EFFECT OF DIALECT ON THE IDENTIFICATION OF SPEECH IMPAIRMENT IN INDIGENOUS CHILDREN

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The influence of dialect on child speech assessment processes is important to consider in order to ensure accurate diagnosis and appropriate intervention (teaching or therapy) for bidialectal children. In Australia, there is limited research evidence documenting the influence of dialectal variations on identification of speech impairment among Aboriginal and Torres Strait Islander children. The effect of dialect on the identification of speech impairment was therefore investigated in seven eight-year-old Aboriginal and Torres Strait Islander Australian children living in Townsville, Queensland. Up to eighty words were transcribed from a connected speech sample and phonological patterns were analysed using contrastive analysis. The number of participants identified with a speech impairment decreased when typical characteristics of Australian Indigenous Englishes (AIE) were used as the target reference rather than Standard Australian English (SAE).

KEY WORDS: dialect, Aboriginal English, speech impairment

INTRODUCTION

Speech impairment during childhood may have long-term effects on one's communication skills, socioemotional health, academic success and future employment opportunities (McTurk, Nutton, Lea, Robinson, & Carapetis, 2008; Lewis, Freebairn, & Taylor, 2000; Nathan, Stackhouse, Goulandris, & Snowling, 2004). It is therefore important that teacher referrals and speech-language pathology assessment accurately identify speech impairment and targets for therapy (Baker & Bernhardt, 2004; Toohill, McLeod, & McCormack, 2012). The identification of speech impairment is a complex and multifaceted process that is further complicated if the child is multilingual due to interference between sound systems and lack of appropriate cross-linguistic normative guidelines (Goldstein & Iglesias, 2013).

Aboriginal and Torres Strait Islander (hereafter referred to as Indigenous) children living in rural and remote communities are more likely to be multilingual than those in urban communities due to use of traditional languages, creoles and non-standard dialects of English (Butcher, 2008; Malcolm et al., 1999; Simpson & Wigglesworth, 2008). Australian Indigenous Englishes (AIE) are also the first and main language of communication for many

Aboriginal and Torres Strait Islander children (Australian Institute of Aboriginal and Torres Strait Islander Studies, 2005; Butcher, 2008). At present, no clinical guidelines or standardised tests are available to assess speakers of AIE or to differentiate between speech difference and speech impairment in Australian Indigenous children (Cahir, 2011; Gould, 2008, 2009; Williams & McLeod, 2012). Despite this, standardised assessments are still frequently administered to qualify children for services without consideration of the stage of multilingual development or linguistic or sociocultural differences (Cahir, 2011; Gould, 2008, 2009; Pearce & Williams, 2013). In some cases, due to the inappropriateness of available standardised assessments, speech-language pathologists (SLPs) create and administer their own informal measures to assess Indigenous children's speech (Limbrick, McCormack, & McLeod, 2013). Such assessments should be interpreted with caution due to their lack of operationalisation (Limbrick et al., 2013).

Other important issues include knowing the appropriate age to evaluate a bidialectal child's speech and, in the absence of speech impairment, whether intervention (teaching or therapy) is necessary to obtain second dialect proficiency (Siegel, 2010; Toohill et al., 2012). Siegel (2010) suggests that the 'sensitive period' occurs up to seven years for simple phonological rules and up to thirteen years for suprasegmentals. Many Indigenous children also have little exposure to SAE prior to attending school and therefore, only begin to acquire and use SAE during the school years (Gould, 2008; Siegel, 2010). Thus, bidialectal children under the age of seven may still be acquiring the phonology of their dialects and therefore, differentiation between speech difference and speech impairment may be difficult (Siegel, 2010; Toohill et al., 2012). However, if teachers or SLPs wait until after age seven the child misses the prime time for early intervention and optimum therapy outcomes (Limbrick et al., 2013; Nelson, Nygren, Walker, & Panoscha, 2006).

Children who do not speak a version of the 'standard' dialect are at greater risk of being negatively perceived by persons outside of their speech community (Goldstein & Iglesias, 2001). Thus, proficiency in both SAE and AIE may be important for the child's future success; and code-switching control may help the child to maintain their cultural identity and relationships with their linguistic communities, whilst also promoting educational success (Berry & Hudson, 1997; Couzos, 2004; Limbrick et al., 2013). Teachers and speech-language pathologists should therefore support children to develop mastery of both dialects (Berry & Hudson, 1997; Toohill et al., 2012).

The speech and language skills of Australian Indigenous children are likely to be screened or assessed by non-Indigenous teachers or SLPs unfamiliar with the child's home language (Gould, 2008; Verdon, McLeod, & McDonald, 2014; Williams & McLeod, 2012). Most SLPs report some difficulties assessing multilingual children due to the lack of developmental data on the child's language and the availability of culturally appropriate tools (Cahir, 2011; Toohill et al., 2012; Williams & McLeod, 2012).

Dialectal features need to be considered when assessing Indigenous bidialectal children in order to accurately differentiate between dialectal difference and speech impairment (Goldstein & Iglesias, 2001; Toohill et al., 2012; Washington & Craig, 1992). Failure to consider dialectal difference during assessment may lead to misidentification of speech impairment (Goldstein & Iglesias, 2001; Gould, 2008; Toohill et al., 2012; Washington & Craig, 1992), including over-identification of speech errors or under-identification, assuming dialect to be responsible for all errors (Cahir, 2011; de Plevitz, 2006; Goldstein & Iglesias, 2001; McGregor, Williams, Hearst, & Johnson, 1997; Stockman, 2010). Under- and over-identification can lead to inappropriate educational or therapeutic support decisions (Friberg, 2010, p. 86). In the Australian context, it is therefore important that SLPs possess a sound understanding of the common phonological features of AIE dialects.

AIEs differ from SAE at all linguistic levels from phonology to pragmatics (Butcher, 2008; Eagleson, 1982; Kaldor & Malcolm, 1979, 1982, 1991; Sharpe, 1977; Williams, 2000). Toohill et al. (2012) identified nineteen Australian Aboriginal English (AAE) phonological features from previous research (Butcher, 2008; Eagleson, 1982; Kaldor & Malcolm, 1979, 1982, 1991; Priman, 2002; Sharpe, 1977; Williams, 2000) with the most commonly reported Aboriginal English phonological features reported across the literature including /h/ deletion, alternation of voiced and voiceless plosives, fricatives alternating with stops (without consistent preservation of voiced and voiceless features) and consonant cluster reduction. See Toohill et al. (2012) for a comprehensive summary of features identified across the studies. The pervasiveness of these features is highly variable across regions of Australia and among individuals within Indigenous communities (Butcher, 2008). Shnukal's (2001) description of the features of Torres Strait English largely overlaps Toohill et al.'s (2012) description of Aboriginal English.

In their examination of fifteen Indigenous Australian children aged 3;11-5;00 years, Toohill et al. (2012) found that when dialect was considered, a statistically significant decrease was observed in seven children's severity classifications of speech impairment and one child no longer adhered to the criteria of speech impairment. The Aboriginal English phonological features produced by the participants of the study included /h/ insertion and deletion, primary stress on the first syllable and diphthongs alternating with monophthongs. These features were considered to be unique to AAE and not a developmental error for a four- to five-year-old or an error produced by a child with speech impairment. Research in other bidialectal communities also found similar results with a decrease in impairment severity ratings (e.g., Goldstein & Iglesias, 2001 for Spanish-English; Washington & Craig, 1992 for African-American English) and an increase in percentage of phonemes correct (PPC) when dialect was considered (Goldstein & Iglesias, 2001).

The aims of this pilot research study were to:

1) Determine the effect of minority dialect phonology on the identification of speech impairment in a small sample of eight-year-old Aboriginal and Torres Strait Islander children living in Townsville, Queensland. At this age, phonological development for a child's first language is essentially complete (McLeod, 2013).
2) Document the phonological features used by Indigenous children living in Townsville as clear documentation of the varieties of AIE spoken in the Townsville region was not identified in the literature.
3) Determine whether there was any relationship between teacher ratings of oral language ability and the number of AIE phonological features produced.

METHOD

This descriptive pilot study adapted the methodology used by Toohill, McCormack & McLeod (2012) to a small case series. Ethical approval for this research study was granted from the James Cook University Human Research Ethics Committee (16/10/2012) approval number H4796. The board of the school where the research was conducted also approved the study.

PARTICIPANTS

Participants were seven Indigenous children (4 males and 3 females) aged 8;01-8;11 years from an independent school in Townsville, Queensland. The school provides a culturally inclusive curriculum for Aboriginal and Torres Strait Islander children from Prep to Year 12. The majority of funding comes from government and private sources, with minimal fees required of families (Australian Curriculum, Assessment and Reporting Authority [ACARA], 2011a). Staff included both Indigenous and non-Indigenous teachers while most ancillary staff (e.g., teacher aides, administrative officers) were Indigenous. The school had one hundred percent Indigenous enrolment (ACARA, 2011b) and SAE was the language of instruction. AIE use was accepted within the classroom but students were encouraged to differentiate between SAE and AIE, and teachers assisted students in acquiring SAE forms required for literacy and academic success using the FELIKS approach (Berry & Hudson, 1997).

Purposive sampling was used to select the youngest age cohort (sample) from a small study of children aged 8–13 years (Pearce, Williams, & Steed, forthcoming). At this age, we expect that children will have mastered phonology (McLeod, 2013), and that any differences from SAE will be from either dialect transfer or a speech impairment. In their school records, six of the children were identified as Aboriginal and English speaking, and one child was identified as Torres Strait Islander, and speaking Yumplatok (Torres Strait Creole, see Sellwood & Angelo, 2013 and Shnukal, 2001). All participants were residents of Townsville (and had been for most of their schooling life), living with immediate or extended family members and were from low socio-economic backgrounds. None were identified by their teachers as having a speech impairment. Hearing records held by the school were limited so

it was not possible to reliably categorise the participants' aural health. For further demographic details see Table 1.

The parents/caregivers of the children were informed about the study through home visits conducted by an Indigenous staff member and through information sent home with the students. Consent forms were required from parents/caregivers, and assent given by the child participant prior to conducting the assessments. The researchers interacted with the children on several occasions to build rapport prior to conducting the assessments to elicit the speech samples used in this study.

PROCEDURES

The speech samples used for this study were extracted from language samples collected for another study (Pearce, Williams, & Steed, forthcoming). The recordings were of children retelling or creating three narratives based on picture stimuli from the Test of Narrative Language (TNL) (Gillam & Pearson, 2004). Recordings were made at the school in non-classroom areas using a small Olympus digital recorder and lapel microphone.

A sample of up to eighty different words (sixty content words: nouns, verbs, adjectives and adverbs; and twenty function words: determiners, conjunctions, and pronouns) was selected from each participant's narrative samples. Separating and including function words ensured that the word list was not biased towards function words, but acknowledged their potential impact on intelligibility through their frequency. The first twenty different content words from each of the three TNL stories and the first twenty different function words were selected to make the sample of eighty words (the first occurrence of repeated words was used). In cases where the participants produced a story that contained fewer than twenty different content words, additional words from the other stories were substituted. Two participants (#2 and #6) still did not produce enough different words to make up the sample of eighty words. The audio recording from participant #6's McDonald's retell (which consisted of only one utterance) was missing; therefore all distinct words from the other two stories (Late for School and Aliens story) were used for analysis.

The seven study participants were rated by their teachers as having high, average or low levels of oral language ability, shown in Table 1. The ratings were based on the child's overall performance within the classroom.

TRANSCRIPTION

The speech samples were broadly transcribed with narrow transcription used where appropriate to code phonemic differences. Transcription reliability was assured by consensus (Shriberg, Kwiatkowski, & Hoffman, 1984). Two judges transcribed the data independently using the audio-recordings. The first was a final-year speech-language pathology student and

the second a linguist with strong experience in transcription. Where discrepancies occurred, both judges re-listened to the recording and differences were resolved by consensus.

ANALYSIS

Each participant's words and transcription were used to calculate two accuracy measures, Percentage Consonants Correct (PCC) and Percentage Vowels Correct (PVC), by dividing the number of correctly produced consonants/vowels by the total number of consonants/vowels produced. A third compilation accuracy measure, Percentage Phonemes Correct (PPC), was calculated by dividing the total number of phonemes produced correctly (consonants plus vowels) by the total number of phonemes produced (consonants plus vowels). More detailed statistical analysis was not undertaken due to the small sample size.

The analysis method for this research study was based on that of Toohill et al. (2012). The contrastive analysis consisted of seven steps:

1) The children's responses were compared to SAE target words;
2) The SAE PCC, PVC and PPC measures were then calculated;
3) A defined set of possible AIE phonological features (Toohill et al., 2012; Shnukal, 2001) was then used to identify AIE features in the recordings;
4) The targets were modified to accept AIE phonological features;
5) The AIE PCC, PVC and PPC measures were calculated;
6) PCC, PVC and PPC measures from both the SAE and AIE transcription data were compared to determine if dialectal difference affected the identification of impairment; and
7) The PCC, PVC and PPC measures for both the SAE and AIE transcription data were compared to the teacher ratings of oral language ability.

Phoneme acquisition is typically complete by age seven so normative data for SAE speaking Australian children was available only up to 7;11 years (McLeod, 2013). The criterion used to determine the presence of speech impairment was a PCC or PVC below 95% or a PPC below 96%, based on SAE normative data from several sources for children of six and seven years of age (Dodd, Hua, Crosbie, Holm, & Ozanne, 2002; McLeod, 2013, p. 96).

RESULTS

PHONEME FEATURES

The most common English phonemes not fully acquired by the participants included /h/, /ð/ and the consonant clusters /nt/, /nd/, /br/, /pt/ and /st/, particularly in word final position (see Table 2). These phonemes are usually acquired in monolingual SAE speakers by the ages 2;0-3;0, 7;06-8;0 and 3;0-6;0 years respectively (McLeod, 2013, pp. 96–97).

In total, six AIE phonological features were used by the participants of the study. The two most common AIE phonological patterns observed were fricatives alternating with stops (13 occurrences, used by six out of seven children); and consonant cluster reduction, particularly word-finally (13 occurrences, six of the seven children). Other observed AIE phonological patterns were velar fronting, /h/ deletion, alternation of voiced and voiceless plosives particularly in nasal plosive clusters and /d/ alternation with flapped [ɾ]. Alternation of alveolar stops with flapped [ɾ] is considered to be a feature of both AIE and SAE (Cox, 2012, p. 131) and thus, was not coded as an error during SAE analysis. Five AIE phonological feature patterns (initial /h/ deletion, fricatives substituted by stops, consonant cluster reduction, alternation of voiced and voiceless plosives and velar fronting) are also errors produced by SAE speakers with speech impairment (McLeod, 2013). It was therefore difficult to differentiate whether these phonological patterns were produced because the participants had a speech impairment, or because they spoke AIE, or both.

Table 1. Demographic and assessment data (*n*=7)

Child number	Sex	Ethnicity	Age	Lang. Ability	SAE			AIE		
					PPC	PCC	PVC	PPC	PCC	PVC
#1	F	Aboriginal	8;04	High	97.4	96.5	99.1	97.8	97.0	99.1
#2	M	Aboriginal	8;10	Low	95.1*	93.0*	98.7	98.0	97.6	98.7
#3	M	Aboriginal	8;02	Avge	90.1*	87.8*	94.2*	92.9	92.2*	94.2
#4	F	Aboriginal	8;05	Low	92.1*	89.1*	97.1	95.6*	94.7*	97.1
#5	M	Aboriginal	8;11	Low	96.9	96.2	98.1	97.2	96.7	98.1
#6	F	Aboriginal	8;01	Avge	96.2	95.5	97.5	97.6	97.7	97.5
#7	M	Torres Strait Islander	8;11	Low	96.0*	94.2*	99.0	98.5	98.2	99.0

*** marks a diagnosis of speech impairment**

SPEECH ACCURACY MEASURES

The PPC, PVC and PCC measures for both SAE and AIE targets and demographic data for each participant are presented in table 1. To allow for comparison with Toohill et al.'s (2012) results, descriptive statistics for the case series are presented here. The mean PPC following SAE analysis was 94.8% (SD = 2.7, range = 90.1–97.4%). Following AIE analysis, PPC increased to 96.8% (SD = 1.9, range = 92.9–98.5%)—an increase of 1.98%. SAE analysis

showed an average PCC of 93.2% (SD = 3.5, range = 87.8-95.5) and following AIE analysis, it increased to 96.3% (SD = 2.1, range = 92.2-98.2)—an increase of 3.14%. The mean SAE PVC was 97.7% (SD = 1.7, range = 94.2-99.1%). No difference in PVC was observed following AIE analysis. Using SAE speech impairment criteria, four of the seven participants were considered to have a speech impairment.

TEACHER RATINGS OF ORAL LANGUAGE ABILITY

No clear relationship was observed between teacher ratings of oral language ability and the child's PPC, PCC and PVC from either the SAE or AIE analyses. The PPC measures in table 1 showed similar values. For the one child rated with high language ability, SAE PPC = 97.4%, AIE PPC = 97.8%; for those rated with average language ability, SAE PPC ranged from 90.1% to 96.2%, AIE PPC ranged from 92.9% to 97.6%; and for those rated with low language ability, SAE PPC ranged from 92.1% to 96.9%, AIE PPC ranged from 95.6% to 98.5%. Distributions were similar for PCC and PVC.

Table 2. Australian Indigenous English (AIE) features used by children in the study

	Child number							
Australian Indigenous English Feature	#1	#2	#3	#4	#5	#6	#7	Number of children using this feature
/ð/ -> [d] Fricative substituted by stop	X	X	X	X		X	X	6
Consonant cluster reduction		X	X	X	X	X	X	6
/ŋ/ substituted by [n] (velar fronting)			X	X	X			3
Alternation of voiced and voiceless plosives particularly in nasal plosive clusters			X					1
/h/ deletion				X			X	2
/d/ alternation with flapped [ɾ]*		X		X				2

***This AIE feature is also a feature of SAE.**

X = AIE phonological feature used by participant.

Table 3. Examples of Australian Indigenous English features by participants

Participant	Target	SAE	AIE	AIE Features
1	then	ðen	d̪en	/ð/ -> [d] Fricative substituted by stop
2	these	ðiz	diz	/ð/ -> [d] Fricative substituted by stop
2	this	ðɪs	dis	/ð/ -> [d] Fricative substituted by stop
3	going	gəɯɪŋ	gəwən	/ŋ/ substituted by [n] (velar fronting)
3	Raymond	ɹæɪməɳd	ɹæɪmən	Consonant cluster reduction /nd/ -> [n]
3	got	gɔt	kɔɾ	Error + /t/ replaced by [ɾ]
3	other	ɐðə	ɐdə	/ð/ -> [d] Fricative substituted by stop
3	wanted	wɔntəd	wɔndəd	/ð/ -> [d] Fricative substituted by stop
3	then	ðen	den	/ð/ -> [d] Fricative substituted by stop
3	wanted	wɔntəd	wɔndəd	Alternation of voiced and voiceless plosives particularly in nasal plosive clusters
4	going	gəɯɪŋ	gəɯɪn	/ŋ/ substiuted by [n] (velar fronting)
4	drived	dɹɑevd	dɹɑev	Consonant cluster reduction
4	school	skɯːl	kɯːl	Consonant cluster reduction
4	breakfast	bɹekfəst	bwekfət	Consonant cluster reduction
4	then	ðen	den ðɛn	/ð/ -> [d] Fricative substituted by stop
4	coming	kɐmɪŋ	kɐmən	/ŋ/ substiuted by [n] (velar fronting)
4	him	hɪm	ɪm	/h/ deletion
4	his	hɪz	ɪz	/h/ deletion
5	going	gəɯɪŋ	goən gəɯɪn	Error + /ŋ/ substituted by [n] (velar fronting)
5	fast	fɐːst	fɐː	Consonant cluster reduction
6	then	ðen	den	/ð/ -> [d] Fricative substituted by stop
6	had	hæd	æd	Initial /h/ deletion

Participant	Target	SAE	AIE	AIE Features
6	the	ðə	də	/ð/ -> [d] Fricative substituted by stop
7	want	wɔnt	wɔn	Consonant cluster reduction
7	don't	dəunt	dəu	Consonant cluster reduction
7	breakfast	bɹekfəst	bɹekfəs	Consonant cluster reduction
7	snapped	snæpt	snæp	Consonant cluster reduction
7	then	ðen	den	/ð/ -> [d] Fricative substituted by stop
7	brother	bɹʁðə	bʁðə	Consonant cluster reduction

DISCUSSION

To the authors' knowledge, this small pilot case study series is the first documented analysis of how the phonological features of the speech of Indigenous Australian children in Townsville, Queensland, may impact on a diagnosis of speech impairment. Speech accuracy measures for both SAE and AIE targets were high (above 89%). Nevertheless, phonological features consistent with AIE were present in the children's speech and potential for a misdiagnosis of speech impairment was evident. The number of participants identified as having speech impairment using SAE norms decreased when AIE features were considered. Overall, both the SAE and AIE speech accuracy measures (PPC, PCC and PVC) in this study were lower than those found in similar bidialectal studies, suggesting that the participant's age, type of speech task or variety of AIE may have influenced the findings (Toohill et al., 2012; Goldstein & Iglesias, 2001).

The participant PPC average increase of 1.98% was lower than the results of Toohill et al. (2012), whose mean PPC increase was 6.86%. Consonant production was the main factor contributing to the observed difference between PPC measures in both this study and in Toohill et al. (2012). The AIE PCC in this study was also lower with a mean PCC increase of 3.14%, compared to Toohill et al. (2012), whose mean PCC increase was 9.26%. Additionally, Goldstein and Iglesias' (2001) study of Spanish-English-speaking children found a similar mean PCC increase (10.1%) to that of Toohill et al. (2012).

DIALECT FEATURES

Participants in this study were from a different geographical area to the Toohill et al. (2012) study (North Queensland vs. New South Wales and Victoria). The participants of this study produced six AIE phonological features in total, seven fewer than the participants of Toohill et al. (2012). These included fricatives substituted by stops (both voiced and voiceless);

consonant cluster reduction; velar fronting; alternation of voiced and voiceless plosives; and initial /h/ insertion. It is possible, therefore, that the phonological dialectal features of AIE spoken in Townsville differ minimally from SAE.

The lack of notable change in PVC between the SAE and AIE analysis implies that the children's vowel phonology did not differ much from SAE. Although the children's production may be perceived as broad SAE, there was no observed monophthongisation or contrast neutralisation, as may be observed in other AIE samples (e.g., Toohill et al. 2012).

AIE speakers living in rural and remote areas are more likely to speak a basilect variety of AIE than Indigenous people living in metropolitan areas (Butcher, 2008; Eagleson, 1982; Kaldor & Malcolm, 1982; Sharpe, 1977). However, this comparison has been made with caution as the difference in the age of the participants could have also contributed to the difference in dialectal density. Many Aboriginal and Torres Strait Islander people tend to reside in many different locations (Malcolm et al., 1999). Therefore, in this study more detailed demographic information regarding the length of time the participants have lived in Townsville would have helped determine whether the dialect spoken is representative of the variety spoken by residents of Townsville.

AGE AND EXPERIENCE

Age is likely to have contributed to the lower number of AIE phonological features produced, with the 8-year-old participants of this study aged up to five years older than the participants of other studies (3;11-5;0: Toohill et al., 2012; 3;0-4;0: Goldstein & Iglesias, 2001; and 4;5-5;3: Washington & Craig, 1992). Other possible explanations include increased exposure to majority culture and the impact of formal schooling where SAE is the language of instruction (Goldstein & Iglesias, 2001; Siegel, 2010; Washington, 2000). The older children in this study, naturally, may have had more exposure to SAE; or, being in a fully Indigenous school, they may have had less exposure to SAE and more exposure to AIE. Another influential factor may have been the explicit SAE instruction used in the school (Berry & Hudson, 1997).

TASK EFFECTS

Pragmatic influences such as the context of the communication exchange, in particular the communication partner and the pressures of assessment (i.e., the presence of a voice recorder) are likely to have influenced the use of dialectal features (Eagleson, 1982; Williams, 2000). The number of AIE features would most likely be higher in another community with greater dialect distance from SAE or if participants were talking with an AIE speaker. The participants of this study were also required to participate in a formal assessment where there is implicit pressure to perform, delivered by a non-indigenous speech-language pathology student assessor. A non-indigenous assessor may prompt

participants to use SAE as the expected target for academic tasks in a school setting (Eagleson, 1982; Harkins, 1990; Sellwood & Angelo, 2013; Siegel, 2010). On the other hand, the challenges of second dialect acquisition mean that some participants may have lacked sufficient proficiency with SAE (Sellwood & Angelo, 2013; Siegel, 2010).

The use of connected speech for contrastive analysis was both a methodological strength and weakness of this study. Connected speech promotes the production of more naturalistic speech patterns compared to the use of tasks that elicit single word naming (Bankson, Bernthal, & Flipsen, 2013). On the other hand, determining the target words and word boundaries is more imprecise and controlling the total number of different words is more difficult. The children also demonstrated some variability of word production due to contextual coarticulation. Variability of word production decreases with age, but some variation is expected, even among adults (Eagleson, 1982; Goldstein & Iglesias, 2001).

RELATIONSHIP BETWEEN PHONOLOGY AND LANGUAGE

A finding of no relationship between the teacher ratings of oral language ability and the child's phoneme accuracy measures from both SAE and AIE analysis suggests that speech characteristics of the dialects may be independent of overall oral language ability, or at least the teachers' perspectives of language ability. Mastery of phonological features does not necessarily imply mastery of other language features such as morphosyntax, or vice versa (McLeod, 2013; Siegel, 2010). However, a comparison between phonology and other language domains was beyond the scope of this study. The teachers' familiarity with students who use AIE may have affected the interaction of dialect phonology with teacher ratings. A different relationship may have emerged if the teachers were specifically asked to rate speech skills, if teachers were less familiar with AIE or if a larger number of participants were involved.

In typically developing monolingual SAE speakers, mastery of phonemes is usually achieved by eight to nine years and PPC measures near 100% are expected (McLeod, 2013, p.92). However, many Indigenous children do not begin to acquire and use SAE until attending school and therefore have less time within the sensitive period to acquire the second dialect accent (Siegel, 2010). In this study, the participants showed good overall development of SAE forms, suggesting that the children may have had exposure to SAE either prior to or during school and developed proficiency whilst attending school (Gould, 2008).

LIMITATIONS

The present pilot study was limited by the small number of participants, the restriction to connected speech sampling and use of non-Indigenous research assistants. A larger sample size would increase the power of the study, enable statistical analyses, and increase the ability to determine relationships among variables (e.g., between phoneme accuracy and teacher ratings). Extended speech sampling would have enabled comparison of different

factors, such as the influence of code switching or comparison of various speech samples such as single word, formal language use, conversation with others and connected speech. Other limitations included the difficulty in determining the target words and word boundaries and controlling the total number of different words produced in the connected speech samples. The audio recordings may have been distorted and visual cues absent. AIE speakers are not a homogenous group, with regional differences and variation within and between speakers noted in literature (Gould, 2008, 2009; Toohill et al., 2012), so generalising the findings across Australia is not possible.

More comprehensive information about the children's hearing status and history would have been useful given higher rates of otitis media and conductive hearing loss among Indigenous people (Australian Bureau of Statistics, 2006). Conductive hearing loss during the childhood years may result in impairments of speech production, oral language skills and written literacy development (Williams & Jacobs, 2009).

IMPLICATIONS

Overall, the results indicate that Indigenous children living in Townsville have good mastery of most phonological features and phonemes of SAE. The developmental appropriateness of identified phonological differences is difficult to determine given the lack of research in phoneme acquisition in Indigenous children acquiring both SAE and AIE (Gould, 2008; Toohill et al., 2012). Research in other bidialectal communities suggests that phoneme acquisition may be different for AIE and SAE (Gould, 2009; McGregor et al., 1997; Toohill et al., 2012). Thus, although five of the seven of the participants were not identified as having a speech impairment (when AIE phonological features were considered), they still may require assistance to develop SAE communication skills needed for academic and employment success.

Accurate and thorough assessment procedures are necessary to ensure appropriate identification of concerns and appropriate intervention (Baker & Bernhardt, 2004; Limbrick et al., 2013; Toohill et al., 2012). Currently, the lack of guidelines or standardised assessments available for AIE speaking children (Cahir, 2011; Gould, 2008, 2009; Williams & McLeod, 2012) may lead to misdiagnosis (Limbrick et al., 2013). Regular data collection is also needed to determine changes in a child's speech over time and to enable comparisons with other children of the same age and cultural and linguistic backgrounds (Gould, 2008).

Research areas requiring further investigation include larger and higher-level research studies such as: a) longitudinal phoneme and language acquisition in bidialectal speakers of AIE and SAE; b) development of culturally appropriate assessment and diagnostic procedures used to determine speech impairment in Aboriginal and Torres Strait Islander children throughout Australia; c) investigation of the prevalence and variation of AIE across Australia; and d) the

personal views of children, family and teachers regarding their language/dialect use in all environments (Toohill et al., 2012).

CONCLUSIONS

Use of contrastive analysis to investigate the phonological AIE features used by bidialectal children showed that judgements of phoneme accuracy increased when AIE phonological features were accepted as the target. The increase in PPC following AIE analysis was of consequence for two children, as they no longer met the criteria for speech impairment. It is therefore important for teachers and SLPs to consider dialectal variation when evaluating the speech skills of Indigenous Australian children. This consideration will be facilitated by the availability of appropriate normative data.

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