and Molly. Both names are lexically strong-weak, and were so pronounced. Although Sam rarely uses schwa when producing isolated words, this reduced vowel does occur in his connected speech, demonstrating mastery of the final type of English strong-weak differentiation. All this implies that, contrary to initial appearances, Sam's non-segmental phonology is not a simplified version of the adult system. There is in fact no crucial element that he lacks. What he has difficulty with is co-ordinating different types of co-occurring prominence contrasts. When this is overwhelming (e.g., in the presence of multiple consonant distinctions), his default strategy is to stress each syllable with pauses in between. In this style of speaking, each syllable is a phonologically separate utterance.

We consider it significant that Sam's segmental phonology exhibits the same tendency. While Sam can produce almost all English consonants in some context or other, combining multiple points of articulation within a word is challenging. In such circumstances, Sam reverts to default behaviour (e.g., total assimilation or default to glide). Thus Sam's underlying deficit (differentiating several similar but subtly different elements inside a word) can be seen as uniformly accounting for both the segmental and the non-segmental aspects of his disordered speech. Recall moreover Sam's attempts to pronounce *hi(ppo)po(ta)mu(s)* and *o(ct)opu(s)*, with stress indicated by underlining and omissions in brackets; *hippopotamus* led to syllable deletion, while in *octopus* the vowels were maintained but all consonants except /p/ sacrificed.

Sam also provides phonologists with evidence that favours Ladefoged's (2001) position against the multilevel IPA-based approach to stress. Ladefoged argues that the latter ignores English phonology and is thus less elegant. We find it worth mentioning that the IPA-based view is difficult to apply consistently. Dictionary transcriptions either leave out secondary stress entirely, or include it but typically in a very inconsistent manner. Understanding the underlying phonology circumvents these problems and inconsistencies for lexicographers. Sam's speech is likewise best characterised using phonology as well as phonetics.

## Conclusion

Obviously we are not recommending that every client's assessment data requires input from both a clinician and a phonologist. However, when dealing with difficult or unusual cases, both professions stand to benefit from each other's perspectives. During our discussions, both authors used both top-down (theory to data) and bottom-up (data to theory) thinking, but often in complementary ways.

Collaboration and consideration of both segmental and suprasegmental parameters has been shown to yield more apt analyses for an individual client, as well as evidence casting light on more theoretical debates. In line with Velleman and Shriberg (1999), we have also demonstrated the potential of exploring associations between syllable and word structure variables and suprasegmental production patterns. Moreover, we have provided explanation regarding apparent inconsistency, which is why a child with a severe speech disorders may be able to produce particular segments adequately in certain contexts and not in others.

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