

# Idiosyncratic sound systems of the South African Bantu languages: Research and clinical implications for speech-language pathologists and audiologists

**Authors:**

Anita van der Merwe<sup>1</sup>  
Mia le Roux<sup>1</sup>

**Affiliations:**

<sup>1</sup>Department of Speech-Language Pathology and Audiology, University Of Pretoria, South Africa

**Correspondence to:**

Anita van der Merwe

**Email:**

anita.vandermerwe@up.ac.za

**Postal address:**

PO Box 70030, The Willows,  
Pretoria 0041, South Africa

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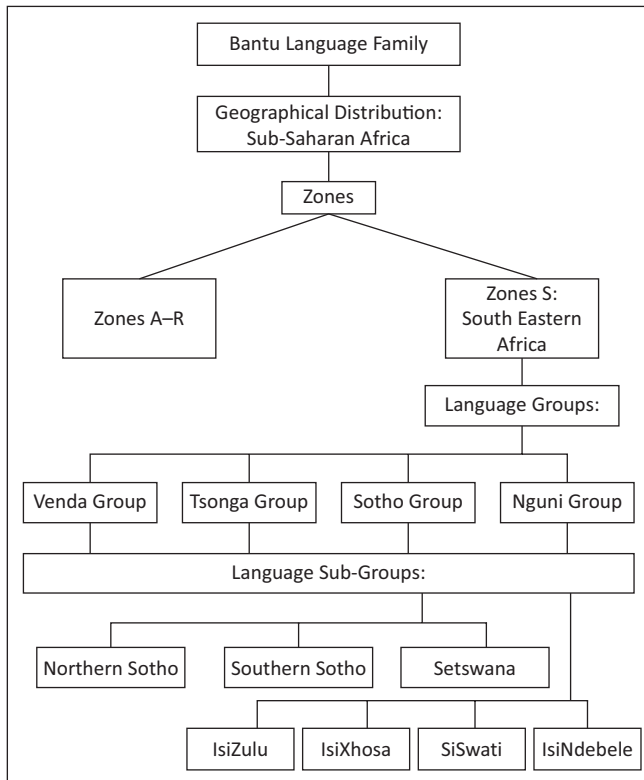
The objective of this article is to create awareness amongst speech-language pathologists and audiologists in South Africa regarding the difference between the sound systems of Germanic languages and the sound systems of South African Bantu languages. A brief overview of the sound systems of two Bantu languages, namely isiZulu and Setswana, is provided. These two languages are representative of the Nguni language group and the Sotho group respectively. Consideration is given to the notion of language-specific symptoms of speech, language and hearing disorders in addition to universal symptoms. The possible impact of speech production, language and hearing disorders on the ability to produce and perceive speech in these languages, and the challenges that this holds for research and clinical practice, are pointed out.

## Introduction

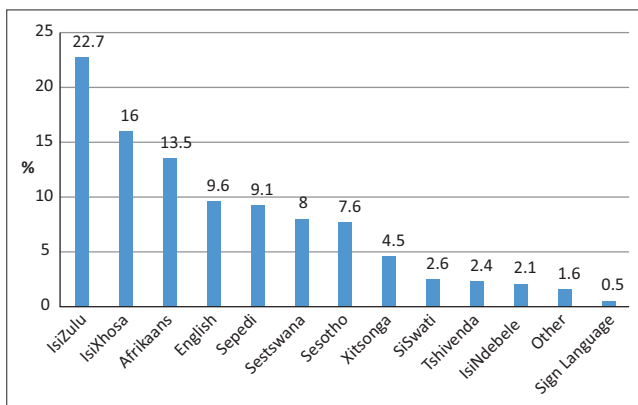
Speech-language pathologists (SLPs) and audiologists in South Africa have to serve a linguistically diverse population. Additionally, SLPs and audiologists come from different language backgrounds. South Africa is a multilingual country with 11 official languages. Two of these languages, English and Afrikaans, are Germanic languages, whilst the remaining nine are South African Bantu languages. The Bantu languages of South Africa belong to the Bantu language family which is a single, fairly homogeneous family of languages. The linguistic uniformity of this family of languages was noted by early linguists and, in 1862, Bleek (Ziervogel, 1967:7) introduced the term 'Bantu languages' for referring to languages sharing certain linguistic characteristics. The term 'Bantu language family' therefore refers to a family of languages that shares various linguistic features. Between 300 and 600 Bantu languages are spoken in large areas of central and southern Africa, and are geographically the most widespread language group in sub-Saharan Africa (Guthrie, 1948; Herbert, 1990). Guthrie (1948) divided the languages belonging to the Bantu language family into 16 geographical zones labelled from A–S, with subdivisions within the zones indicated numerically. The South African Bantu languages belong to the South-Eastern Bantu language zone, and more specifically to Zone S. Within South Africa, there are four language groups: the Nguni group, Sotho group, Venda group and Tsonga group (Cole, 1992; Doke, 1967; Jacobson & Traill, 1986; Poulos & Bosch, 1997). The focus in this article is on isiZulu and Setswana. IsiZulu belongs to the Nguni group, and Setswana belongs to the Sotho group. The subdivisions within the Bantu language family in Sub-Saharan Africa are summarised in Figure 1.

The distribution of languages spoken in South Africa is reflected in Figure 2. IsiZulu is the most widely spoken; it is the first-language of about 22.7% of the country's population of approximately 50 million people. Most isiZulu speakers reside in the province of KwaZulu-Natal. As first-language, Setswana is spoken by 8.2%, English by 9.6%, and Afrikaans by 13.5% of the population (Statistics South Africa, 2012). Setswana is primarily spoken in the North West Province of South Africa. According to Guthrie's (1948) classification, isiZulu is indicated as belonging to zone S. 42, whilst Setswana belongs to zone S.30.

The objective of this article is to introduce SLPs and audiologists who are not first-language African language speakers, to the unique sound systems of isiZulu and Setswana. Many of the sound characteristics to be discussed also apply to other languages from the Nguni and Sotho groups and to Tsonga and Venda. The intention is not to present an exhaustive account of the sound systems. For such detail, the reader should consult the relevant references cited in this article, and Van der Merwe and Le Roux (2014). The aim is rather to introduce the reader to this topic and to raise awareness of the difference in sound systems of the Bantu languages and Germanic languages, and to point out some of the research and clinical implications. The ultimate aim is to create awareness of the notion of *language-specific symptoms* of speech, language and hearing disorders (Miller, Lowit & Kuschmann, 2014). Salient features of disorders as portrayed in the literature are mostly based on English language studies. These could be *universal language-independent*



**FIGURE 1:** Language groups found in the south-eastern zone of Africa, with special reference to the Nguni and Sotho sub-groups.



Source: Statistics South Africa. (2012). *Census 2011: Census in brief. Report no.: 03-01-41*. Pretoria: Statistics South Africa, p.4.

**FIGURE 2:** Distribution of languages spoken in South Africa.

symptoms and may portray signs as they would be presented in a Germanic language and in other languages such as the Bantu languages. However, the idiosyncratic features of the sound systems of the Bantu languages suggest the reality of Bantu language specific symptoms. As background to such a statement and its consideration in clinical practice and research, it is firstly necessary to briefly outline the idiosyncratic characteristics of the sound systems of isiZulu and Setswana as models of the Bantu languages.

## Sound system characteristics and the associated motoric mechanisms

The following discussion focuses on the sound system features that are characteristic of isiZulu and Setswana, but which are *not present* in Germanic languages. These features

are important to take note of as each is *phonemic* and carries lexical or grammatical meaning. For example, the absence of a specific feature may change a specific phoneme into another phoneme. Examples of phonemic differentiation are presented in the following discussion. As SLPs and audiologists, we have to be aware that an inability to accurately *produce* these features during speech production will affect the intelligibility of a message. On the other hand, the inability to *hear* or *understand* these features will affect the accurate reception of a message.

Various phoneticians have worked in the field of Bantu language phonetics. The information in the following sections and in Table 1 was compiled from a number of sources (e.g., Cole, 1992; Cope, 1983; Doke, 1967; Poulos & Bosch, 1997; Taljaard & Snyman, 1993; Ziervogel, 1967). However, a rich body of literature exists on this topic.

### Lexical tone variation

Lexical tone is also referred to as word tone, contour tone or syllabic tone. Lexical tone should be *distinguished from intonation* which is a prosodic feature of Germanic languages and of Bantu languages. Intonation refers to meaningful pitch changes at the *sentence level*. Other prosodic features include speech rate (tempo), stress (loudness) and rhythm (Crystal, 2003; Zerbian & Barnard, 2008).

Tone, as opposed to intonation, comprises *syllable level* pitch variations and may distinguish different meanings in phonologically similar words. All Bantu languages are *tone languages* (Cole, 1992; Doke, 1967; Khumalo, 1990; Zerbian & Barnard, 2008). Tone languages use pitch contrastively at the word level to indicate word meaning (Wong, Perrachione, Gunasekera and Chandrasekaran, 2009). Both isiZulu and Setswana implement two phonological tones – high tone (H) and low tone (L). These may occur in different combinations in words; for example, HH, LL, HL or LH on bi-syllabic words. Tone is apparent on vowels and syllabic consonants. Tonal information is not indicated in the orthography of these languages (Cole, 1992; Doke, 1967; Khumalo, 1990; Zerbian & Barnard, 2008). The following two Tswana words illustrate two phonemically similar words that are only distinguished by tone: *bó.nà* (to see) and *bò.ná* (they). In these examples, tone is indicated to illustrate the function of tone variation. Tone in the first word is HL (or: rising, falling) and in the second word it is LH (or: falling, rising).

Tone variation is achieved by manipulation of the length of the vocal folds. The physical attribute is fundamental frequency, and the perceptual correlate is voice pitch. The acoustic change results from the state of this single articulator. Laryngeal muscle contraction and relaxation, which determine vocal fold tension, must be sequenced to produce pitch variation (Zhang, 2008). Absence or distortion of tone variation will affect intelligibility. Inaccurate tone may render a word as jargon or a substitution with another word.

### Air stream mechanisms and sound classes

An *exclusively pulmonic* air stream is implemented in Germanic languages. On the other hand, the air stream

**TABLE 1:** Occurrence of specific sound system characteristics in English, Setswana, and isiZulu.

Sound system characteristic	English	Setswana	isiZulu
<b>Number of consonants</b>	24	34	59
Consonant clusters	Yes, do occur	No	No
Number of vowels	14 (may vary in different regions)	7 basic and 4 raised	5 and 2 variants
Diphthongs	Yes, do occur	No	No
<b>Manner of air stream release of consonants:</b>			
Plosives	Yes	Yes	Yes
Affricates	Yes	Yes	Yes
Fricatives	Yes	Yes	Yes
Nasals	Yes	Yes	Yes
Approximants	Yes	Yes	Yes
Trills	No	Yes	Yes
Ejectives	No	Yes	Yes
Implosives	No	No	Yes
Clicks	No	Yes, in interjections and loan words	Yes
Pre-nasalised	No	No	Yes
<b>Air stream mechanism:</b>			
Pulmonic	Yes	Yes	Yes
Glottalic	No	Yes	Yes
Egressive	No	Yes	Yes
Glottalic ingressive	No	No	Yes
Velaric (for clicks)	No	Yes	Yes
Velaric + pulmonic	No	Yes	Yes
<b>Nature of air stream release:</b>			
Voiced	Yes	Yes	Yes
Voiceless	Yes	Yes	Yes
Aspirated	Yes (not phonemic)	Yes (not phonemic)	Yes (not phonemic)
Breathy voice	No	No	Yes (not phonemic)
Partially voiced	No	No	Yes (not phonemic)
<b>Syllable structure:</b>	CV, VC, CVC, CVCV	V, C, CV	V, C, CV

utilised during the articulation of the sounds of isiZulu and Setswana is pulmonic, glottalic egressive, glottalic ingressive or velaric (lingual). The following sounds occur in isiZulu and Setswana: vowels, plosives, implosives (present in isiZulu), ejectives, affricates, trills, fricatives, approximants, nasals and clicks. Clicks are characteristic of Nguni languages. The different click positions are: dental, palatal and alveo-lateral. Consonant clusters do not occur in the Bantu languages (Cole, 1992; Finlayson, Jones, Podile, & Snyman, 1990; Ladefoged & Maddieson, 1996; Zerbian, 2009; Ziervogel, 1967).

The *pulmonic* air stream is utilised to produce vowels, plosives, affricates, trills, fricatives, approximants and nasals. These are sounds that occur in both Germanic and Bantu languages. Use of the pulmonic air stream mechanism implies that lung air is pushed through the vocal tract by the action of the respiratory muscles. Implosive sounds in isiZulu make use of the *glottalic ingressive* air stream. Ejectives in both isiZulu and Setswana implement a *glottalic egressive* air stream and are stops that require the larynx to be raised rapidly upwards to increase supraglottal pressure. Air above the glottal closure is then released with greater amplitude in the stop burst. The *velaric* air stream is used to produce clicks (Ladefoged & Maddieson, 1996:78).

A combination of air streams may be used in sounds such as nasalised clicks in isiZulu. Both the pulmonic and velaric

air stream mechanisms are employed: the pulmonic air stream mechanism for articulation of the nasal segment, and the velaric air stream mechanism for articulation of the click component (Cole, 1992; Ladefoged & Maddieson, 1996; Zerbian, 2009; Ziervogel, 1967). Speech production in the Bantu languages necessitates alternation between the pulmonic and other air stream mechanisms or the simultaneous control of more than one air stream.

### Nature of air stream release

isiZulu and Setswana speech sounds can be voiced, voiceless or aspirated. In isiZulu, sounds can also be breathy-voiced (partial or fully breathy-voiced). Aspirated sounds and breathy-voiced sounds are *phonemic* and can therefore differentiate lexical meaning in isiZulu and Setswana. In both languages, aspiration is usually indicated in the normal orthography by an 'h'. For example, in Setswana, *thaba* means 'mountain' whilst *taba* means 'case', such as a legal case. Aspiration of the sound differentiates these two phonemes (/t/ and /th/). Breathy voice is not indicated in the orthography of isiZulu, but is phonemic (Taljaard & Snyman, 1993; Van Rooy & Grijzenhout, 2000).

For production of both aspirated and breathy-voiced sounds, a greater rate of airflow than occurs in modal voice is forced through the vocal folds. During aspirated sounds, the arytenoid cartilages may be further apart than during voiceless sounds (Ladefoged & Maddieson, 1996:48).

The term 'breathy voice' describes sounds that have a high respiratory flow rate and a loose form of vibration of the vocal folds (Ball & Rahilly, 1999; Ladefoged & Maddieson, 1996:48, 57). Production of both aspirated and breathy-voiced sounds has to be controlled on the level of the vocal folds and by adaptations in the rate of expiratory airflow. The vocal fold movements and airflow manipulation have to be coordinated over and above the diadochokinetic abduction and adduction movements of the vocal folds for voiced and voiceless sounds.

### Nasalised consonants

Pre-nasalisation or partial nasalisation of sounds are features of isiZulu. Pre-nasalised or partially nasalised sounds differ from nasal sounds. During *nasal* sounds, the velum is lowered and air from the lungs is directed out through the nasal passage alone. *Nasalisation* refers to nasal airflow that accompanies oral airflow (Ladefoged & Maddieson, 1996:102, 118). Affricates, plosives and clicks can be pre-nasalised or partially nasalised in isiZulu (Cope, 1983). Production of nasalised sounds requires change of the velar position while maintaining essentially static positioning of the other articulators (Ladefoged & Maddieson, 1996:118).

### Syllable structure in isiZulu and Setswana

In Bantu languages, syllables may consist of a single vowel (V), a single consonant (C) – a syllabic C, or a CV structure. Word stems are usually disyllabic, but prefixes and suffixes may be added to represent, for example, a noun class prefix, diminutive, female sex, past tense, passive form of the verb, locative adverbs, or the plural (Cole, 1992:52; Taljaard & Snyman, 1993; Snyman, 1989; Ziervogel, 1967). IsiZulu and, to a lesser extent, Setswana make use of this conjunctive orthography. Conjunctivism refers to the convention of writing different elements of the same word conjunctively, that is, as one word (Louwrens, 1994:34). According to Cole (1992), the crux is word division and writing of certain groups of syllables conjunctively or disjunctively. The result of the agglutinating nature of isiZulu in particular is that words may contain several syllables. What appears to be a single word may in fact be a more comprehensive description with each affix adding meaning to a word stem or root.

In Table 1, the sound system characteristics of isiZulu and Setswana are compared with the sound features of English, and information is provided on the number of consonants and vowels and the types of consonants and vowels that occur in these languages.

### Stimuli selection in research and clinical practice

The brief overview of the idiosyncratic features of the sound systems of two Bantu languages highlights the *importance of stimuli selection* in research and clinical practice. Irrespective of our field of research, we have to be aware that the Bantu languages contain sound characteristics that do not occur

in the Germanic languages and that are not in all instances portrayed in the orthographical representation of a word. To the non-Bantu language speaker, the latter fact may pose a challenge in research and clinical intervention. Consequently, stimuli selection has to be considered carefully. The sound systems of each language or language group differ, and therefore best practice for an individual researcher or clinician is to focus on a specific language or language group and to become familiar with the idiosyncratic features of that particular Bantu language or language group. As SLPs and audiologists, we should involve experts in African languages during the planning stage of research. It is also evident that the mere translation of English assessment protocols is inefficient. There is a dire need for research that could inform clinical practice.

The development of stimuli (e.g., word lists) for a particular research project should be driven by the aims of the project. If the aim is, for example, to determine the effect of a particular communication disorder on tone variation, then tone patterns across the different stimuli should be controlled. It is also important to determine if each selected stimulus word is one of a minimal pair in terms of phonemes that occur in the word. Orthographically, a minimal pair will appear similar, but the tone pattern will determine the meaning of the word; this is of particular importance if pictures are used to depict a particular word.

The development of clinical assessment protocols and stimuli for research purposes is complicated by the absence of a Dewey-type index of relative phoneme and syllable frequency and an index of word frequency. The latter does exist for Southern Sotho. There is an absence of standardised passages or other comparable word lists for reading or other elicitation of speech (Jacobson & Traill, 1986). Jacobson and Traill (1986) developed intelligibility word lists for five Bantu languages with the aim of assessing intelligibility in speakers with glossectomy. To our knowledge, further research has not been done on these word lists. These lists may prove to be valuable for stimuli selection in different areas of research.

Regarding the development of speech and language in the Bantu languages, a few studies have been published (e.g., Maphalala, Pascoe & Smouse, 2013; Naidoo, Van der Merwe, Groenewald & Naude, 2005). This line of research needs to be continued in all of the local languages as normative data guide the compilation of assessment protocols and the treatment of children with speech and language disorders. It is important to determine at which age specific sounds and specific sound features are mastered. Also, the issues of effective tone variation and the syllable structure of words produced at certain ages need to be determined. As indicated previously, the affixes in words convey meaning, and the ability to add semantically meaningful prefixes and suffixes to word stems at certain ages should be explored.

The development and standardisation of *articulation assessment protocols* and *language development assessment protocols* for each

of the Bantu languages spoken in South Africa appears to be a necessity and a good starting-point for research regarding speech and language development. All sound features of a language should be represented in the words that are included in articulation assessment protocols. In language assessment protocols, the conjunctive or disjunctive writing style in these languages should be considered. However, to be able to develop such protocols, researchers and clinicians need data regarding communication development. The number and range of studies that need to be done are numerous. A few randomly selected examples of research questions are presented below. The intention of this article is to facilitate awareness of the idiosyncratic features and the need for research in this field, and not to provide an exhaustive account of all possible research topics.

The following are *examples of research questions* that could be addressed in individual studies:

- At what age does a first-language isiZulu-speaking (or Setswana-speaking) child start to vary syllabic tone in CVCV words?
- At what age does a first-language isiZulu child start to differentiate between breathy-voiced and modal voiced sounds?
- What is the order of development of dental, palatal and alveo-lateral clicks in first-language isiZulu-speaking children?
- What is the appropriate syllable structure for words included in assessment protocols at different ages?

## Potential effects of expressive and receptive disorders on communication in speakers of Bantu languages

The sound characteristics of African languages may have very specific implications for speech, language and hearing levels of processing and disorders on these levels. Internationally, very few studies have been done to determine language-specific signs and symptoms in languages other than English. Reference is made in the following sections to a few studies. As SLPs and audiologists in South Africa, we have to address the issue of *language-specific* symptoms in addition to *universal symptoms* of communication disorders. In the following discussion, the potential effects of expressive and receptive disorders on Bantu language-specific signs will be considered. Almost no research has been done in this field. The possible effects on different disorders, as mentioned in the following sections, are mere predictions and are speculative. The aim of the following discussion is to facilitate research and consideration in clinical practice in the respective fields.

### Speech and voice production

The nature and typical signs of speech and voice disorders as described in the literature are largely based on the results of studies using speakers of the English language. The typical signs of these disorders as they present in English may be

generalised to other Germanic languages, but it is likely that additional signs or idiosyncratic variations of these signs, driven by the sound systems of, for example, the Bantu languages, may be present. The study of such symptoms may elucidate the nature of speech disorders (Van der Merwe & Le Roux, 2014). An awareness of language-specific symptoms may also better equip clinicians.

Lexical tone variation has been studied in some populations with communication disorders, but these studies are mostly in East-Asian tone languages such as Mandarin Chinese (Whitehill & Wong, 2007; Wong, *et al.* 2009). One study has been published that focused on tone disruption in speakers of Shona, a Bantu language spoken in Zimbabwe (Kadyamusuma, De Bleser & Mayer, 2011). The participants presented with either left hemisphere or right hemisphere brain damage. They found lexical tone disruption and an inability to manipulate pitch in both left and right hemisphere-damaged Shona-speaking participants. There was also a discrepancy between the production and perception of lexical tone for both groups of brain-damaged clients (Kadyamusuma, *et al.* 2011).

Two research projects have been undertaken at the University of Pretoria to explore the nature of speech signs in Bantu language speakers with motor speech disorders. An unpublished study (Apraxia of speech in a multilingual individual: Speech signs across languages) by Coetzee, De Jager, and Van der Merwe (2011) found speech signs in a multilingual individual with apraxia of speech (AOS) which were similar to the signs described for English. However, additional errors specific to the sound systems of the two African languages (isiZulu and Setswana) were click distortion, click deletion, de-aspiration, and omission of syllabic tone variation. The latter was the most frequent of all speech errors. The second unpublished study (Dysarthria speech characteristics of African language speakers) (Mahwayi, Uys & Van der Merwe, 2011) explored signs of dysarthria in two isiZulu speakers. One participant presented with severe dysarthria whilst the other presented with a unilateral upper motor neuron (UMN) dysarthria after a stroke. The first participant's speech was severely affected and language-specific errors could not be identified. The second participant who presented with the typical left-sided unilateral spastic paresis of the lower quarter of the face and half of the tongue displayed the characteristic slight distortion of articulation, but also unexpected errors such as omission of syllabic tone variation, de-aspiration of aspirated sounds, and pre-nasalisation errors. The latter are unexpected as the vocal folds, the velum, or breathing muscles are not affected in a unilateral UMN dysarthria. The noted errors affected intelligibility severely. The effect on intelligibility was disproportional to the mild nature of signs reported in English language studies (Duffy, 2013:42).

These preliminary studies indicate language-specific signs in motor speech disorders in the Bantu languages. The studies may also suggest that speech production in isiZulu and Setswana places high demands on the speech control

system. For example, tone variation adds another level of control of the vocal folds during syllable production over and above the abduction and adduction of the vocal folds for the production of voiced and voiceless sounds and the change in intonation across the sentence. Also, the alternation between different air stream mechanisms, which is not necessary in Germanic languages, may affect ease of control. The Bantu languages contain no consonant clusters and diphthongs that may ease motor control demands but, on the other hand, these languages have more phonemes, and therefore more core motor plans need to be stored in the sensorimotor memory (Van der Merwe, 1997; 2009).

Further research in the field of neurogenic motor speech disorders, but also many other speech production disorders such as stuttering, cleft lip and palate, and also voice disorders as they present in African languages, is necessary. The outcomes measures could be accuracy of production in speech-focused studies. Data analysis procedures could entail *acoustic analyses* or *narrow* phonetic transcription that notes errors such as distortion of sounds and word tone errors. *Broad* perceptual analysis is not appropriate as this method only focuses on errors such as substitutions, additions and omissions of phonemes. It needs mentioning that narrow perceptual analysis is a specialised skill that has to be developed with experience.

In clinical practice, clinicians have to be aware of the potential effect of speech production disorders on *speech intelligibility*. Treatment of a speaker of a Bantu language should target the specific sound characteristics of the language, such as lexical tone variation, aspiration, pre-nasalisation, breathy-voiced sounds, click production, and articulation of long conjunctively written words containing numerous syllables.

Examples of possible research questions in this field could be:

- Do voice disorders affect tone variation?
- Is tone variation affected by stuttering?
- Does the presence of dysarthria affect the ability to produce aspirated as opposed to non-aspirated sounds?
- What is the effect of ataxic (or hyperkinetic/hypokinetic) dysarthria on the alternation between air stream mechanisms during the production of words?
- Do multilingual individuals with apraxia of speech (or acquired dysarthria) display equal numbers of speech errors across the Germanic and Bantu languages that they are equally proficient in, and in which error category is there a difference, if any?
- Is speech intelligibility equally affected across Germanic and Bantu languages in bi/multilingual individuals with a motor speech disorder (e.g., unilateral UMN dysarthria)?

Of particular importance in this field is the development of *speech intelligibility tests* in all South African Bantu languages. Change in intelligibility is an important *outcomes measure* in evidence-based practice in the field of speech disorders. An intelligibility test in Sepedi (Northern Sotho) was

developed by Fouche and Van der Merwe in 1999. The test contains four word lists, each comprising 27 words, and a set of 12 multiple-choice items for each word. The phonetic environments of plosives, fricatives, continuants and trills are controlled in the stimuli. Language-appropriate aspirated bilabial, alveolar and velar sounds are included. The authors had at the time some knowledge of the language, but a lack of in-depth knowledge of the sound system of Sepedi prevented development of stimuli that were representative of all the sound classes of the language and that considered tone differentiation during the production of words (Van der Merwe & Le Roux, 2014). Although it was an important first step, this test has to be developed further. There are lessons for future researchers to be learnt from this attempt (see Van der Merwe & Le Roux, 2014 for a discussion of this issue).

### Expressive and receptive language

The relevance of the sound system of a language is not as obvious in language disorders as in motor-based communication disorders. However, there appears to be some relevance. In language disorders such as aphasia, delayed language development, and developmental phonological disorders, the sound characteristics of Bantu languages could also drive some of the presenting signs. In Bantu languages, the reception and use of, for example, lexical tone variation may be compromised in aphasia and in children with delayed language development. To our knowledge, no research has been conducted to establish if, for example, tone *production* is affected in individuals suffering from Broca's aphasia or tone *reception* in individuals with Wernicke's aphasia. Moreover, the agglutinating nature of isiZulu words in particular may challenge expressive and receptive processes in individuals with aphasia or children with delayed language development.

The following are examples of possible research questions in this field:

- Does a receptive language disorder also affect the reception and comprehension of lexical tone variation?
- Are Bantu language-speaking children with delayed language development also delayed in their use of lexical tone variation?
- Do the same developmental norms in auditory perception tests apply for first-language tone language-speaking children and non-tone language-speaking children?

### Hearing

A hearing loss may affect the *reception* and *production* of spoken language during communication in a Bantu language in a very specific way. The individual with a hearing loss may be unable to perceive and therefore produce tone variation or the aspirated, breathy-voiced, implosive or pre-nasalised elements of sounds – all of which carry lexical meaning. Differentiation between phonemes in Bantu languages is dependent on these factors in addition to those that determine phoneme differentiation in the Germanic languages. These

variables may be important in the selection of hearing aids for different language groups. The effect of a hearing loss on the *intelligibility* of Bantu language-speakers may also be an interesting field of research. Additionally, *normative data* utilised in temporal auditory tests need to be verified for both tone language and non-tone language-speakers as this may affect the diagnosis of the nature of a hearing disorder. This is a totally unexplored field, and the thoughts offered are merely speculative.

The following are examples of research questions that could be posed in this field:

- Is there any relationship between the frequency range of a hearing loss and the reception of different sound system features such as voicing of sounds, plosive sounds, breathiness and breathy-voiced sounds?
- Are speakers of a Bantu language who present with a hearing loss able to perceive lexical tone variation in minimal pairs of words?
- Do first-language speakers of tone languages and non-tone language speakers perform equally on temporal auditory tests?

## Conclusion

A brief overview of the idiosyncratic features of the sound systems of two South African Bantu languages and the potential implications for clinical practice and research are presented in this article. Such a review clearly shows that, as researchers and clinicians, we have to heed the effect of speech, voice and hearing disorders on intelligible speech and effective communication in these languages. We have to be aware of language-specific signs in communication disorders. The review points out many areas of potential research and emphasises the great need for such research.

The intent of the current article was not to focus on the consequences of bi/multilingualism upon disorders of language or speech production. However, the topic under discussion also highlights that the conditions in which we function in South Africa offer rich possibilities for studying bi/multilingualism and its consequences upon the presenting signs of speech and language disorders.

To serve all individuals in need of speech-language or hearing intervention in their preferred or dominant language in South Africa is a daunting task (Pascoe, Rogers & Norman, 2013). However, this challenge, viewed from a different perspective, becomes a fascinating opportunity for conducting research. The intent of this article is to provide some guidance for future research that in turn will inform clinical practice.

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### Competing interests

The authors declare that they have no financial or personal relationship(s) that may have inappropriately influenced them in writing this article.

## Authors' contributions

A.vd.M. (University of Pretoria) was the author of the entire article. M.le.R. (University of Pretoria) checked the accuracy of the content of the description of the sound systems of the African languages. In a chapter in press by both these authors, M.le.R contributed the original information on the sound systems and A.vd.M. rewrote that as well.

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