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The production of voicing in Namibian English stops by speakers of Khoekhoegowab

Highlights

- Word-initial stop consonant voicing in Khoekhoegowab speakers' Namibian English is examined.
- The speech data consists of interviews conducted in Namibia.
- The voice onset times are significantly longer in voiceless stops than in voiced stops.
- Stop voicing contrast in Namibian English is found congruent with other varieties of English.

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Abstract

This study examines whether Namibian English spoken by L1 Khoekhoegowab speakers has word-initial stop voicing contrasts, and how they might be realized in freely produced speech. The data consists of English interviews collected from nine speakers of Namibian English. For analysis, a total of 365 words beginning with a stop-vowel sequence were extracted from the interviews, and analyzed for voice onset time (VOT). To examine the realization of voicing, the extracted words are divided into voiced and voiceless categories based on their phonological voicing in other varieties of English and their VOTs are compared statistically. The VOTs of voiceless stops are significantly longer than those of voiced stops. The results suggest a short-lag vs. aspiration contrast in word-initial stops in Namibian English and provide new information about the phonetic features of Namibian English consonants.

Keywords: English, Namibian English, speech production, stop consonants, voicing
Asiasanat: englanti, namibianenglanti, puheen tuotto, klusiilit, sointi

1 Introduction

English has been the official language of Namibia since the country gained its independence in 1990 (Norro 2022a). Since then, research has indicated that a distinctly Namibian form of English may be emerging among World Englishes, separate from South African English varieties (Buschfeld & Kautzsch 2014; Schröder et al. 2021; Stell 2022b). Most Namibians are multilingual speakers of indigenous languages and typically learn English as a second or third language in school where it is used as the mode of instruction (Norro 2022b, 2022c), which means that it is likely that the phonetic characteristics of Namibian English are influenced by the phonological systems present in Bantu and Khoe languages. This suggestion is supported by previous research that has identified Bantu influences on spoken Black South African English (see e.g. Kamwangamalu 2020; Louw & de Wet 2007; Makalela 2013). According to the 2011 census, the most commonly spoken indigenous languages are Oshiwambo, Khoekhoegowab, Kavango, and Otjiherero (Namibia Statistics Agency 2013). In addition to these, 10 % of the population are native speakers of Afrikaans, which was the language of administration and education before the independence of Namibia (Norro 2022a). Today, Afrikaans is still used as a lingua franca between speakers of different L1s.

Previous studies have indeed identified certain phonetic characteristics in Namibian English that differentiate it from other English varieties, particularly South African English (Buschfeld & Kautzsch 2014; Schröder et al. 2021). It has been suggested, however, that the pronunciation of Namibian English varies among speakers and is influenced by ethnic factors, implying the existence of multiple localized sub-varieties of Namibian English (Schröder et al. 2021). On the other hand, some argue that a single, more standardized local variation of Namibian English with a

higher social status might be emerging among speakers of different local languages, bringing the ethnically diverse Namibian English variations together (Stell 2022a, 2022b). However, compared to other varieties of English, the descriptions on the phonetic characteristics of Namibian English are still relatively limited and literature often focuses on South African Englishes or English spoken by L1 Bantu speakers in general (e.g. Kamwangamalu 2020).

Khoekhoegowab is a language belonging to the Khoekhoe branch of the Khoe language family (formerly known as Khoesan/Khoisan). It is spoken by roughly 240 000 people in Namibia, or 12 % of the population, making it the second most common language after Oshiwambo (Haacke 2018). Khoekhoegowab has a fairly complex sound system, typically described as having five short and long vowels, three nasal vowels, 12 non-click consonants and 20 click consonant phonemes. In addition, it is a tonal language, with a tone system consisting of six contrasting tones (Cruttenden 1992). The existence of stop consonant voicing in Khoekhoegowab has been described in various and conflicting ways in the existing literature. Cruttenden (1992), for example, describes the language as having three stop consonants, /b/, /d/ and /g/, that have entirely predictable and therefore non-contrastive voicing. They describe the stops as being voiceless in word-initial positions with possible slight aspiration. Voiced plosives only occur word-medially, and /b/ may also occur voiceless in a word-final position, marking masculine nouns (Cruttenden 1992: 104). Fredericks and Banda (2018) report that this supposed lack of stop voicing contrasts in Khoekhoegowab is also maintained by other phonological descriptions of the language and more official language resources, such as the official Khoekhoegowab orthography (Curriculum Committee for Khoekhoegowab 2003) and a Khoekhoegowab-English dictionary (Haacke & Eiseb 2002). In all of these sources, it is claimed that the stop consonant pairs represented in writing with the seemingly contrasting letters p-b, t-d and k-g are in fact phonetically realized with identical sounds, and the use of the distinct letters is motivated by needing to distinguish between the tonal quality of the following vowel (Fredericks & Banda 2018).

Conversely, Fredericks and Banda (2018) suggest that there are, in fact, three contrasting stop voicing pairs in Khoekhoegowab: /p-b/, /t-d/ and /k-g/. Their findings are based on acoustic analysis of recorded sentences and individual words from four Khoekhoegowab speakers, and additionally listener groups of native Khoekhoegowab speakers who discussed the recordings with the researchers. The listener groups were asked, for example, if the meaning of the word would change if the initial stop consonant was changed to its voiced or voiceless counterpart while the tone was kept the same. Both the acoustic analyses of the recorded speech and the statements from the listener groups suggested that word-initial voiced and voiceless stop sounds in Khoekhoegowab are realized with different acoustic qualities, and that they cannot in all situations be switched without changing the mean-

ings of the words (Fredericks & Banda 2018). There is little information about the acoustic nature of the possible contrast in any of the examined literature.

In English, there are three contrasting stop consonant voicing pairs, /p-b/, /t-d/ and /k-g/ (Roach 2004). In a word-initial position, the difference between English voiced and voiceless stops is mainly based on VOT, as originally described by Lisker and Abramson (1967) and confirmed, for example, by Keating et al. (1983). Voiced stops in English exhibit either prevoicing, where voicing begins before the release burst of the consonant, or more typically short-lag VOT, where the delay between the release burst and voicing is very short, if not effectively non-existent. Voiceless stops are typically aspirated (e.g. Cho et al. 2019), meaning that the VOT is longer and turbulent air escapes through the vocal folds after the release burst before voicing starts. The mean VOT durations for English word-initial short-lag voiced stops are 0–20 ms and for aspirated voiceless stops 50–80 ms. Prevoicing, when it occurs, is in the range of 40–100 ms (e.g. Keating et al. 1983; Lisker & Abramson 1967; Suomi 1980).

Models of second language acquisition, such as the Revised Speech Learning Model (SLM-r) (Flege & Bohn 2021) and the Perceptual Assimilation Model of Second Language Speech Learning (PAM-L2) (Best & Tyler 2007), suggest that a second language phonological contrast of similar sounds that are considered to be allophones or other variants of a single native language phoneme category will initially both be perceived and produced like that native phoneme. This could mean that native speakers of Khoekhoegowab, assuming the lack of native stop voicing contrasts, would perceive the English voiced and voiceless stops as members of their own single stop category and then produce them as such when speaking English. With enough experience and exposure to the new contrast, a new phoneme category could form for the more unfamiliar sound in the second language contrast and the speakers would be able to use it contrastively (Best & Tyler 2007; Flege & Bohn 2021). It has been shown, for example, that neural discrimination of an unfamiliar second language fricative voicing contrast can be acquired in just days with focused training, though this is likely not reflected in the productions of the participants (Tamminen et al. 2015). If, however, a second language contrast closely matches an existing native contrast, the speakers will face little problems perceiving and producing it. This could be the case if Khoekhoegowab does have voiced and voiceless stops. (Best & Tyler 2007; Flege & Bohn 2021.)

Studies on Namibian English have typically focused on vowels (e.g. Schröder et al. 2021; Stell 2022a, 2022b), and research on the consonants of Namibian English is particularly scarce. The purpose of the current study was therefore to provide some of the first insights into the consonants of Namibian English by examining the production of word-initial stop consonants by native speakers of Khoekhoegowab. VOT was chosen as the examined feature because it is the main acoustic feature differentiating English voiced and voiceless stops, particularly in a word-initial position (Abramson &

Whalen 2017; Lisker & Abramson 1967). Based on the previously described ambiguity in the existence of stop voicing contrasts in Khoekhoegowab and its possible influence on the L2 English of its speakers, four research questions were formed:

1) Does the English spoken by native speakers of Khoekhoegowab have word-initial stop voicing contrasts?
2) If it does, how are the contrasts realized, based on VOT?
3) Do the word-initial stop voicing patterns follow the short-lag vs. aspiration contrast typical for other English varieties?
4) Are there Afrikaans influences in L1 Khoekhoegowab speakers' production of English voicing contrasts?

It was hypothesized that if there indeed is no stop voicing contrast in Khoekhoegowab, as maintained by some of the examined literature (Cruttenden 1992; Fredericks & Banda 2018), the speakers would face difficulties consistently producing it in English, as they previously would not have had to use voicing contrastively. Based on the literature, variation in VOT in Khoekhoegowab is dependent on the position of the segment in the word, i.e. it is allophonic (Cruttenden 1992), and according to models of second language acquisition, this poses the most difficult learning situation (Best & Tyler 2007; Flege & Bohn 2021). The speakers' likelihood of producing a voicing distinction might be largely dependent on their experience and exposure to a variety of English where the distinction does exist, and there could be a great deal of individual variation. Conversely, if a stop voicing contrast does exist in Khoekhoegowab, as suggested by Fredericks and Banda (2018), the speakers would likely also be able to employ it contrastively in English. The VOT values then produced, however, might not follow typical English patterns if the native contrast is acoustically realized in a different way. Proficiency in Afrikaans, typical to many Khoekhoegowab speakers (Haacke 2018), may also affect the production of voicing contrasts. Afrikaans is considered to have /p-b/ and /t-d/ contrasts, with voiced stops realized as prevoiced and voiceless stops as short-lag (Coetzee et al. 2018). While this pattern differs from the English short-lag vs. aspiration contrast, it could also be employed by the speakers in the current study for English, especially if stop consonant voicing is not a distinctive feature in Khoekhoegowab. As Afrikaans lacks the /k-g/ contrast, however, the influence of Afrikaans might result in a smaller VOT contrast between /k/ and /g/ for the speakers.

2 Materials and methods

2.1 Speakers

Nine students (aged 20–23 years, mean age 21.4 years, six females) from the University of Namibia participated in the study. Khoekhoegowab was the self-reported L1 of all participants. The reported L2s (languages acquired after L1) were English, Afrikaans, German, French, Otjiherero and Oshiwambo, of which Afrikaans and English were the only L2s spoken by all the participants. They had first learned English at the age of 3 to 7 and spoke it daily at the time of taking part in the study. The speakers were selected because they were highly proficient speakers of Namibian English and used it as a lingua franca with speakers of other Namibian languages in their everyday lives.

2.2 Interviews

The interviews where the speech data was collected were originally conducted for folkloristic research and linguistic archiving purposes and they all followed the same structure. All participants gave written informed consent before the interview. The consent covered the archiving of the interviews as well as their use for other research and teaching purposes. The participants were spoken to in English, and they were asked to answer the interviewer's questions first in Khoekhoegowab, and then to summarize their answers in English. The questions pertained both to the participants' everyday lives and their personal experiences and opinions about the historic and current presence of Finnish people in Namibia. The interviews were held at a lecture hall at the University of Namibia campus in Windhoek, and they were recorded using either an Olympus LS-P1 or a Zoom H2n audio recorder. The length of the participants' answers was dependent on both their talkativeness and their experience with the subject matter of the interview. Therefore, the total durations of the interviews ranged between 6 and 19 minutes.

2.3 Analysis

For analysis, words beginning with the target consonant-vowel (CV) sequences (with an initial stop consonant) were manually searched for from the interview recordings. Before further analysis, the words were separated into voiced and voiceless categories based on their phonological forms, i.e. whether the initial stop consonant would typically have been phonologically voiced or not in English. The words were then annotated in three tiers: the orthographic form of the whole word, the phonological form of the initial CV sequence based on British English Received Pronunciation (RP)

as described in the Cambridge Dictionary (2024), and the VOT of the initial stop. If the voicing started before the explosion (prevoicing) the VOT was marked as negative, and if voicing started after the explosion, it was marked as positive. If voicing started immediately at the time of the explosion, the VOT was marked as zero. Every instance of the target CV sequences could not be included in the analysis due to high speech rate or other factors in the recording that made it difficult to reliably assess the boundaries of the sounds. The number of analyzed stop sounds ranged between 21 and 89 between speakers. The total number of analyzed consonants was 365. The number of analyzed tokens per consonant are listed in Table 1.

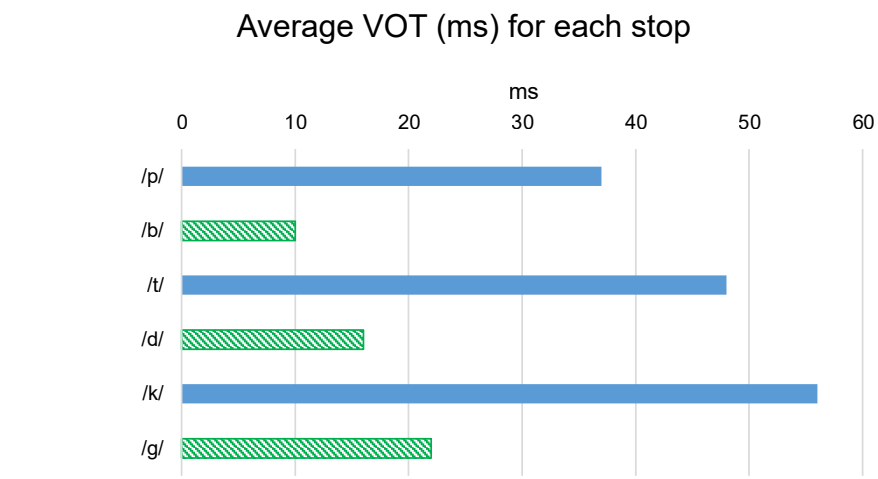
TABLE 1. The number of analyzed stop consonants extracted from the English interviews.

Phoneme	/p/	/b/	/t/	/d/	/k/	/g/	Total
N	50	78	79	52	81	25	365

To statistically analyze possible VOT distinctions in word-initial stop consonant voicing, the extracted stops were divided into three voicing pairs according to English phonology (Roach, 2004): /p-b/, /t-d/ and /k-g/. The statistical analysis of the VOT data began with Shapiro-Wilk's tests of normality, which confirmed that the data were approximately normally distributed. The voiced and voiceless VOT values were then compared within each three voicing pairs with the paired samples' t-tests using the SPSS Statistics (version 27.0.1.0) software.

3 Results

Examination of the stop consonant VOT values extracted from the speakers' productions revealed that the voiceless stops had overall longer VOTs (37–56 ms) than the voiced stops (10–22 ms). The average VOT values from the whole group for each stop consonant are displayed in Figure 1.



	/g/	/k/	/d/	/t/	/b/	/p/
average VOT (ms)	22	56	16	48	10	37

FIGURE 1. The group average of average VOTs calculated for each stop from the productions of the whole group (N=9). The bars represent the average VOT value, not the range.

The longest VOTs, on average, were produced in words beginning with /k/ (56 ms), whereas words beginning with /b/ were produced with the shortest VOT (10 ms). There appeared to be some variation in the average VOT ratios between the three consonant voicing pairs, with the VOT difference being the largest for the velar pair /k-g/ (44 ms), the smallest for the bilabial pair /p-b/ (27 ms), and intermediate for the dental-alveolar pair /t-d/ (32 ms). Examination of the individual average VOT values from each speaker revealed that the VOTs were produced fairly consistently within the group (Figure 2). Overall, there was more VOT variation between speakers in the voiceless stops /p, t, k/ than in the voiced stops /b, d, g/. There were two outliers in the speakers' average /d/ VOT values, as seen in Figures 2 and 3, but no other discrepancies emerged.

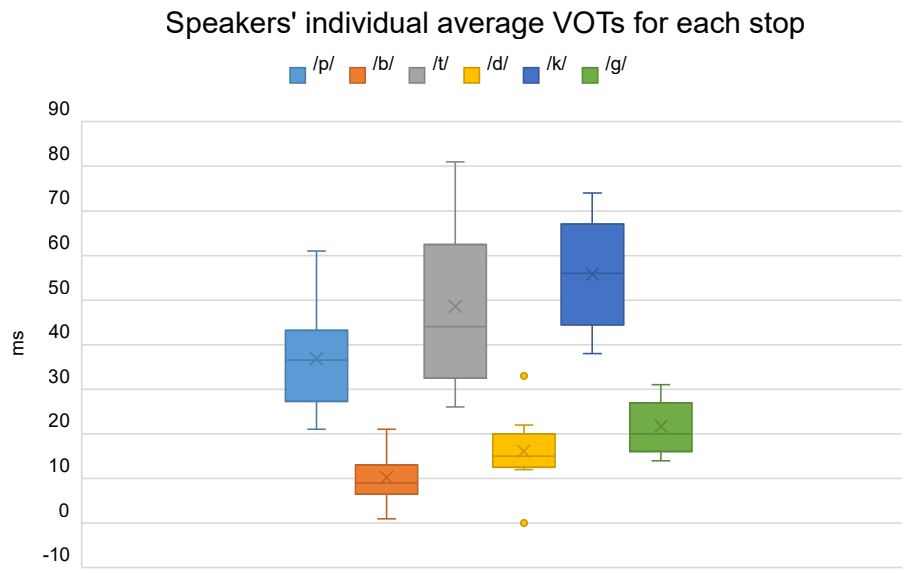


FIGURE 2. The average VOT values from each speaker for the six stops.

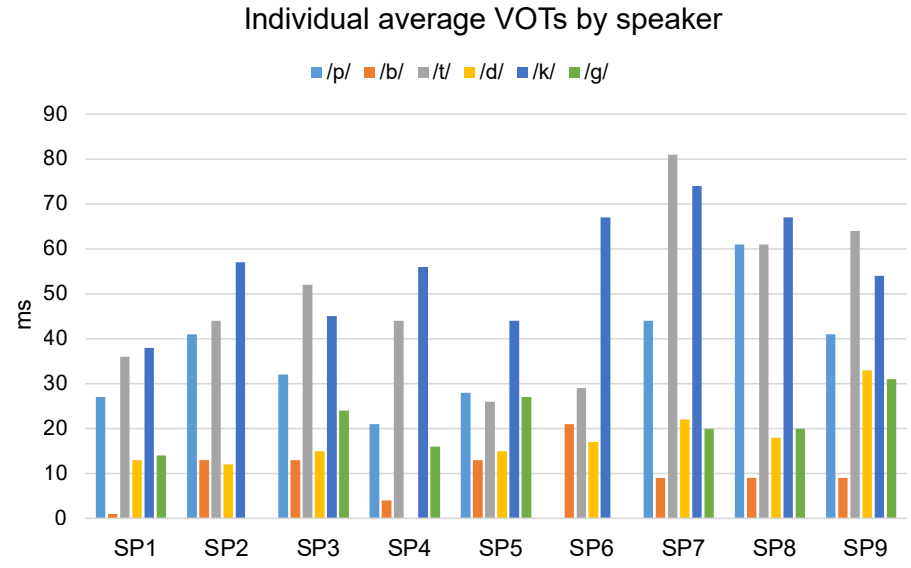


FIGURE 3. The average VOT values from each individual speaker.

The results of the paired samples' t-tests on subject averages revealed that the VOT values extracted from /p/ and /b/ differed significantly from each other ($t(8) = 6.558$, $p < .001$; Cohens' $d = 2.318$), and the same was true for the pairs /t-d/ ($t(8) = 6.155$, $p < .001$; Cohen's $d = 2.052$) and /k-g/ ($t(6) = 5.914$, $p = .001$; Cohen's $d = 2.235$). In other words, the VOTs were significantly longer in the voiceless than in the voiced stops in all the tested consonant voicing pairs.

4 Discussion

This study examined stop consonant production in Namibian English speech by native speakers of Khoekhoegowab. The research questions were:

1) Does the English spoken by native speakers of Khoekhoegowab have word-initial stop voicing contrasts?
2) If it does, how are the contrasts realized, based on VOT?
3) Do the word-initial stop voicing patterns follow the short-lag vs. aspiration contrast typical for other English varieties?
4) Are there Afrikaans influences in L1 Khoekhoegowab speakers' production of English voicing contrasts?

The hypothesis was that the speakers' production of word-initial consonant voicing might show influences of Khoekhoegowab and/or Afrikaans voicing production patterns, which differ from those of most English varieties. Possible Khoekhoegowab influences were expected to be reflected on the VOT values as a lack of clear voicing contrasts or as VOT values that are not typical for other English varieties. The second hypothesis was that possible Afrikaans influences on the speakers' production of Namibian English stop consonants would be reflected on the VOT values as a prevoiced vs. short-lag contrast and/or the lack of the /k-g/ voicing contrast.

The results show that the L1 Khoekhoegowab speakers produced word-initial stop voicing contrasts in their Namibian English speech, which was reflected in the consonant VOTs. The voiceless stop consonants /p, t, k/ were produced clearly aspirated with longer VOTs, whereas the voiced stops /b, d, g/ were produced with short-lag, i.e. very short or almost non-existent VOTs. The average VOTs for aspirated stops were slightly shorter than the VOT durations reported in some previous literature (e.g. Keating et al. 1983; Lisker & Abramson 1967), which could be at least partly explained by the high speech rate of the speakers and the free nature of the speech data, though some findings contradict the idea of an articulation rate influence (e.g. Nakai & Scobbie 2016). Though few individual words were produced with slight prevoicing, which was well under the typical 40–100 ms range reported for prevoiced stops (Keating et al. 1983; Lisker & Abramson 1967), or zero VOT, the majority of the

analyzed words with voiced initial consonants were produced with short-lag. These findings indicate that the primary cue for maintaining the stop voicing contrast in Khoekhoegowab speakers' English appears to be the aspiration of the voiceless stop rather than strong (pre)voicing of the voiced stop.

The short-lag vs. aspiration contrast found in the speakers' VOT data suggests that the speakers' production of stop voicing was similar to the voicing contrasts typically found in other English varieties (Keating et al. 1983; Lisker & Abramson 1967; Roach 2004) and was not greatly affected by the differing voicing patterns found in Khoekhoegowab or Afrikaans (Coetzee et al. 2018; Fredericks & Banda 2018). If the speakers had produced the English stops according to their L1 phonology, we would have expected there to be more variation in the stop VOTs. On the other hand, if their production had been influenced by their knowledge of Afrikaans, we would have expected the stop VOTs to show a prevoiced vs. short-lag contrast rather than a short-lag vs. aspiration contrast. In addition, the large VOT contrast found in the velar stop pair /k-g/ does not support the hypothesis that the speakers' production of English stops might have Afrikaans influences, as there is no /k-g/ voicing contrast in Afrikaans (Coetzee et al. 2018). The longer average VOT values found in the velar stop consonants /k/ and /g/ are also in keeping with previous literature on consonant voicing production in English, stating that the VOT tends to lengthen as the place of articulation moves back (Lisker & Abramson 1967). This has been discussed in detail by Cho and Ladefoged (1999) as well as by Suomi (1980), who describe how the place of articulation, length of occlusion and length of VOT are connected in English stops. As the place of constriction moves back in the mouth, the volume of the articulatory tract between the constriction and vocal folds decreases. This means that the pressure required to cause the release of the constriction can build up faster the further back the place of constriction is, resulting in shorter occlusion and a longer VOT. The exact glottal mechanisms underlying the connection between occlusion and VOT are physiologically different for voiced and voiceless English stops, but the general principle holds for both (Suomi 1980).

The study focused on L1 Khoekhoegowab speakers' production of English stop consonants but the results also offer valuable information on Namibian English phonetics in a broader perspective. There is still relatively little research on the phonetic features of Namibian English, and there is some debate on whether there is a single standardized English variety or multiple L1 dependent varieties spoken in the country (Buschfeld & Kautzsch 2014; Schröder et al. 2021; Stell 2022a, 2022b). Either way, since Khoekhoegowab is the second most common indigenous language spoken in Namibia, a notable number of Namibian English speakers are L1 Khoekhoegowab speakers. Therefore, the results of this study reveal new insights into the production of consonant voicing in the emerging Namibian English variety/varieties. Our results suggest that although Khoe and Bantu language influences and variety specific features have been found in Namibian English vowels (Buschfeld & Kautzsch

2014; Schröder et al. 2021) as well as South African English (e.g. Kamwangamalu 2020; Louw & de Wet 2007; Makalela 2013), the voicing contrasts of word-initial stop consonants in Namibian English seem to follow the common production patterns of English. These results can be used in the future to develop phonetic English training materials for L1 Khoekhoegowab speakers in Namibian schools.

More research into stop consonant voicing production in word-medial and word-final positions as well as fricative voicing production in general needs to be conducted in the future in order to gain an even better understanding of the phonetic features of Namibian English consonants. Moreover, additional data on word-initial stop consonant voicing from more L1 Khoekhoegowab speakers could be collected to verify our findings with this speaker group. Data from different L1 speakers of Namibian English could also be gathered to see if there are L1 related differences in the realization of word-initial stop consonant voicing contrasts. Due to the small number of speakers in this study, and due to their homogenous linguistic backgrounds, we need more phonetic research on Namibian English in the future to make more definite conclusions. The lack of clear Khoekhoegowab or Afrikaans influences in the current data suggests that the speakers' other languages did not affect the production of English stop consonant voicing. In other words, these results represent L1 independent stop consonant VOT production patterns in Namibian English.

5 Conclusions

The results of this study showed that L1 Khoekhoegowab speakers of Namibian English produce word-initial stop consonant voicing contrasts /p-b/, /t-d/ and /k-g/ in their speech, with voiced stops produced with significantly shorter VOTs than voiceless stops. The short-lag vs. aspiration voicing contrast found in the data is congruent with the voicing contrast production patterns found in other English varieties. The results can be used in the future to design phonetic English teaching materials and to support English learning in Namibian schools.

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