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Tok Pisin Phonology: a preliminary study

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ABSTRACT

Tok Pisin, a major lingua franca of Papua New Guinea, is the focus of this phonological pilot study. This is a descriptive study of multi-lingual speakers of Creole Tok Pisin, Melpa (vernacular) and English. Because TP phonology has significant variation along domain, substrate language and geographical divides, this pilot study was done to compare local phonology to descriptions in the literature, prior to gathering developmental data from child speakers.

Twelve adult speakers in Mt Hagen, Western Highlands Province, were recruited as participants. A book of local photos was the stimulus and responses were recorded and transcribed in International Phonetic Alphabet. Transcriptions were checked against the recordings with a native speaker. This data was analysed in two forms: at the level of individual words and then, a larger corpus of single word and connected speech data, to establish the phonetic repertoire of this group. Phonetic inventories were analysed individually to determine individual phonological inventories and the rules of distribution, before collating them to identify this population's phonology. In this population, there were additions of fricative and affricative phonemes to the previously reported phonology, including a strong contrast between [f] and [p] and expanded phonemic distribution. It is likely that these changes reflect both substrate and superstrate language influences.

INTRODUCTION

This descriptive pilot study examines the phonology of a population of Melpa background Creole Tok Pisin-speaking adults in the Western Highlands Province (WHP) of Papua New Guinea (PNG). It is a precursor to a larger cross sectional developmental study of child creole TP phonology. The child study represents a new branch of linguistic study in Papua New Guinea, namely clinical linguistics (Ball, Perkins, Muller and Howard, 2008, Crystal, 2013). This adult study seeks to confirm or modify for this population only, the phonology described in the literature (Laycock, 1985, Mihalic, 1989, Romaine, 1992a, Smith, 2002).

This paper begins by touching on the strengths in TP which led to it being the subject of clinical linguistic research. It then outlines factors impacting TP and its phonology: its creole and sociolinguistic status, variation, the forces impacting change in the language, and the phonology as described in the literature. The key concept of 'core phonology' (Romaine, 1992a, p. 179), around which variation occurs, is introduced. A core phonology from the literature is outlined as a basis of comparison to the data obtained.

The method and procedures adopted for this study are then outlined and the data from both single words and connected speech samples are summarised to reveal individual phonetic

inventories. Analysis of phonetic inventories that generated individual phonological inventories is outlined. Statistical analysis of these individual phonologies was examined in light of contrast and distribution rules to generate a phonology for this population. Because minimal pairs could be difficult to elicit in TP, this includes the utilisation of similar pairs to build a statistical basis for contrast.

TOK PISIN PHONOLOGY STUDIES

Romaine points out that ‘the phonology of creoles has been less well investigated than their syntax’ (2000, p. 184). Earlier studies of TP phonology are often, as Romaine notes, ‘anecdotal and unreliable’ (1992a, p. 179). However, in 1975 the LSPNG devoted a conference to TP studies (McElhanon) and in 1985 *The Handbook of Tok Pisin* (Wurm and Mühlhäusler) was a benchmark for its time. In it Laycock outlined a ‘core phonology of 30 phonemes for Tok Pisin’ (1985, p. 297), from which Romaine (1992a) subsequently eliminated substratum elements. Verhaar’s orthography took a corpus linguistics approach (1995), and Adam Blaxter Paliwala discussed the variation and instability of Tok Pisin phonology with reference to the literature and his ‘own data’ (2012, p. 99). This study is predicated on the need for Speech and Language Therapists (SALTs) to research normal speech and language development (Grunwell, 1987). Developmental studies are the foundation for appropriate, targeted therapeutic assessments and treatment (Ingram, 2008). There are many good clinical reasons for establishing an understanding of normal phonology in a population in which Speech and Language Therapists hope to provide services (Grunwell, 1988, Maphalala, Pascoe and Smouse, 2014).

FACTORS IMPACTING TOK PISIN PHONOLOGY

CREOLE AND LINGUA FRANCA STATUS

TP is a pidgin which has acquired creole status. A pidgin language is a ‘contact language’ (Romaine, 1992b, p. 31) between three or more language groups (Wardhaugh, 2010). One language usually has a dominant position (Romaine, 1992a, Wurm 1984) and is the primary source of vocabulary or the ‘main lexifier’ (Smith, 2002, p. 17). Substrate languages have a critical role in the syntax, phonology and suprasegmentals of the pidgin (Wardhaugh, 2010). When a pidgin language becomes entrenched, it begins to acquire first language speakers, who will vary and develop the language. This creolization process (Siegel, 2008) began for Tok Pisin in the early 70s when it began acquiring native speakers, children for whom it is the first language (Sankoff, 1973). This has brought about changes in the rules of the language (Sankoff,

1973b). Phonological features of the change process are ‘morphophonological condensation’ and increasing phonological contrasts (Romaine, 1992a, p. 172), processes of which this study shows examples.

Today the original creole TP speakers are parents and grandparents, and creole TP is the most widely and frequently used language in everyday PNG life (Mihalic, 1989, Mühlhäusler, Dutton and Romaine, 2003). Tok Pisin has a syncretic, figurative and creative power unique to its speakers (Brash, 1971). Wurm described Tok Pisin as the ‘intrinsic means of expression’ for modern Papua New Guinean life (1985, p. 67). It is free of tribal associations especially in the highland provinces (Romaine, 1992a), so has long been used for ‘cross language communication’ (Nidue, 1990, p. 49). Research has shown it is an appropriate language for early literacy in certain areas of PNG (Siegel, 2010). Tok Pisin’s strong link to modern PNG identity means it is the default language in many settings. It is a resilient language, which is one of the reasons why a sample of twelve adults was deemed sufficient. The lingua franca and second language status of TP limits the variation likely and has been found to provide ‘severe constraints on the amount of variation possible’ (Smith, 2002, p. 211).

VARIATION AND BORROWING IN CREOLE TOK PISIN

Variation is an inherent feature of any language and variation in Tok Pisin overall has been described in terms of regions and sociolects, influenced by levels of urbanisation or isolation, education and exposure to the lexifier language (Mühlhäusler, 1984b, Siegel, 1997). Romaine described the driving influences of the creolization process in Tok Pisin as;

‘developmental processes, markedness and universals, influence from superstrate and substrate as well as sociolinguistic factors such as style’ (1992a, p. 207).

These factors, which are also the source of variation, require reflection when attempting to determine if an example of a particular phone is truly part of normal adult use to which children will aspire as they learn the language.

English, as the main lexifier of Tok Pisin, has been the source of much lexical borrowing as creolization has progressed (Brash, 1971, Romaine, 1992a). Sometimes, as this takes place, the phonology may change (Paliwala, 2012, Smith, 2002). Borrowing can result in either no change to the recipient phonology, instead conforming to TP phonology, a temporary change limited to the borrowed word, or to permanent changes to the phonology and phonotactics of the language (Matras, 2010). For example, the child who calls a carrot [kerot], imposes TP vowel

use on the English word, but whenever she uses [dʒizaz] (Jesus), changes her TP phonology to use English [z] and in saying [dʒɪndʒa] (ginger) reflects a broadening use of the voiced affricate with English word adoption.

Determining when the phonology of loanwords entering the lexicon becomes part of the language (Matras, 2010) requires distinguishing the ongoing diachronic process of ‘borrowing’ from more spontaneous codeswitching, to distinguish ‘nonce borrowings’ or ‘structurally integrated borrowings that are not universally used’ (Matras, 2010, p. 106), from permanent changes to the phonology. Poplack explains that:

‘morphosyntactic integration of BORROWED (author’s emphasis) items is largely abrupt and categorical, whereas phonological integration is often gradual and highly variable.’ (Poplack, 2012, p. 644)

Speech may also vary according to its purpose. Tok Pisin speakers, who are usually multilingual, utilise frequent code mixing and code switching (Mühlhäusler, 2003, Paliwala, 2012). As Siegel notes when discussing creole speakers:

‘there is a great deal of variation in the speech community and the point at which a form of speech is located along the continuum depends on the context as well as the social characteristics of the speaker (2008, p. 235).’

The literature comments on changes to Tok Pisin which demonstrate its variation. For example, both Smith (2002, p. 54) and Romaine (1992a, p. 173) note consonant clusters appearing where ‘allegro’ creole speech rate leads to ‘morphophonological condensation’ (Romaine, 1992a, pp. 172-174) and more complex phonological structures. Morphophonological condensation occurs when phonological condensation reduces words such as aspect markers to syllables that then become prefixes. ‘Through reduction of this kind creoles can acquire inflectional morphology’ (Romaine, 1992a, p. 173). As children’s rapid native Tok Pisin develops short forms, there is phonological reduction, for example, formation of shorter aspect and tense markers. The aspect marker [save] is shortened to [sa]. It may be even be shortened as a suffix, as in:

Short form; [mi toʔ sa loʔ yu tasol]

Original TP: [mi tok save long yu tasol]

Gloss: I’m just letting you know. (personal communication 2016)

Smith’s analysis of the demonstrative article ‘dispela’ (this one), shows it replaced by ‘displa’, ‘disla’ and even ‘sla’ (2002, p. 149) as an example of allegro speech resulting in more complex

consonant clusters and creating variation. Tok Pisin creole speakers may produce consonant clusters in a variety of positions, including final word positions. (Sankoff, 1972).

CONSTRAINTS

Romaine comments that Tok Pisin phonology may demonstrate ‘universal pressure ...which eliminates marked segments’ (1992a, p. 180). For example, Mihalic’s TP dictionary (Mihalic, 1989) has the plosive [p] replacing the more marked fricative [f]. Tok Pisin short vowels are in harmony with many of the world’s languages, in that they occupy the extremes of the vowel space, a pattern which Ladefoged and Disner describe as an evolutionary feature designed to allow the vowels to be ‘distributed in the possible vowel space in the most efficient way’ (2012, p. 36).

Universal patterns are much debated and often opposed (Evans and Levinson, 2009, Siegel, 2008). Any new data will contribute and assist clarification of the issues (Berent, 2009).

The level of variation in Tok Pisin has led to several scholars using the concept of a ‘core phonology’ of shared phonemes around which sociolinguistic and regional variation can occur. The proposed cores do vary within the literature, but there is sufficient agreement to suggest a core that can be examined in this adult study.

TOK PISIN CORE PHONOLOGY

Mihalic’s dictionary and grammar (1988, 1989), based on north coast TP, reflects his lifetime’s work developing Tok Pisin resources. He describes the single vowels [a, e, ɪ, o, u] but also allows for allophones [i] and [ʊ] (1989, pp. 4-6). However, it is ‘clear that a larger set of vowel sounds continued to be available in the spoken Tok Pisin varieties of Papua New Guineans’ (Paliwala, 2012, p. 104). Laycock (1985) allowed for 8 diphthongs which show a tendency to move to the extremities of the vowel space (Paliwala, 2012). Paliwala adapts Laycock’s core phonology (1985) to summarise the phonology (2012), including the English consonants /ʃ/, /ʒ/, /tʃ/ /dʒ/ and /z/ which Mihalic’s north coast standard excluded.

Both Romaine (1992a) and Smith (2002) gathered large data corpuses in their studies of creolizing Tok Pisin. Suzanne Romaine’s study (1992a) in the Momase area examined a number of ‘new phonological contrasts to core Tok Pisin phonology’. These were [p] contrast

to [f], [r] to [l], [h] to [∅] and [s] to [tʃ] and [ʃ]. Romaine found the way these contrasts acted demonstrated a typically unstable phonological system (1992a). Smith (2002) carried out a comprehensive geographical and phonological review. He analyses by provincial groupings the English influence in expansion of the phonology and sound distribution; [dʒ], [f] initial position, [f] medial, [ʃ] medial, [tʃ] initial, [θ] and [ʒ], and some final voiced plosives (Smith, 2002). He provides exemplars and totals of occurrences in his data of variants between phone pairs such as [p]/[f], [r]/[l] but no further numerical analysis. He used Mihalic's phonology of 23 phonemes with five vowel allophones (Mihalic, 1989) as the 'standard of comparison' (2002, p. 44), excluding the bilabial fricative which Mihalic describes in variation with the labio-dental (1989). Smith uses a core phonology of consonants [p, b, t, d, k, g, n, m, ŋ, v, s, f, h, l, r, w, j], five vowels [a, e, i, o, u] and four diphthongs [ai, au, iu, ɔi] 'in transcribing from recordings' (2002, p. 44). However he appeals to variation caused by TP's second language status and doesn't commit to a core phonology except for transcription. The phonology described in the Tok Pisin entry for the online Atlas of Pidgin and Creole language Structures (APiCS) by Smith and Siegel (2013) similarly describes five vowels and 16 consonants as major allophones and [ʃ] and [tʃ] as only used in loanwords.

DISTRIBUTION

The literature also describes the phonotactic rules of TP. These include the insertion of epenthetic vowels between consonants (Mihalic, 1989, Smith, 2002), and devoicing of final plosives (Mihalic, 1989). Both voiced and unvoiced affricates are 'neutralized in Tok Pisin' to the alveolar fricative [s] (Romaine, 1992a, p. 180). The affricate [dʒ] is only used word initially, elsewhere it becomes [s] (1989). Mihalic (1989) also describes [v] as often varying to [b] word medially and [w] sometimes varying to become [v] word medially. [j] is only found word initially. Mihalic notes the insertion of [h] word initially before a vowel as a dialect item. These rules were tested in analysis of this pilot study data.

A suggested core phonology is shown in Table 1. This is derived from historical sources in the literature (Mihalic, 1989, Romaine, 1992a, Smith, 2002), the bracketed sounds in the table were not included in Romaine.

Table 1. Core Consonantal Phonology

	bilabial	labio-dental	alveolar	palatal	velar	glottal
Plosive	p, b		t, d		k, g	
Affricate			dʒ			
Fricative		(f)(v)	s			h
Lateral/approximants	w		l	j		
Trill/flap			r			
Nasal	m		n		ŋ	

Based on Mihalic, 1989; Romaine, 1992; Smith, 2002. Phones in brackets were not included in Romaine (1992).

STUDY AIMS

The purpose of this pilot study of adult creole Melpa substrate Tok Pisin speakers is to sample adult phonology in order to either confirm or revise the phonology outlined in the literature and summarised in the core phonology above.

Phonetic and phonological inventories and distribution of phones are described. This study will also seek to identify the ‘constraints’ (Dinnsen and Gierut, 2008, p. 440) of markedness and faithfulness observed in this sample of TP creole phonology.

This study is limited to the speakers of primarily one substrate vernacular group, Melpa (phonological chart, Appendix 1). Melpa speakers using Tok Pisin are distributed in both rural, semi-rural and urban populations in the Western Highlands. This study was limited to urban and semi-urban populations, which will have, to some degree, reduced the level of variation.

METHOD

ETHICS STATEMENT

Ethical clearance was obtained through Curtin University Human Research Ethics Committee. Approval number RDHS-85-15.

PARTICIPANTS

Participants were adult speakers of Tok Pisin from a primarily Melpa substrate background. A convenience sample of participants was recruited from amongst staff and community members at schools and centres participating in the main child study, and eligible work

colleagues at the Mt Hagen Provincial Hospital. Twelve adults (participants 1-5, 7, 9-16) remained after three participants were removed: one as a result of poor recording quality, one due to a perceived speech delay by his community, one for possible interruption to performance by illness. Although small, the sample of participants represents the range of speakers in this community and within the constraints of the study, is considered sufficient for the task of confirming or modifying the phonology as described in the literature. Participant characteristics are displayed in Table 2. Ages are often hard to determine in PNG so some ages are approximate.

Table 2. Participants.

Gender	Age	Occupation	Observed language exposure and use.	Education level
M	35+	Senior Teacher elementary	Professional Tok Pisin, English ⁱ	Tertiary
M	20+	Junior elementary teacher	Professional Tok Pisin, English	Tertiary
F	30+	Elementary teacher	Professional Tok Pisin, English	Tertiary
F	30+	Elementary teacher	Professional Tok Pisin, English	Tertiary
F	30+	Elementary teacher	Professional Tok Pisin, English	Tertiary
F	40+	Senior Teacher elementary	Professional Tok Pisin, English	Tertiary
F	25	Community member	conversational English	Grade 10

F	43	Community member	Conversational English	Primary school only
F	25	Qualified nurse	Professional English & Tok Pisin	Tertiary
M	50	Pastor, community setting.	Community Tok Pisin, some professional English.	Diploma
M	25	Physiotherapy resident	Equal use, English and Tok Pisin	Tertiary
M	27	IT professional	English at home. Professional English and Tok Pisin.	Tertiary

MATERIALS

Samples were elicited using a specifically developed photo book as a targeted word-naming task. Stimulus materials were pictures of familiar objects and events, designed to elicit words containing target phonemes. The word list was comprised of words designed to target all the sounds of the core phonology, plus additional phonemes observed in use locally and those recorded in the literature as new phones in use (G. P. Smith, 2002). Target phonemes were elicited in as many syllabic positions as the lexicon allows. These include Syllable Initial Word Initial (SIWI), Syllable Initial Within Word (SIWW), Syllable Final Within Word (SFWW) and Syllable Final Word Final (SFWF). Phonotactic restrictions of Tok Pisin meant that all phonemes were not expected in all possible positions. The picture book comprised 62 labelled pictures with multiple target words per picture. Spontaneous comments were also recorded and transcribed.

PROCEDURE

Participants were verbally invited to participate. Once verbal consent and identifying details were obtained, the participants were shown the picture book and the Olympus LS-12 voice recorder. The researcher explained that they would be shown the pictures and asked to

respond to them in Tok Pisin. It was explained that their voice would be recorded and stored for later analysis. Any questions participants had were answered at this point.

There were some logistical challenges to acquiring clear recordings. Spaces, when available, were typically in rooms with no effective soundproofing and an abundance of ambient noise. The picture book was presented and participants were usually asked ‘stori long mi bilong dispela piksa’ (tell me a story about this picture). If the target word wasn’t elicited, the researcher would ask appropriate questions to try to elicit it. When target words weren’t elicited, repetition was successfully stimulated by the presenter asking if that word was ever used for the photographed item. Some additional photos were added when target sounds were not elicited.

Responses in full were manually transcribed simultaneously with administration, using a broad transcription in International Phonetic Alphabet (IPA) and recorded electronically. Targeted single words from these recordings were later transcribed. During this transcription, a native speaker listened simultaneously to the recording with the researcher and checked the notation. She was confident to challenge the researcher’s perception, and when hers differed, the section was replayed until a consensus was reached.

Prior to further analysis using the Summer Institute of Linguistics (SIL) ‘Phonology Assistant’ software, the researcher undertook intensive training in phonetics with SIL Australia during which Melpa phonological data (Ladefoged, 2001, Stucky, 1990), recordings (Ladefoged, 2012) and phonetic practice were employed.

A connected speech, narrow transcription was prepared for the Phonology Assistant software from the original recordings and entered for processing according to the conventions of the software. This covered all connected speech, providing further phonetic data for the individuals and group.

ANALYSIS

Analysis of single word responses generated phonetic inventories for each individual participant and the corpus as a whole. The percentages of sounds elicited according to syllable position gave indications of the distribution of phones (see table 4 below). Alternate phones used were also recorded. Further details about analysis are given in appendix 2.

The additional data set which included the participants' full sentences and a narrower transcription, generated phonetic consonant and vowel inventories for each participant and the group as a whole. These were compared to the phonetic inventories generated by the single word analyses. Participants' metalinguistic awareness of phonetic variants was noted. Examples are seen below in table three.

Individual phonological analyses were conducted following phonological principles (Burquest, 2006) to determine phonemic contrast in likely pairs and groups of phones. These included the phone pairs examined in the literature for changed phonological status as outlined in the aims. These were examined for contrast to determine complementary distribution or free variation (Burquest, 2006).

The phonemic and phonotactic features examined were: contrastive use of [f] and [p], [w] and [v], voicing of final plosives, contrastive use of [h], consonant cluster use or reduction and expanded fricative repertoires. The presence and distribution of non-core Tok Pisin fricatives [z, ʃ, θ, ð, ʒ] plus Melpa substrate influenced [r] and the occasional [ʔ] were examined. The affricate [tʃ] also was examined for phonemic status in individual phonologies.

'Minimal pairs' are a useful tool to establish phonological contrast. These are often unsuitable for elicitation in TP and were rarely found in this sample of data. Therefore, the phenomenon of similar pairs was often used to establish contrast.

There were examples of free variation, for example when participant three used two forms for the word 'village' [vɪɫs, vɪɫɔʒ], which were regarded as evidence of lack of phonemic contrast.

RESULTS

A variety of responses were generated. Current Mt Hagen word use was found to vary from that in the dictionaries (Mihalic, 1989, Volker, Russel Jackson, & Deutrom, 2007). For example, although the Mihalic dictionary has 'didiman' for farm worker, the farm pictures shown never elicited this word, participants invariably used the borrowed superstrate word [fama], utilising English phonology. Participants made some interesting metalinguistic comments on word use and the perceived correct Tok Pisin pronunciation, which could vary from their spontaneous utterances. Examples in table three also demonstrate participants' code mixing behaviour which suggests they have access to English and TP phonologies. Participants

would also perceive errors in the written labels if they differed from the TP dictionary form (Mihalic, 1989, Volker, 2007), even if they didn't speak that way, a phenomenon Siegel predicts as a feature of standardisation (Siegel, 1981).

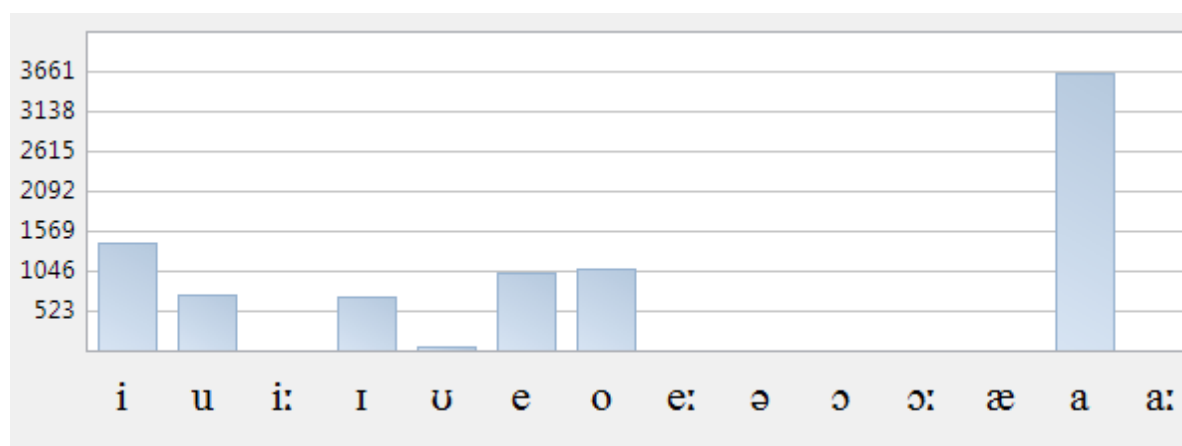
Table 3. Examples of metalinguistic comments.

Identifier	Utterance	Gloss
A05F42038	wanpla man wantaim han bek̄ zipa a: sori d̄ʒipa, in English you talk sound as 'zipa' in Tok Pisin 'd̄ʒipa'	a man with a backpack zipper, oh, sorry zipper, in English you say zipper, in Tok Pisin it's zipper.
A03F37032	ʔan wos wotʃem inglifʔan wos Tok Pisin	Hand watch. Watch is English, han was Tok Pisin
A01M40025	sampela lain i wok gaden. Didiman is not used now (participant reading word printed in picture book).	Some people are working in a garden. 'Didiman' is not used now.

VOWEL INVENTORIES

The vowel inventory compiled from all participants was very similar to that of the core phonology. The occurrence of lengthening plus additional phones, [æ], [ɔ] and [ə], in the phonetic inventory, showed less than 30 occurrences in every case, low enough to not appear on the histogram generated by Phonology Assistant software (SIL, 2015)(figure1).

Figure 1. Histogram of all adults' vowel inventory



Diphthongs

In this sample, eight diphthongs [au] [maus] ‘mouth’, [ai],[paia] ‘fire’ [ia] [aria] ‘next to, vicinity of,’ [iu] [niupela] ‘new,’ [ei], [peipa] ‘paper’ [oʊ], [smouk] ‘smoke’, [ɔi], [bɔi] ‘boy’, were transcribed. This larger number than Mihalic’s three diphthongs (Mihalic, 1989), is equal to Laycock’s inventory (Laycock, 1985, p. 296), [ea] and [oa] that he described did not appear in this sample.

CONSONANT INVENTORIES

Spontaneous production of the consonant sounds targeted by the picture book, in single words across all syllabic positions, is displayed in Table four below.

Table 4. Percentages of successful elicitations from total presentations of consonants in single words.

Manner	Voiceless consonant	% elicited	Fraction: elicited/presented	Voiced consonant	% elicited	Fraction: elicited/presented
plosive	p	74	145/195	b	89	150/169
	t	82	139/169	d	75	68/91
	k	87	270/312	g	55	50/91
nasal				m	91	165/182
				n	74	172/234
				ŋ	67	70/104
fricative	f	83	54/65	v	40	31/65
	θ	0	0/13	ð	8	1/13

	s	73	293/403	z	20	13/65
	ʃ	35	13/52	ʒ	31	4/13
				h	22	14/65
affricate	tʃ	33	30/91	dʒ	48	63/104
lateral				l	86	202/234
Trill/flap				r	94	146/156
approxim				w	72	84/117
ate/glide				j	85	11/13

The phonetic inventory of consonants obtained from the continuous speech, although derived from a narrower transcription, was very similar to that obtained by the single word analysis, which affirmed the validity of utilising single words for phonetic sampling. Additions in the connected speech sample were instances of the alveolar lateral fricative [ɬ] (four occurrences) and increased occurrences of the voiceless dental fricative [θ] (five occurrences), the voiced dental fricative [ð] (three occurrences) and the voiced alveolar fricative [z] (28 occurrences).

PHONETIC DISTRIBUTION

Both the individual word and the connected speech analyses shed light on the distribution of phonemes. Table 5 shows the percentage of target sounds elicited successfully in the four syllabic positions examined. Table 5 is based on successfully elicited sounds in single words as a percentage of entire possible responses, rounded to whole numbers. Phones with percentages less than 50% were deemed not significant enough to be regarded as a feature of the phonology.

Table 5. Distribution of phonetic repertoire.

	% SIWI	% SIWW	% SFWW	% SFWF
Plosive	[p]78 [b] 92	[p]95 [b]79	[p] 62	[p] 63
	[t]85 [d]100	[t]86, [d] 63,		[t]69 [d]85
	[k]87 [g]81	[k]87, [g] 31	[k] 92	[k] 83 [g] 31
Nasal	[m] 94 [n] 64	[m] 90 [n] 100	[m] 69 [n] 85	[m] 92 [n] 90
			[ŋ] 60	[ŋ] 75

Affricate	[tʃ] 23	[dʒ] 69	[tʃ] 42	[dʒ] 33
			[dʒ] 65	[dʒ] 54
Fricative	[f]82 (v) 31	[f] 92 [v]100	[v] 31	[f] 77 [v] 31
	[s]73 (z)23	[s] 80 (z) 23	[s] 88	[s] 66 [z] 18
	[ʃ] 19 [ʒ] 31	[ʃ] 38		[ʃ] 31
	[h] 17			
Lateral	[l]100	[l]89	[l] 38	[l]79
Trill/flap	[r]95	[r]90	[r] 92	[r]85
Glide/Approx.	[w]67 [j]85	[w]82		

SIWI syllable initial word initial; SIWW syllable initial within word; SFWW syllable final within word; SFWF syllable final word final

Some phones, [p, k, m, n, s, r, l], occurred in all positions. However, instances of SFWW seemed to be rare except possibly for phones which may be geminateⁱⁱ. Some phones were only seen in SIWI and SIWW positions; [w], [b] and [h] occurred only in SIWI. [v] occurred strongly only in SIWW position, as in [draiva]. Some phones occurred less frequently in SFWF; [d, f, dʒ] and [ŋ] occurred only in SFWW or SFWF.

Initial consonant clusters recorded were; [pl, br, dr, fl, gr, kl, st].

PHONOLOGICAL ANALYSIS

Vowels

The core phonology vowels [ɪ, i, e, o, a, u] are well represented but [ʊ] is less frequent. There are additional vowels, which are not typically part of Tok Pisin, however the infrequent use of the central vowel [ə], [ɔ] and the high [ʊ] and low [æ], in loanwords, does not justify including them in the phonology for this group.

Consonants

A new phonology for the consonants of this population was derived from individual phonologies (based on Phonology Assistant analysis of single word and connected speech). Collated summaries are outlined below:

Fricative Use; Additional Fricatives

Each participant showed variation to the historical phonology for TP fricative or affricate use:

[v]: 75% had unchanged standard Tok Pisin SIWI and SIWW distribution. 25% of participants had additional uses of SFWW and SFWF positions.

[z]: 58% had introduced [z] in various syllabic positions, but with only three participants (25%) using [z] contrastively with [s]. One participant (8%), had [z] in all positions, using it contrastively with [s] (participant 16).

[ʃ]: 92% had [ʃ] present. Some words, such as [fis] were original Tok Pisin words with the new phonological use, but many were recent borrowings (not seen in Mihalic's dictionary), as these samples illustrate:

Table 5. Samples of [ʃ] use from Phonology Assistant analysis

Word in IPA	Gloss	Syllable pattern	Participant and line identifier	Mihalic dict.
ɪŋɡlɪʃ	English	VCCCVC	AO3F37032	ɪŋɡlɪs
fɪʃ	fish	CVC	A16M26035	pis
dɪʃ	dish	CVC	AO1M40018	plet
ʃel	shell	CVC	AO1M40035	sel
ʃauwɪn	sewing	CVVCVC	A05F42037	absent
ʃop	shop	CVC	A02M24029	stua
ʃolda	shoulder	CVCCV	A07F55002	sol

Only 25% of all participants used [ʃ] contrastively with [s]. Minimal pairs were rarely seen in this study and here [ʃ]/[s] contrast was seen in similar pairs, for example [masɪʃ] and [maʃɪn] 'matches' and 'machine' (participant seven).

[θ] 42% used [θ], most only once with the borrowed number [θriplɑ] (three).

[ð], [ʒ] and [ʔ] all appeared in less than 25% of users, so were not significant.

[tʃ] appeared in 92% of participants but only 25% contrasted with [ʃ]. 50% used the phone contrastively with either [dʒ] or [ʃ].

[dʒ] was seen in 100% of speakers according to historical Tok Pisin use. It was used contrastively with [tʃ] or [ʃ] in 50% of speakers. Its regular appearance in the borrowed English word 'zipper' shows TP changing English.

Devoicing final fricatives and affricates: 42% or five participants, continued with the devoicing of fricatives such as [sɪsɪs], 'scissors'.

1. Affricates

All speakers had some SFWF affricate use in anglicised words [bitʃ], [titʃ], [brɪtʃ] or [brɪdʒ] [vɪɪdʒ], and [orɪndʒ]. The SIWI use of [dʒ], as described by Mihalic(1989, p. 5) was in evidence in this sample most frequently in words such as [dʒɪpa], ‘zipper’ [dʒizas] ‘Jesus’ and [dʒɪndʒa], ‘ginger’ borrowed from English and [dʒɪwaka], ‘Jiwaka’ the adjacent province’s name. In SIWW position [dʒ] was only found in [piendʒi]’PNG’ and [dʒɪndʒa] ‘ginger’. [tʃ] had a similiarly small repertoire of words in this sample, in a variety of syllable positions and similiarly anglicised: e.g. [tʃekim], ‘check’ [titʃa], and ‘teacher’. 50% used the affricates contrastively in SFWF with [s] in groups such as [brɪdʒ]/ [wɒtʃ]/ [klos] and [nambɪs]/ [brɪtʃ] or SIWI [sɪnk] / [dʒɪndʒa], mostly in English loanwords.

2. Devoicing final plosives: Changes to phonotactics through use of final voiced plosives

All speakers had some SFWF voiced plosive use, such as participant five [kapbed], [ri:d] but final voiced plosives without free variation in the SFWF position was seen in only 4/12 or 33% of participants in pairs such as [nek]/[beg].

3. Contrast of [f] and [p]

The group data and the data from individual phonologies suggest that there is an emerging contrastive distinction between [f] and [p] in many phonetic contexts for many speakers in this sample. In this sample 66% had clearly established contrastive use between [f] and [p], 83% emerging in SIWI position only. This is different from the phonology of Tok Pisin reported in the literature and most recently in APiCS (Smith and Siegel, 2013). Table 6 demonstrates this development in this sample:

Table 6. Summary of individual phonological use of [f] and [p].

Participant number	Phonological distribution, indicated by;	Conclusion, contrast Y /N
1	Free variation [f] and [p] with the same words e.g. [paipela], [faipela]	N
2	Similiar pairs support contrast. E.g. [pɪsɪn], [fɪs] and [papi], [fama]. SIWI only .	N Tentative contrastive use emerging

3	similar pairs e.g. [pnis]/ [fis] two over-corrections: [failot], ‘pilot’ and [froduks] ‘products’ (code-switch?).	N contrastive use but over-correction in loanword suggest contrastive use is not yet established
4	five similar pairs SIWI and SIWM e.g.[papi]/ [fama], [dʒɪpa]/dʒenifa]. No Free Variation (FV).	Y[f] / [p] contrast established.
5	Similar pairs (5) in initial position. No free variation.	N Contrast emerging, established SIWI only.
7	Similar pairs in SIWI. e.g. [ples] / [fleg], [faɪpla]/ [pato] but [pɪs], [pnɪs].	Y Contrast becoming established.
9	Similar pairs e.g. [pɪsm] / [fis], [pegɪm] / [femili]	Y Contrast established.
10	Similar pairs both in SIWI and SIWW e.g. [dʒɪpa]/[dʒenifa]	Y Contrast established.
11	Similar pairs in SIWI and SFWF positions	Y Contrast established
12	Similar pairs and no FV	Y Contrast established
13	Similar pairs, no FV	Y Contrast established
16	Similar pairs, no FV	Y Contrast established
TOTAL		8/12, 66% established. 10/12 emerging 83%

4. Contrastive use or free variation [w] and [v]

A clear phonemic contrast between [w] and [v] in similar pairs such as [draiva] and [diwai] was seen in this sample for 58% of speakers. The remainder of speakers showed free variation of [w] and [v].

Initial [h] production versus [ʔ] substitution

Only 17% of participants had consistent SIWI [h] use in connected speech. This compares to 22% in the single word analyses. The remainder showed free variation with omission of SIWI [h] or substitution of [ʔ]. For example, participant four used both [aus] and [haus] for ‘house’.

5. Consonant cluster reduction (Mihalic, 1989, P. 6)

The insertion of epenthetic vowels between consonants is classically described in TP phonology (Mihalic, 1989; Smith, 2002). Some exceptions to these patterns was noted for creole participants whose local language Melpa has consonant cluster patterns in all positions (Ruby, 1990). Examples of SFWF consonant clusters in the PA analysis were seen in morphophonemic contractions such as [blɔŋ], and recent loanwords such as [flauwa], not found even in the Oxford Tok Pisin- English dictionary (Volker, 2007). These uses may be an example of creole bilingual speakers having English phonology at their disposal as well as TP (Smith, 2002), and at times incorporating this into TP words. For example, most participants

had a final [pl] cluster in ‘pineapple’ [painapl] and initial cluster in [stretɪm] ‘straighten/fix’ occurring with three participants. The standard Tok Pisin phonotactic rule of final affricate reduction to a voiceless alveolar fricative [s] was challenged by 92% of speakers in this sample by words like [bridʒ] and [wotʃ].

The influence of English phonology, both in loanwords adopted with phonology intact, use of the plural [s] and in the elision of the TP epenthetic vowel, for example with [boks] ‘box’, are seen in the examples from the Phonology Assistant word list of final consonant cluster examples in table 7:

Table 7. Final consonant cluster examples, Phonology Assistant (SIL, 2015)

WORD	GLOSS
[nekst]	next
[sɪŋk]	sink
[gold]	gold
[insekt]	insect
[froduks]	products
[boks]	box
[orinz]	orange
[gadens]	gardens

NEW PHONOLOGICAL INVENTORY

The findings are summarised in table eight which sets out the phonological consonant inventory derived from both sets of analyses. The phoneme /h/, although used inconsistently, is included in the orthography. [h] and other phones in round brackets are not included in the phonology but will be monitored in the future child study. Table 4 (above) shows distributional limitations.

Table 8. New phonological inventoryⁱⁱⁱ

	bilabial	labio- dental	dental	alveolar	post alveolar	palatal	velar	glottal
Stop	p, b			t, d			k, g	
Nasal	m			n			ŋ	
Affricate				(tʃ)	dʒ			
Fricative		f, v		(ʃ)				(h)
Trill/flap				r				
Lateral				l				
approximant	w					j		

DISCUSSION

The variability of Tok Pisin makes establishing a categorical phonology challenging. Code switching was seen in these adults, which indicates input from more than one phonology is available to them (Docherty and Khattab, 2008). However, the concept of variation around a core phonology is one way of reflecting flexibly on the phonology (Wakizaka, 2008) in order to have some guidelines for a much needed clinical phonology (Grunwell, 1977). Distinguishing each participant's phonology as opposed to their phonetic repertoire is a considerable task. This needed to be done for individual phonologies which could then be compared. In this situation, it was also important to determine the consistency of phonemic distribution changes in the data. The greater TP precision of single words compared to the occurrence of some additional English phonemes in the connected data is an interesting reflection on creolisation force in connected speech.

The individual phonologies were generated in Phonology Assistant according to phonological principles (Burquest, 2006), resulting in a strong and consistent picture of the phonology for the population of this sample. The study revealed some differences on comparison with the core phonology in the literature, but variation around the core is to be expected in creole TP speakers. The core phonology reported in the literature is reinforced by this adult population, with the addition of [f] and [p] as individual phonemes and the addition of some expanded fricative and affricate use. The task of determining whether a phoneme was merely part of an unintegrated borrowing was a task whose complexity was beyond the scope of this study, and invites further research. Some innovative borrowed words such as [meikez] were infrequent enough not to dramatically change its phonology.

One of the most interesting analyses in this population was that of the [p]/ [f] contrast. In TP the voiceless labiodental fricative [f] can be realised as voiceless bilabial plosive [p]. The most frequent example of this in TP is the change of the words for numbers such as; ‘two fella’ [tufela] to [tupela]. However, as TP creolises, the [f] is appearing in this highlands population, for example in words like [fis] ‘fish’ rather than [pis]. Using the continuous speech samples, each participant was examined for contrastive use of the phones [f] and [p] and for free variation, which would indicate allophonic rather than phonemic status for the phone. The group data and the data from individual phonologies suggests that there is an emerging contrastive distinction between [f] and [p] in many phonetic contexts

for many speakers in this sample. This is different from the standard TP phonology (Smith & Siegel, 2013). An ability to distinguish [f] and [p] may therefore be part of normal phonological acquisition in this group and may well be an feature of ongoing creolisation introducing the constraints of English phonology. Melpa phonology uses dentalisation and prenasalisation contrastively and has an alveolar lateral fricative (Stucky, 1990). One could speculate that these features of the substrate phonology may have helped this population master this labiodental fricative/ bilabial plosive distinction.

There were interesting changes in fricative use and fricative/affricate contrast. The phoneme [dʒ] is occurring in positions other than SIWI, a limitation Mihalic noted, (1989) but which Smith also observed changing (2002, p. 49). Although there is evidence of universal pressure in the strength of unvoiced versus voiced plosives, the strength of the affricate [dʒ] is not universally typical and may reflect the influence of a substrate which routinely uses fricatives, even though ‘from a markedness perspective, fricatives are more marked than stops’ (Romaine, 1992a, p. 180).

Group and individual analyses in both continuous speech and single word data show an expanded phonemic repertoire from that described in the literature (Mihalic, 1989, Romaine, 1992a, Smith and Siegel, 2013). Some, [z], [θ] and [ð], lacked the statistical strength to be included in the phonology. [ɬ] also occurs infrequently, and may be due to substrate influence. The limited contrastive use of [tʃ] and the introduction of [dʒ] in SFWF position do not warrant inclusion in the phonology. Post alveolar fricatives [ʃ] and [ʒ] have appeared, the unvoiced more frequently, and analyses show some individuals are using [s] and [ʃ] contrastively. Although [ʃ] is not uniformly used, it is frequent enough to be included in a future child survey

to clarify its status. The strong showing of [v] in SIWW position negates any suggestion of it being stopped and labialised as [b].

This pilot study was designed to confirm the phonology in the literature and as such was limited by the size of the cohort, the size of the corpus collected and the time frame. Further study of this population would benefit from a larger cohort, selected from an even broader range of sociolinguistic backgrounds. It would be interesting to monitor expansions to the phonetic repertoire which are at present in free variation (e.g. [ʃ]), but which may well be emerging.

CONCLUSION

This pilot study in a Melpa substrate, creole TP-speaking adult population achieved its goal of describing the phonology. It confirmed the historical core phonology, with some additions evident. These additions included more frequent use of voiced plosives, use of unvoiced affricates and allophonic SFWF voiced affricates. 92% of participants showed use of SFWF affricates rather than reduction of the superstrate lexifier form to fricative [s]. In this population, the major difference was in clearly contrastive use of [f] and [p] by 66% of participants, and emerging contrast in 83%. Thus, there is an expanded phonetic repertoire compared to the literature with evidence of additional phonological developments. These findings provide a model against which it is possible to evaluate phonological development in Tok Pisin speaking children in urban and semi-urban populations of the Western Highlands Province.

APPENDIX 1. MELPA PHONOLOGY (STUCKY, 1990) ORIGINAL FORMAT.

	Bilabial	dental	alveolar	retroflex	palatal	velar
PLOSIVE						
Voiceless	p	t̪	t			k
voiced	b	d̪	d			
Prenasalised						
plosives	(mp)	(nt̪)	(nt)			(ŋ)
Voiceless	(mb)	(nd̪)	(nd)			
voiced						

Nasals	m	ɱ	n		ŋ
Trill			r	r	
Approximant					j
Lateral					
approximant					ɭ
Voiceless		(ɻ) (ʃ)		ɻ	ɻ̥
voiced					

APPENDIX 2. DETAILS OF PHONOLOGICAL RATING.

Individual and group phonologies were rated on a four-point scale; 1. Successfully elicited target sound, 2. word or phone not present (not elicited), 3. Phoneme omitted from word, 4. Phone substituted in word. Category one generated the phonetic inventory. It also indicated the percentage of successful elicitations of a phone, according to position, within the target words.

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ENDNOTES

- i. “professional language user” – mastery expected for normal work use.
- ii. Sometimes phonemes appear to be geminates (Davis, 1999) that could be deemed to be both SFWW and SIWW across the syllables in a word.
- iii. In this study, words are regarded as recent borrowings if they do not appear in either the Mihalic (1989) or Oxford (Volker, 2007) dictionaries of Tok Pisin, or appear in only the Oxford dictionary (Volker, 2007).