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EFFECTS OF NONNATIVE PHONOTACTIC CONSTRAINTS ON THE PERCEPTION OF NASAL-INITIAL CONSONANT CLUSTERS

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EFFECTS OF NONNATIVE PHONOTACTIC CONSTRAINTS ON THE PERCEPTION OF NASAL-INITIAL CONSONANT CLUSTERS

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ABSTRACT

This study examines the effects of non-native phonotactic constraints on the perception of nasal-initial consonant clusters (NICC), specifically whether native English speakers can perceive NICC as accurately as native Swahili speakers. The ABX task was conducted over Zoom to test L1 English speakers (N=12) and L1 Swahili speakers (N=12). Stimuli with four conditions were used: 1) The stimuli had one of the three nasal sounds (/m/, /n/, and /ŋ/) in word-initial consonant clusters; 2) The stimuli had NICC composed of a nasal sound followed by either a voiced or voiceless consonant; 3) The consonant clusters were composed of sounds that are pronounced in the same or different place of articulation; 4) The stimuli had counterparts formed by either deleting a nasal sound or inserting a vowel sound between consonant clusters.

Four mixed ANOVAs with repeated measures on the type of nasal sound, voicing, place of articulation, and vowel insertion versus nasal deletion counterparts revealed that L1 Swahili speakers are more accurate than English speakers in perceiving NICC. The results also revealed that the type of nasal sound, voicing, and place of articulation do not significantly affect the L1 English speakers' perception of NICC. Nevertheless, the results revealed that stimuli condition with vowel insertion counterparts significantly affected the English participants' perception; the English participants had difficulties differentiating clusters with and without /ɑ/ sound between NICC, which suggests that they perceived an illusory /ɑ/ sound between NICC. The participants' performances reflect their L1 phonotactics; the structure of NICC adheres to the Swahili phonotactics, but deviates from the English phonotactics. These results, therefore, support the hypothesis that non-native phonotactic constraints affect the perception of L2 sounds.

DEDICATION

I dedicate this thesis to my beloved people, family, and anyone who believes that anything is possible as long as you do the right thing at the right time.

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CHAPTER I

LITERATURE REVIEW

1. Introduction

This study examines the effects of phonotactic constraints on the acquisition of second language (L2) sounds, specifically how phonotactic constraints affect the perception of L2 nasals. Previous studies on the effects of phonotactic constraints on the perception of L2 nasals have shown that it can be difficult to perceive nasal sounds that deviate from native language (L1) phonotactics (Alcock, & Ngorosho, 2007; Berent, Lennertz, Smolensky, & Vaknin-Nusbaum, 2009; Kluge Rauber, Reis, & Bion, 2007; Markwardt, 1946). For instance, Kluge et al. (2007) found that Brazilian L1 speakers have difficulties perceiving and producing English nasals in the coda because this structure deviates from their L1 phonotactics. However, it appears that there are three significant gaps in previous studies on the effects of phonotactic constraints on the perception of L2 nasal structures.

The first gap is that some phonotactic environments have not yet been fully investigated. For instance, previous studies appear to not yet have tested the perception of nasal-initial consonant clusters (NICC), composed of a nasal sound followed by a voiced or voiceless consonant (e.g., [mb] voiced nasal + voiced consonant vs [mp] voiced nasal + voiceless consonant). In addition, the perception of NICC composed of a nasal produced in the same place versus a different place of articulation with the following consonants has not yet been tested (e.g., same: [mb] bilabial + bilabial vs different: [md] bilabial + alveolar). It is, therefore, significant to examine whether these phonotactic structures that have not yet been tested influence perception difficulties.

The second significant gap is that speakers of many languages that have nasals, especially less commonly taught languages (LCTLs), such as Swahili and other African languages, appear to not yet have been tested by the previous studies. As such, it is noteworthy to test other groups of participants that have not yet been tested in order to further examine if non-native phonotactic constraints can affect their perception.

The third gap is that there are some limitations in previous studies. Some studies did not have a control group (e.g., Markwardt, 1946), while other studies had a small-sized control group of just three L1 English speakers (e.g., Kluge et al., 2007). Yet, other studies used non-native speakers whose L1 phonotactics deviate from stimuli structures to produce the stimuli that were used to test participants' perception (e.g., Berent et al., 2009). It is, therefore, noteworthy to address these previous limitations and re-examine the effect of phonotactic constraints on the perception of L2 nasals.

The current study addresses the gaps stated above by examining three main issues discussed in the first gap in the literature above: 1) whether phonotactic constraints affect the perception of NICC; 2) whether English native speakers have difficulties perceiving NICC composed of a nasal sound followed by a voiced or voiceless consonant; 3) whether English native speakers have difficulties perceiving NICC composed of a nasal sound followed by a consonant sound that is pronounced in the same or different place of articulation. To address these questions, L1 Swahili and L1 English speakers are tested in this study using pseudo-word stimuli that have the structure of NICC; this structure adheres to the Swahili phonotactics but violates the English phonotactics.

2. Phonotactic differences between English and Swahili nasals

Swahili and English have the same nasal sounds of /m/, /n/, and /ŋ/, but only Swahili has /ɲ/. Nonetheless, the phonotactic environments of these sounds are different. The differences between the English and Swahili nasal structures can be categorized into three main groups: 1) nasal sounds mainly appear in the word-initial and -medial positions, but not in the word-final position in Swahili (e.g., [**m**]a[**m**]a, [**n**]i[**ŋ**]i[**n**]ia, and [**ŋ**]amua) whereas in English two nasals (/m/ and /n/) appear in the word-initial, -medial, and -final positions (e.g., s[**m]**all, [**m]**an, psal[**m]**, tow[**n]**, [**n]**ot, and s[**n]**ake) while the /ŋ/ mainly appears in the word-medial and -final position (e.g., Seemi[**ŋ]**ly and goi[**ŋ**]); 2) according to Harvey & Mreta (2017), nasal sounds appear in the word-initial position as syllabic nasals in Swahili (e.g., [**m**.to.to), [**ŋ**.ga.zi], [**n**.t ʃi]) whereas according to Malécot (1960), English syllabic nasals mainly appear in the word-final position (e.g., [ˈbʌt[**n̩**] and pris[**m**]). However, there is no syllabic /**ŋ/** in the English language**;** 3) nasals can be followed by either voiced or voiceless sounds in Swahili (e.g., [**ms**]itu and [**mz**]azi) while in English they are mainly followed by voiced consonants (e.g., dor[**mz**], chicke[**nz**], and to[**ŋz])**. The phonotactic structure of [**mz**] does not appear in the word-initial position in English because it violates the sonority scale (Wiese, 2001). Additionally, the [**ms**] structure does not appear in the word-final position in English because it violates the progressive voicing assimilation rule (Lombardi, 1999). The table below summarizes the phonotactic structures of nasal sounds in English and Swahili. The columns show the three main differences discussed above and the rows show how these differences appear in Swahili and English.

Table 1

Phonotactic differences between English and Swahili nasals.

Difference / Language		**The position of nasals (non-syllabic) within a word**			**The position of syllabic nasals within a word**			**Can a nasal sound be followed by a voiced or voiceless consonant?**	
		Initial	Medial	Final	Initial	Medial	Final	Nasal + Voiced	Nasal + Voiceless
Swahili	/m/	○	○	X	○	○	X	○	○
	/n/	○	○	X	○	X	X	○	○
	/ŋ/	○	○	X	○	X	X	○	X
	/ɲ/	○	○	X	X	X	X	○	X
English	/m/	○	○	○	X	X	○	○	X
	/n/	○	○	○	X	X	○	○	X
	/ŋ/	X	○	○	X	X	X	○	X
	/ɲ/	X	X	X	X	X	X	X	X

Note: ○ = it appears; X = it does not appear.

3. Theoretical Background

Studies have shown that a learner's L1 influences the perception of L2 sounds (Best & Cardoso, 2011; Tyler, 2007; Derwing & Munro, 2015; Dupoux, Kakehi, Hirose, Pallier, & Mehler, 1999; Durvasula, & Kahng, 2015; Flege & Wang, 1989; Goto, 1971; Miyawaki, Jenkins, Strange, Liberman, Verbrugge & Fujimura, 1975; Ota, Hartsuiker, & Haywood, 2009; Tyler, Best, Faber & Levitt, 2014). These studies suggest two factors that can affect the perception of L2 sounds. The first factor is that it can be difficult to perceive sounds that do not exist in the L1 phonological inventory (Best, 1995; Goto, 1971; Miyawaki et al., 1975; Tyler et al., 2014). For instance, Goto (1971) states that Japanese speakers struggle to perceive English /l/ and / ɹ / sounds because these sounds do not exist in their L1 phonological inventory; therefore, when perceiving English /l/ and / ɹ / sounds, they assimilate them into the single category [ɾ] that exists in their L1 phonological inventory.

The second factor is that it can be difficult to perceive sounds that violate L1 phonotactic structures (Cardoso, 2011; Dupoux et al., 1999; Durvasula, & Kahng, 2015; Markwardt, 1946). These studies claim that a sound may exist in both the L1 and L2, but its phonotactic environment can lead to perception and production difficulties. For instance, Dupoux et al. (1999) tested the perception of Japanese and French L1 speakers on structures that violate their L1 phonotactics: using stimuli with consonant clusters (CC) (e.g., *e**bz**o*) for L1 Japanese listeners and stimuli with short and long vowels (e.g., *eb**u**zo* and *eb**uu**zo*) for French listeners. Results show that the Japanese participants perceived an illusory vowel between the CC, while there was no vowel, whereas the French participants had difficulties in vowel length contrast. These results reflect the perceptual constraints that the L1 structures of each group of participants places on L2 perception: Japanese L1 structure does not allow a CC structure while in French, vowel length does not differentiate lexical meaning. Therefore, the participants repaired the stimuli using structures that are allowed in their L1 phonological systems.

As discussed above, both non-native phonotactic constraints and sounds that do not exist in the L1 system can lead to perceptual errors (Best & Tyler, 2007; Best, McRoberts & Goodell, 2001; Derwing & Munro, 2015, Dupoux et al., 1999; Tyler et al., 2014). Best (1995) argues that perceptual errors happen because L2 speakers assimilate L2 phonemes into their own phonemic inventory. This process is described as the Perceptual Assimilation Model (PAM). According to PAM, there are three types of assimilation: Single Category (SC) — two L2 sounds are assimilated into a single L1 category (e.g., English speakers assimilate Hindi retroflex /ʈ/ and dental /t̪/ into English /t/), Two Category (TC) — two L2 sounds are assimilated into two L1 categories (e.g., English speakers assimilate French dental /d̪/ and uvular /ʁ/ into /d/ and /ɹ/ respectively), and Non-Assimilable (NA) — L2 sounds are not assimilated to any L1 category (e.g., two Zulu clicks are not assimilated to any English category).

Along with assimilation, L2 speakers also map L2 categories onto their L1 by inserting, deleting, or substituting sounds (Derwing & Munro, 2015). For example, Dupoux et al. (1999) state that Spanish speakers tend to perceive an illusory [e] sound in front of the /s/ sound in English words that start with an /s/ followed by consonant sounds (sC). For instance, Spanish speakers perceive e*structure* instead of *structure*. This is a good example of an epenthesis error. This effect reflects Spanish phonotactics: An sC cluster is always preceded by [e] in the Spanish language. Therefore, L1 Spanish speakers repair L2 English words with sC clusters using the structure that is acceptable in their L1 phonotactic system.

4. Previous studies on the effects of phonotactic constraints on the perception of nasals

Previous studies have also shown that phonotactic constraints can affect the perception of L2 nasal sounds (Alcock, & Ngorosho, 2007; Berent et al., 2009; Kluge, et al., 2007; Markwardt, 1946). For instance, Markwardt (1946) demonstrates that L1 Spanish speakers misperceive English nasal sounds in the coda position because this structure violates their L1 phonotactics. That is, Spanish does not allow nasal sounds in the word-final position. Kluge et al. (2007) also show that Brazilian L1 speakers have difficulties perceiving English nasal sounds in the word-final position because this phonotactic structure violates their L1 phonotactics; Portuguese does not allow the structure of nasal sounds in the word-final position. These studies support the hypothesis that L1 phonotactics influence the perception of L2 nasals. However, this does not mean that phonotactic constraints affect the perception of all participants across all languages. Also, these studies used real English words with the participants who had exposure to the English language. This might have skewed the results as the participants might have perceived familiar stimuli using their L1 or L2 experiences, i.e., lexical knowledge. Based on these gaps, it is noteworthy to re-examine the perception and production of nasal sounds using non-words and different participants with varying backgrounds.

Moreover, Berent et al. (2009) investigated whether Russian and English L1 speakers perceive nasal-initial clusters epenthetically, and whether falling sonority influences perceptual epenthesis more than rising sonority. The researchers used twelve minimal pairs of monosyllabic and disyllabic pseudo-word stimuli with initial-nasal clusters of rising or falling sonority (e.g., [mlɪf, mdɪf] and [nlɪf, ndɪf]). The stimuli were recorded by an L1 English speaker. Results show that Russian participants were more accurate than English participants in identifying the number of monosyllabic stimuli. Results also show that English L1 speakers misperceive initial-nasal clusters with falling sonority more often than clusters with rising sonority. These results support the hypothesis that L1 phonotactics influences the perception of L2 nasal sounds.

In general, previous studies on the effects of non-native phonotactic constraints on the perception of nasal sounds support the hypothesis that it can be difficult to perceive nasal sounds that deviate from the L1 phonotactics, including the structure of NICC, which is further examined in the current study.

5. The current study

The current study addresses the gaps stated above. The first experiment in Berent et al. (2009) study is the base of this study. The difference between the current study and Berent et al. study can be categorized into three main groups. First, Berent et al's study focused on the effect of markedness and sonority on the perception of nasal-initial clusters, using stimuli with clusters composed of a syllabic nasal followed by one consonant sound with either rising or falling sonority. The current study focuses on the effect of voicing on the perception and production of nasal-initial clusters using stimuli with clusters composed of a Swahili nasal sound followed by either a voiced or voiceless consonant. Second, Berent et al's study only focused on the perception of /m /and /n/ sounds in nasal-initial clusters. The current study examines the perception of / m/, /n/, and /ŋ/ in the word-initial clusters. Third, instead of investigating native English and Russian participants, the current study investigates native English and Swahili speakers as Swahili features many syllabic nasals in the word-initial position followed by one consonant to create consonant clusters. The objective is to include other groups of participants who have not yet been tested by the previous studies on the effects of non-native phonotactic constraints on the perception of L2 nasal sounds.

6. Research questions

This study examines the following questions:

(RQ1) Can native English speakers perceive NICC as accurately as native Swahili speakers?

(RQ2 Is there any difference in accuracy by native English speakers' perception of:

a) all three nasal sounds (/m/, /n/, and /ŋ/) in NICC?
b) NICC composed of a nasal sound followed by voiced versus voiceless consonant?
c) NICC composed of a nasal sound followed by a consonant sound that is pronounced in the same place versus different place of articulation?

(RQ3) Do native English speakers perceive an illusory /ɑ/ sound between NICC more often than deleting a nasal sound?

The following are predictions for the above research questions:

(P1) The Swahili speakers will have an advantage over the English participants as the stimuli structures adhere to their L1 phonotactics. That is, the Swahili participants will perceive the stimuli using their L1 phonotactics which will result in many correct responses. On the other hand, the English participants will have difficulties perceiving NICC because this structure deviates from their L1 phonotactics. The English participants will perceive the stimuli using their L1 phonotactics which will lead to many incorrect responses compared to the Swahili participants.

(P2.A) The native English speakers are expected to have almost the same results in two nasals — /m/ and /n/ — because these sounds share many features in both Swahili and English language. The English speakers’ performance of /ŋ/, however, is expected to be lower than the other two nasals as this nasal shares few features compared to the other two nasals. For more details about Swahili and English nasals refer to Table 1.

(P2.B) The L1 English speakers' performance may be higher in clusters composed of a nasal sound followed by voiced sounds compared to the structures composed of a nasal sound followed by voiceless sounds because this structure adheres more closely to their L1 phonotactics (refer to the third row in Table 1 for more details).

(P2.C) The performance of native English speakers is expected to be less accurate in NICC composed of a nasal sound followed by a consonant sound that is pronounced in the same place of articulation. This result will be influenced by the effects of coarticulation which is expected to be more intense in clusters composed of two consonant sounds that are pronounced in the same place of articulation compared to clusters that are pronounced in different places of articulation.

(P3) The English speakers are expected to make more errors in structures with vowel insertion than structures with nasal deletion. This is expected to happen because stimuli with vowel insertion will have the same number of syllables, whereas stimuli with nasal deletion will have different numbers of syllables. As such, the participants may refer to the number of syllables to differentiate stimuli.

CHAPTER II

METHOD

1. Participants

Twelve L1 English speakers and twelve L1 Swahili speakers (six females and six males in each group) volunteered to participate in this study. The English participants were the experimental group, and the Swahili participants were the control group. The participants were recruited through posting advertisements on social networks such as WhatsApp, GroupMe, Facebook, and Instagram. None of the English participants reported being fluent in Swahili or any other language with the structure of NICC. Based on a questionnaire, the native English participants' ages ranged from 19 to 32 (M = 24.92, SD = 3.655) whereas the native Swahili participants' ages ranged from 21 to 30 (M = 26.08, SD = 2.483). Twenty participants reported that they are college students, while the rest of the participants reported that they are recent graduates. All the English participants live in the United States, whereas five Swahili participants live in the United States and the other seven participants live in Tanzania. All the participants reported that they do not have any health issues relating to the perception or production of sound.

2. Materials

The following materials were used in the current study:

2.1 Questionnaires

Two questionnaires were used in this study. The first questionnaire was about the participants’ biographical information and their language learning background (refer to appendix A for more details about this questionnaire). The second questionnaire was about the participants' experiences in this study (refer to appendix B to view the list of questions).

2.2 Stimuli for the ABX discrimination task

Ten pseudo/non-words stimuli were formed. All the pseudo-words adhered to Swahili phonotactics but only the test stimuli deviated from the English phonotactics. That is, all the pseudo-words had Swahili syllabic nasals in the NICC (refer to the first column in the table below). The clusters had two conditions. First, each nasal sound was followed by either a voiced or voiceless consonant. Second, each nasal sound was followed by a consonant sound that is pronounced in the same or different place of articulation. Twenty new pseudo-words were then formed from the ten pseudo-words, making a total of thirty pseudo-words. The newly formed words were created by deleting the nasal sounds (refer to the second column in the table below) or by inserting /a/ between the consonant clusters (refer to the third column in the table below).

Table 2

List of Stimuli for the ABX task written in IPA

No.	The structure that deviates from the English phonotactic	The structure that represents nasal deletion	The structure that represents vowel epenthesis
1	**m**papo	papo	**mɑ**papo
2	**m**bapo	bapo	**mɑ**bapo
3	**m**sapo	sapo	**mɑ**sapo
4	**m**zapo	zapo	**mɑ**zapo
5	**n**dʒapo	dʒapo	**nɑ**dʒapo
6	**n**ʧapo	ʧapo	**nɑ**ʧapo
7	**n**tapo	tapo	**nɑ**tapo
8	**n**dapo	gapo	**nɑ**dapo
9	**ŋ**gapo	gapo	**ŋɑ**gapo
10	**ŋ**kapo	kapo	**ŋɑ**kapo

Twenty minimal pair test items were formed by combining stimuli in the first and second columns and stimuli in the first and third columns (e.g., [msɑpo] vs [sɑpo]). Twenty control stimuli were also formed by combining stimuli in the second and third columns (e.g., [zɑpo] vs [mɑzɑpo]). All the control stimuli adhered to both Swahili and English phonotactics. All forty minimal pairs — both test items and controls — were then listed in an excel sheet in the order of one pair of test items followed by one pair of controls. One stimulus in each pair was labeled as A and the other one as B in all minimal pairs. Four orders — ABA, ABB, BAA, and BAB — were then created in all forty minimal pairs, forming a total of one hundred and sixty trials. The stimuli were then divided into four blocks by picking one order in each pair (e.g., picking the ABA structure followed by ABB, BAA, and then BAB) in order to balance the number of all four orders in all blocks. Each block had forty trials — twenty test items and twenty control items. Arrangements of trials, in all blocks, were then randomized using online software —

Random.org — to form a unique pattern of trials in all four blocks. Refer to appendix C to view the list of all 160 trials in all four blocks.

The researcher, who is a male native Tanzanian Swahili speaker, recorded all the stimuli in Table 2 above twice at different times in a quiet room using the Audacity software (Audacity, 2015). One recording was used for A's and the other one for B's to create two different tokens. The projected rate was 44100 Hz at a recording level of -12. The same software — Audacity — was used to arrange the recorded stimuli. Four audacity files were created for all four blocks by inserting the stimuli using the orders of blocks that were created earlier. An interstimulus interval of 500 ms was manually set between all trial. A beep sound was also inserted before each trial to separate one trial from another and to remind the participants that the time for one trial is over and another trial is coming. The interval between the beep sound and trials was 1000 ms. The intertrial interval of 3000 ms was manually set between all trials. This time was set to give the participants ample time to write their responses on a piece of paper as this study was planned to be conducted unconventionally over Zoom due to the coronavirus disease 2019 (COVID-19). The noise was reduced to 15 dB, sensitivity to 2.00, and frequency smoothing to 4 bands. The peak amplitude was normalized to -2.00 dB. Four MP3 audios were then exported from the four audacity files. All the exported audio files were four minutes and thirty seconds long.

2.3 Training stimuli

Two Swahili words — *Baba* and *Mama* — and two English words — father and mother — were used to create a sample of the ABX discrimination task with four triplets. All the procedures in section 2.2 above were followed.

3. Tasks and Procedures

This study was conducted online in order to maintain social distancing due to the COVID-19 pandemic. The participants signed a consent form indicating approval from IRB from the University of Mississippi and then filled in the questionnaire about their biographical information and language learning background in a Google form a week before the actual experiment (refer to appendix A to view the questionnaire). The researcher met with each participant via Zoom to perform the ABX task. Before the experiment, the researcher explained the task to the participants and then tested if they understood what they were required to do using the training sample. Only participants who passed the training were tested. The researcher played the four ABX audios from a computer and shared the sound via Zoom. As explained in section 2.2 above, each audio had 40 trials. All the participants listened to a total of 160 trials, four in a row. Participants were asked to decide whether the third stimulus was the same as the first or second stimulus in each ABX triplet. For instance, the participants heard [mpɑpo — mɑpɑpo — mpɑpo] and decided whether the third stimulus [mpɑpo] is the same as the first stimulus [mpɑpo] or the second stimulus [mɑpɑpo]. The participants responded on a piece of paper by writing 1 if the third stimulus was the same as the first stimulus and 2 if the third stimulus was the same as the second stimulus. Each participant finished this task in approximately 30 minutes. The researcher then interviewed the participants about their experience in this study immediately after the experiment (refer to appendix B to view the list of interview questions). Based on the questionnaire, none of the participants reported experiencing technical issues, such as network issues or audio stacking, when performing this task.

4. Analysis

Four mixed ANOVAs with repeated measures were run in SPSS 27 software. There was one between-subject factor: L1—with two levels (Swahili and English native speakers), and four within-subject factors: nasal type—with three levels (/m/ /n/ and /ŋ/), voicing—with two levels (voiced and voiceless), place of articulation—with two levels (Same and different place of articulation), and stimuli condition—with two levels (nasal deletion and vowel insertion counterparts). The main effects of within-subject and between-subject variables, and interaction between the group and nasal type, group and voicing, group and place of articulation, and group and stimuli condition, were compared in the first, second, third, and fourth analysis respectively. Before running the data on SPSS 27, the accuracy mean percentage for each participant was calculated in each level specified in the within-subject factors stated above (e.g., the accuracy mean of voiced versus voiceless).

CHAPTER III

RESULTS

The following are the results for the four mixed ANOVAs that were conducted in this study.

1. Nasal Type

The Figure 1 below shows the mean accuracy scores for each nasal sound and in each group of participants. As seen in the figure, the accuracy mean score for the Swahili participants was significantly higher than the English participants in all nasal sounds, F (1, 22) = 3425.25, $p <$ .001 (i.e., Swahili participants: M = 96.4%, SD = .053 for /m/; M = 95.8%, SD = .047 for /n/; and M = 94.3%, SD = .068 for /ŋ/, while English participants: M = 75.8%, SD = .091 for /m/; M = 80.2%, SD = .097 for /n/; and M = 75%, SD = .133 for /ŋ/). These results shows that there was no significant interaction between the type of nasal and the participants' L1, F (2, 44) = 1.124, p = .151. The participants' accuracy means score in one nasal sound was not significantly different from other nasals, F (2, 44) = 1.972, p = .334.

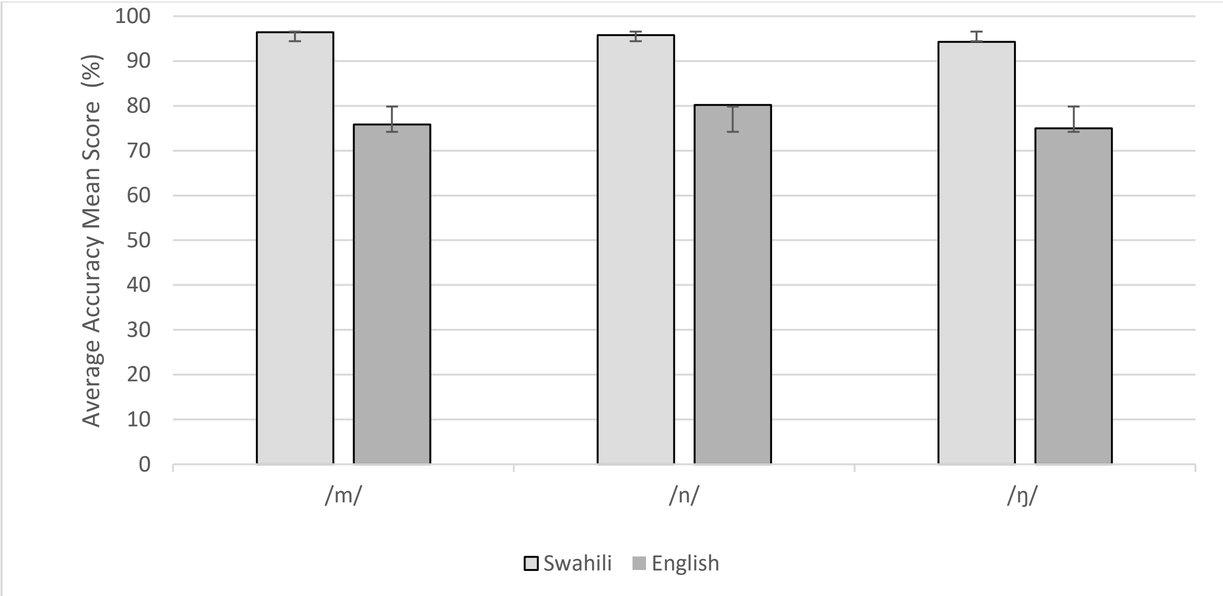

Figure 1. Average Accuracy Means Score for each group and nasal type. Error bars represent the standard deviation between one nasal and another within-subject groups.

2. Voicing

The Figure 2 below shows the mean accuracy scores for stimuli composed of voiced and voiceless clusters for each group of participants. As seen in the figure, the accuracy mean score for the Swahili participants was significantly higher than the English participants in both two clusters, F (1, 22) = 3918.75, p < .001 (i.e., Swahili participants: voiced clusters: M = 94.2%, SD = .070; voiceless clusters: M = 96.5%, SD = .031; English participants: voiced clusters: M = 77.1%, SD = .108; voiceless: M = 78.8%, SD = .092). Both Swahili and English participants had higher performance on voiceless clusters than voiced clusters: however, this difference was not statistically significant, F (1, 22) = 1.210, p = .283. Additionally, there was also no significant interaction between voicing and the participants' L1, F (1, 22) = .030, p = .863.

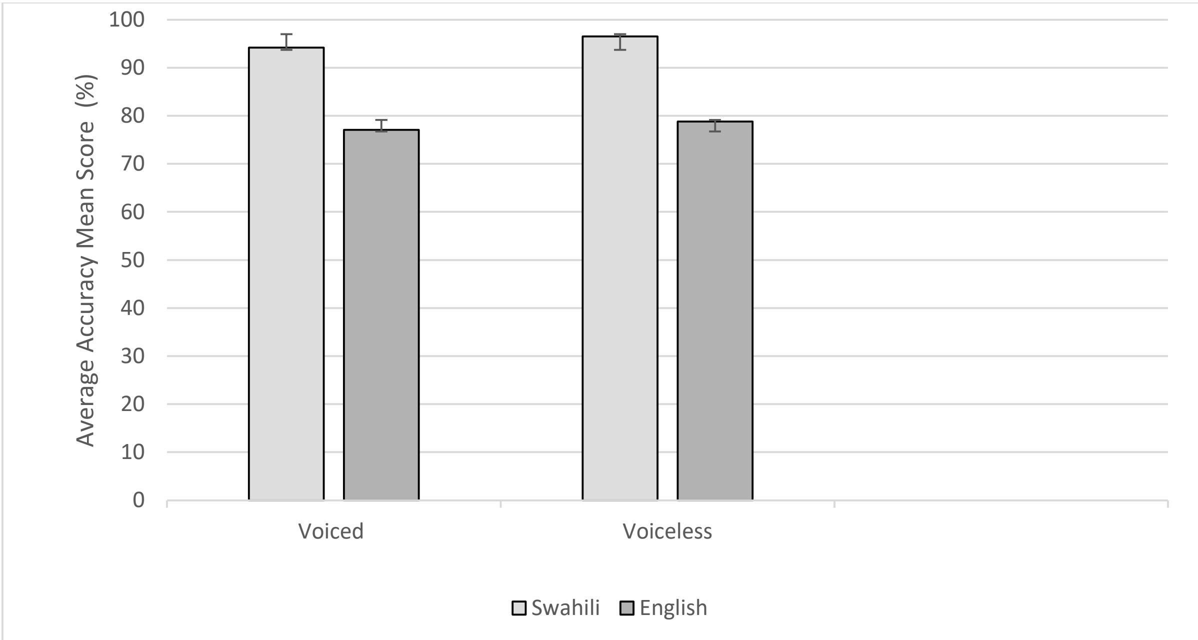

Figure 2. Average Accuracy Means Score for each group and voicing. Error bars represent the standard deviation between voiced and voiceless clusters within-subject groups.

3. Place of Articulation

The Figure 3 below shows the mean accuracy scores for stimuli composed of the nasal-consonant clusters that are pronounced in the same and different place of articulation and for each group of participants. As seen in the figure, the accuracy mean score for the Swahili participants was significantly higher than the English participants in both two clusters, F (1, 22) = 53.57, $p < .001$ (i.e., Swahili participants: same place: M = 95.4%, SD = .045; different places of articulation: M = 95.6%, SD = .047; English participants: same place: M = 75.2%, SD = .109; different places of articulation: M = 80%, SD = .101). The Swahili participants had almost the same results in both two structures while the English participants had higher scores on clusters that are pronounced in different places of articulation compared to clusters that are pronounced in the same place. However, the participants' accuracy means scores in clusters that are pronounced in the same place of articulation were not statistically different from clusters that are pronounced in different places of articulation, F (1, 22) = 2.032, p = .168. Additionally, there was also no significant interaction between the place of articulation and the participants' L1, *F* (1, 22) = 1.708, $p = .205$.

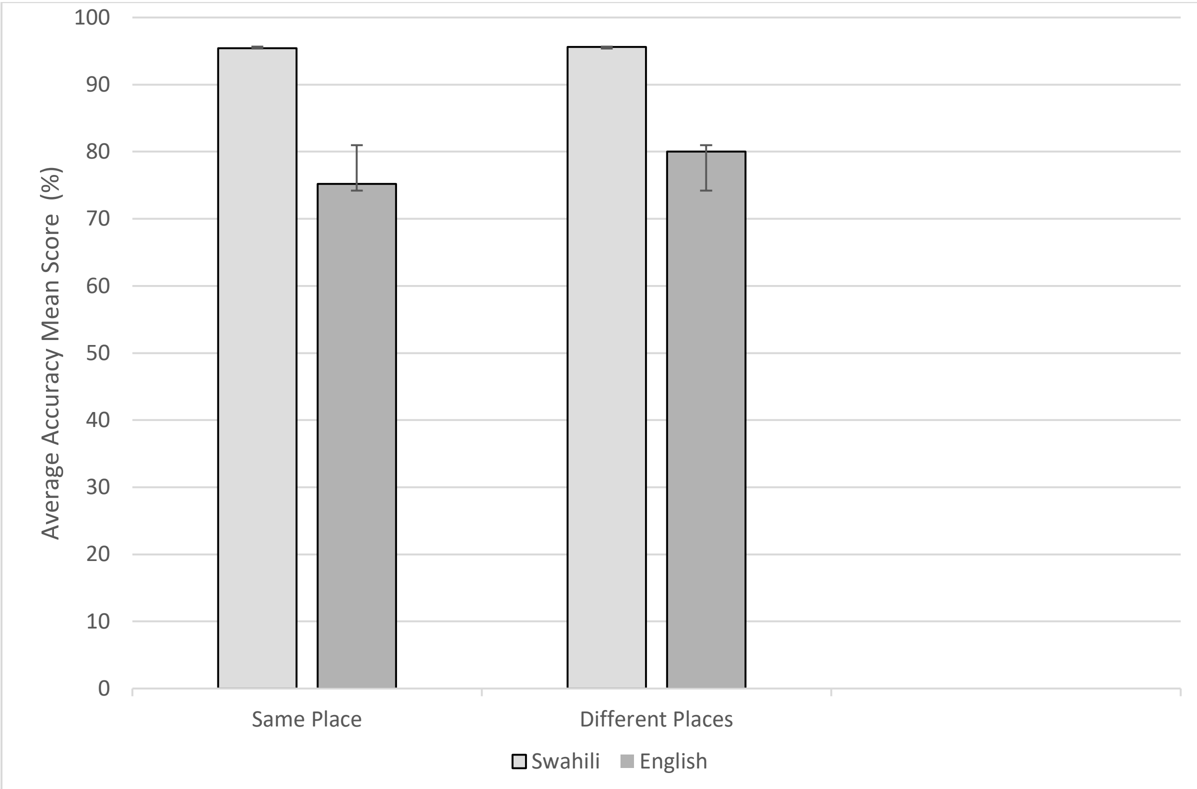

Figure 3. Average Accuracy Means Score for each group and the place of articulation. Error bars represent the standard deviation between the clusters that are pronounced in the same and different places of articulation within-subject groups.

4. Insertion/Deletion

The Figure 4 below shows the mean accuracy scores for stimuli with vowel insertion and vowel deletion counterparts in each group of the participants. The Swahili participants had significantly higher accuracy mean scores in both two structures compared to the English participants, *F* (1, 22) = 3646.728, $p < .001$ (i.e., Swahili participants: Vowel insertion: *M* = 96.3%, *SD* = .038; nasal deletion: *M* = 94.6%, *SD* = .075; English participants: vowel insertion: *M* = 70.4%, *SD* = .122; nasal deletion: *M* = 84.6%, *SD* = .074). There was also a significant interaction between the type of stimuli and the participants' L1, *F* (1, 22) = 19.23, $p < .001$. The

Swahili participants had higher scores on clusters with vowel insertion counterparts compared with clusters with nasal deletion counterparts: however, the difference was not statistically significant. The English participants, on the other hand, had higher scores on clusters with nasal deletion counterparts and lower scores on clusters with vowel insertion and this difference was statistically significant. The results show that there was a significant main effect on the stimuli with vowel insertion counterparts, *F* (1, 22) = 11.985, *p* = .002.

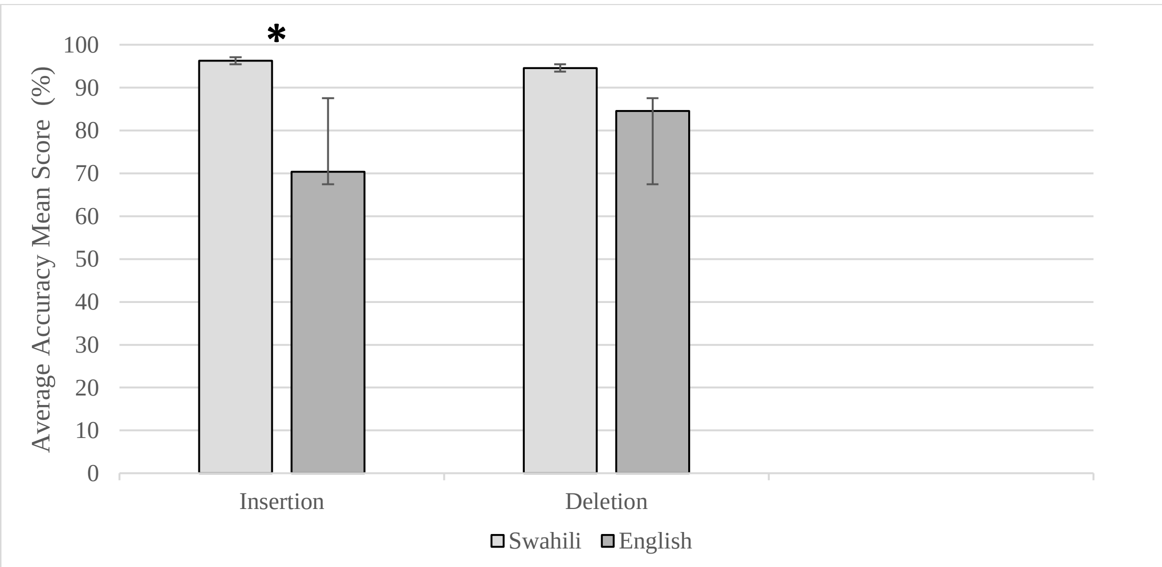

Figure 4. Average Accuracy Means Score for each group and stimuli with vowel insertion and nasal deletion counterparts. Error bars represent the standard deviation between stimuli with vowel insertion and nasal deletion within-subject groups.

5. Results Summary

As discussed in the individual result sections above, the between-subject results reveal that the Swahili participants were more accurate than the English participants in all four conditions. On the other hand, the within-subject results show that the type of nasal sound, voicing, and place of articulation do not significantly affect the L1 English speakers' perception. Nevertheless, the stimuli with vowel insertion counterparts significantly affected the L1 English speakers' perception. These results, therefore, reveal that the L1 English speakers have difficulties differentiating syllabic and non-syllabic nasals in the word-initial position whereby they perceive an illusory /ɑ/ between NICC.

CHAPTER IV

DISCUSSION

From the results above, the following are the answers to the research questions.

1. Research question #1

The first research question asked whether L1 English speakers perceive NICC as accurately as L1 Swahili speakers. It was hypothesized that the Swahili participants would be more accurate than the English participants because the structure of NICC adheres to the Swahili phonotactics. The results suggest that the hypothesis is correct: The Swahili participants had higher accuracy mean scores than the English participants. The questionnaires also revealed that many English participants complained that some of the trials were all the same. For instance, English participant number 5 (E5) commented that "some words were easy to differentiate, but others were difficult because they sounded all similar". Additionally, English participant number 9 (E9) asked the researcher if he was sure that all trials were different because some trials sounded similar. These comments reveal that the English participants had difficulties perceiving NICC. Therefore, L1 English speakers cannot perceive NICC as accurately as Swahili L1 speakers.

2. Research question #2A

The second research question part A asked whether there is any difference in native English speakers' perception of all three nasal sounds—/m/, /n/, and /ŋ/—in NICC. It was hypothesized that the native English speakers would have almost the same results in two nasals — /m/ and /n/ — because these sounds share many features in both two languages. Additionally, the English speakers' performance of /ŋ/ was expected to be lower than the other two nasals as this nasal shares few features compared to the other two nasals. The results show that English participants had lower accuracy means scores in /ŋ/; however, these scores were not statistically significant. Therefore, it is concluded that there is no significant difference in native English speakers' perception of all Swahili syllabic nasals.

3. Research question #2B

The second research question part B asked whether there is any difference in native English speakers' perception of NICC composed of a nasal sound followed by voiced versus a voiceless consonant. It was hypothesized that the L1 English speakers' performance would be higher in clusters composed of a nasal sound followed by a voiceless consonant compared to the structures composed of a nasal sound followed by a voiced consonant. Results show that English participants had higher accuracy means scores in clusters followed by a voiceless consonant; however, this result was not statistically significant. It is, therefore, concluded that there is no significant difference in native English speakers' perception of clusters followed by a voiced or voiceless consonant.

4. Research question #2C

The second research question part C asked whether there is any difference in native English speakers' perception of NICC composed of a nasal sound followed by a consonant sound that is pronounced in the same or different place of articulation. It was hypothesized that the performance of native English speakers would be lower in NICC composed of a nasal sound followed by a consonant sound that is pronounced in the same place of articulation. The results show that the native English participants had high accuracy mean score in clusters followed by a consonant sound that is pronounced in different places of articulation. It is, therefore, concluded that there is no significant difference in native English speakers' perception of clusters that are followed by a sound that is pronounced in the same or different place of articulation.

5. Research question #3

The third research question asked whether native English speakers perceive an illusory /ɑ/ sound between NICC more often than deleting a nasal sound. It was hypothesized that the English speakers would make more errors in structures with vowel insertion than structures with nasal deletion. The results show that native English speakers had low accuracy means scores in clusters with vowel insertion than clusters with nasal deletion. It is, therefore, finalized that native English speakers indeed perceive the insertion of an /ɑ/ sound between NICC more often than the deletion of a nasal sound.

CHAPTER V

CONCLUSION

In conclusion, the results above reveal that nonnative phonotactic constraints affect the perception of NICC. The Swahili participants had higher accuracy means scores than the English participants in perceiving NICC because this structure adheres to their L1 phonotactics. These results support the previous nonnative phonotactic constraints studies that claim that L1 phonotactic affects the perception of L2 sounds because L2 speakers tend to repair L2 structures to conform to their L1 structures (Best & Tyler, 2007; Cardoso, 2011; Dupoux et al., 1999; Markwardt, 1946). Like Dupoux et al.'s (1999) study where the L1 Japanese speakers perceived an illusory vowel between consonant clusters, the English participants also perceived an illusory vowel between NICC because this structure deviates from their L1 phonotactics. The English participants, therefore, repaired the stimuli to conform to their L1 phonotactics which resulted in many incorrect responses. For instance, the English participants perceived /mɑ/ instead of /m/ because the syllabic /m/ in NICC violates their L1 English phonotactics.

The current study also shows that the type of nasal, voicing, and place of articulation do not significantly affect the native English speakers' perception of NICC. Nevertheless, the results show that native English speakers have difficulties differentiating the clusters with and without a vowel between NICC. These results also reveal that L1 phonotactics affect the perception of L2 segments due to two reasons. First, all categories in nasal type, voicing, and place of articulation deviated from English phonotactics (i.e., both /ms/ and /mz/ in NICC do not exist); the English participants might have treated these categories the same because they did not have a close reference in their phonological inventory to repair these structures with. Second, the English participants had difficulties differentiating the clusters with and without a vowel (/ɑ/) between NICC because one structure exists in their L1 phonotactics and the other structure does not exist (i.e., /mɑ/ exists in the word-initial position while syllabic /m/ does not exist in English). The English speakers, therefore, chose the structures that are allowed in their L1 phonotactics over the structures that are not allowed which resulted in many incorrect responses.

In Swahili, nasal sounds, especially /m/, have a higher functional load. There are eighteen noun classes in Swahili, and about four noun classes represent the syllabic /m/ category, which appears in the word-initial position. For instance, animate and tree nouns are in M-noun class (e.g., [m]tu (a person), [m]bwa (a dog), [m]chungwa (orange tree), and [m]pera (guava tree). Additionally, In Swahili, the meaning of the word can change when a syllabic nasal is misperceived as a non-syllabic (i.e., when /m/ is misperceived as /mɑ/). For instance, [mkopo] means *a loan*, and [mɑkopo] means *cans*, [m]papai means *a pawpaw tree*, and [mɑ]papai means *pawpaws*, and [m]ji means *a town* while [mɑ]ji means *water*. Therefore, L2 teachers who are teaching languages with NICC phonotactics, such as Swahili, should give words with this structure special treatment when teaching L1 English speakers or other speakers whose L1 phonotactics deviate from this structure because when these structures are misperceived they can distort the meaning of a word and whole sentence. Misperception might likely affect learners' comprehensibility, intelligibility, and overall L2 proficiency.

The current study has pedagogical implications: L2 teachers should improve learners' perception in order to improve their comprehensibility, intelligibility, and overall proficiency. This study recommends the use of five steps for teaching pronunciation that are suggested by Celce-Murcia, Brinton, Goodwin, & Griner (2010) to improve learners' perception. These steps include: 1) developing their metalinguistic awareness about Swahili phonotactics that these structures are different and they can distort the meaning; 2) developing their listening skills using audio files with the target words; 3) applying controlled practice using games such as Go Fish; 4) using guided practices such as using target structures in different positions; and 5) applying communicative practices such as allowing learners to use the target structures. Refer to Celce-Murcia et al., (2010) and Schaefer, Darcy, and Abe (2018) for more details on how to apply these steps in the L2 classroom.

This study also recommends the application of repetition with meaning in the L2 classroom (for more details about this strategy refer to Duff, 2000; Lyster, 1998; Trofimovich and Gatbonton, 2006). Previous studies have revealed that repetition with meaning helps learners to notice L2 structures and negotiate for meaning, leading to acquisition. These two strategies can improve learners' perception of L2 structures, including NICC, and overall L2 proficiency, which is the primary goal of L2 teaching and learning.

CHAPTER VI

LIMITATIONS AND FURTHER RESEARCH

As suggested by Suchotzki, Verschuere, Van Bockstaele, Ben-Shakhar, and Crombez, (2017), reaction times can differentiate participants' confidence in their responses. The current study had one main limitation: reaction times, which are among the important elements in psycholinguistic research, were not measured. This was because the study was conducted unconventionally over Zoom due to the pandemic (COVID19), and there were no enough resources to track the participants' reaction times. Future studies can incorporate reaction times in order to further refine the results.

Previous studies also suggest that L2 speakers may perceive different illusory vowels when perceiving nonnative phonotactic constraints (Durvasula, & Kahng, 2015). This study only tested one vowel sound (/ɑ/) in stimuli with vowel insertion. It is noteworthy to test stimuli with other vowel sounds in order to further examine whether native English speakers might also have difficulties differentiating stimuli with other vowel sounds.

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LIST OF APPENDICES

Appendix A

Personal Information and Language Background Questionnaire

Please answer the questions on the table below regarding your personal information and language experience. All information is confidential.

Name:			Age:………	……………...
Which university are you studying at?	………………	………………...	…………..	Year of study: ……………..
Do you have any health issues relating to speech or hearing impairment?	Yes [ ]	No [ ]		
How many languages do you speak?				
List languages you speak (*list them in order; from the first language you acquired to the last*).	L1 ………………	L2 ………………...	L3 ……………	L4 ……………...
Rate your proficiency in each language. (*tick where applicable*).	Beginner [ ] Intermediate [ ] Proficient [ ] Native [ ]	Beginner [ ] Intermediate [ ] Proficient [ ] Native [ ]	Beginner [ ] Intermediate [ ] Proficient [ ] Native [ ]	Beginner [ ] Intermediate [ ] Proficient [ ] Native [ ]

Appendix B

Questionnaire on Participants' Experiences in this Study

Please describe your experience on the first and second tasks (e.g., was it easy/difficult? What made it easy/difficult?).

i. The first task (ABX discrimination task).

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ii. The second task (reading aloud task).

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iii. Any other comments:

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Appendix C

ABX-task stimuli

Test item
Control (shaded grey)

1	BAB	/tɑpo/	/nutapo/	/tɑpo/
2	ABB	/nupɑpo/	/pɑpo/	/pɑpo/
3	ABA	/ŋgɑpo/	/gapo/	/ŋgɑpo/
4	ABA	/mpɑpo/	/pɑpo/	/mpɑpo/
5	BAB	/zɑpo/	/mɑzɑpo/	/zɑpo/
6	ABA	/msɑpo/	/mɑsɑpo/	/msɑpo/
7	BAA	/tɑpo/	/ntapo/	/ntapo/
8	ABA	/ndapo/	/dɑpo/	/ndapo/
9	BAA	/bɑpo/	/mbapo/	/mbapo/
10	ABB	/mapɑpo/	/pɑpo/	/pɑpo/
11	BAB	/papo/	/nɑpɑpo/	/papo/
12	ABB	/mukɑpo/	/kapo/	/kapo/
13	ABA	/mpɑpo/	/mapɑpo/	/mpɑpo/
14	BAA	/natapo/	/ntapo/	/ntapo/
15	BAB	/bɑpo/	/mabapo/	/bɑpo/
16	ABB	/nɑdɑpo/	/dɑpo/	/dɑpo/
17	BAA	/mabapo/	/mbapo/	/mbapo/
18	BAB	/bɑpo/	/mubapo/	/bɑpo/
19	BAA	/ŋakapo/	/ŋkɑpo/	/ŋkɑpo/
20	ABB	/nudɑpo/	/dɑpo/	/dɑpo/
21	BAA	/ŋagapo/	/ŋgɑpo/	/ŋgɑpo/
22	ABA	/msɑpo/	/sapo/	/msɑpo/
23	BAA	/ʧapo/	/nʧapo/	/nʧapo/
24	BAB	/ʧapo/	/nɑʧapo/	/ʧapo/
25	ABB	/musɑpo/	/sapo/	/sapo/
26	BAA	/zɑpo/	/mzɑpo/	/mzɑpo/
27	BAA	/nɑʧapo/	/nʧapo/	/nʧapo/
28	BAB	/ʧapo/	/nuʧapo/	/ʧapo/
29	ABB	/mupɑpo/	/pɑpo/	/pɑpo/
30	ABA	/ŋkɑpo/	/kapo/	/ŋkɑpo/
31	ABA	/nʤɑpo/	/nʤɑpo/	/nʤɑpo/
32	BAB	/tɑpo/	/natapo/	/tɑpo/
33	BAA	/mɑzɑpo/	/mzɑpo/	/mzɑpo/

34	ABA	/ndɑpo/	/nɑdɑpo/	/ndɑpo/
35	BAB	/zɑpo/	/muzɑpo/	/zɑpo/
36	ABA	/nʤɑpo/	/nɑʤɑpo/	/nʤɑpo/
37	ABB	/mɑsɑpo/	/sɑpo/	/sɑpo/
38	ABB	/nuʤɑpo/	/nʤɑpo/	/nʤɑpo/
39	ABB	/nɑʤɑpo/	/nʤɑpo/	/nʤɑpo/
40	ABA	/mɑkɑpo/	/kɑpo/	/mɑkɑpo/
41	BAA	/nʤɑpo/	/nɑʤɑpo/	/nɑʤɑpo/
42	ABB	/mɑkɑpo/	/kɑpo/	/kɑpo/
43	BAB	/mɑbɑpo/	/mbɑpo/	/mɑbɑpo/
44	ABB	/mpɑpo/	/pɑpo/	/pɑpo/
45	ABA	/muzɑpo/	/zɑpo/	/muzɑpo/
46	BAA	/pɑpo/	/mɑpɑpo/	/mɑpɑpo/
47	ABA	/nɑpɑpo/	/pɑpo/	/nɑpɑpo/
48	ABA	/nɑʧɑpo/	/ʧɑpo/	/nɑʧɑpo/
49	ABB	/nʤɑpo/	/nʤɑpo/	/nʤɑpo/
50	ABA	/nɑtɑpo/	/tɑpo/	/nɑtɑpo/
51	BAA	/pɑpo/	/mupɑpo/	/mupɑpo/
52	BAB	/nɑtɑpo/	/ntɑpo/	/nɑtɑpo/
53	ABA	/nutɑpo/	/tɑpo/	/nutɑpo/
54	ABB	/ŋgɑpo/	/gɑpo/	/gɑpo/
55	BAA	/pɑpo/	/nupɑpo/	/nupɑpo/
56	BAB	/bɑpo/	/mbɑpo/	/bɑpo/
57	ABA	/mɑbɑpo/	/bɑpo/	/mɑbɑpo/
58	BAA	/dɑpo/	/nɑdɑpo/	/nɑdɑpo/
59	ABA	/mubɑpo/	/bɑpo/	/mubɑpo/
60	ABB	/ndɑpo/	/nɑdɑpo/	/nɑdɑpo/
61	BAA	/dɑpo/	/nudɑpo/	/nudɑpo/
62	BAB	/ŋɑgɑpo/	/ŋgɑpo/	/ŋɑgɑpo/
63	ABB	/msɑpo/	/sɑpo/	/sɑpo/
64	BAA	/sɑpo/	/mɑsɑpo/	/mɑsɑpo/
65	BAB	/ʧɑpo/	/nʧɑpo/	/ʧɑpo/
66	ABB	/msɑpo/	/mɑsɑpo/	/mɑsɑpo/
67	BAA	/sɑpo/	/musɑpo/	/musɑpo/
68	ABA	/nuʧɑpo/	/ʧɑpo/	/nuʧɑpo/
69	ABB	/ŋkɑpo/	/kɑpo/	/kɑpo/
70	BAA	/kɑpo/	/mukɑpo/	/mukɑpo/
71	BAB	/zɑpo/	/mzɑpo/	/zɑpo/
72	ABA	/mɑzɑpo/	/zɑpo/	/mɑzɑpo/
73	BAB	/mɑzɑpo/	/mzɑpo/	/mɑzɑpo/
74	BAB	/tɑpo/	/ntɑpo/	/tɑpo/
75	ABB	/ndɑpo/	/dɑpo/	/dɑpo/

76	ABB	/mpɑpo/	/mapɑpo/	/mapɑpo/
77	ABB	/nʤɑpo/	/nɑʤɑpo/	/nɑʤɑpo/
78	BAA	/nʤɑpo/	/nuʤɑpo/	/nuʤɑpo/
79	BAB	/nɑʧɑpo/	/nʧɑpo/	/nɑʧɑpo/
80	BAB	/ŋakɑpo/	/ŋkɑpo/	/ŋakɑpo/
81	BAB	/nʤɑpo/	/nuʤɑpo/	/nʤɑpo/
82	ABB	/mabɑpo/	/bɑpo/	/bɑpo/
83	ABA	/ntɑpo/	/tɑpo/	/ntɑpo/
84	BAB	/kɑpo/	/mukɑpo/	/kɑpo/
85	ABA	/ŋkɑpo/	/ŋakɑpo/	/ŋkɑpo/
86	BAA	/nɑʤɑpo/	/nʤɑpo/	/nʤɑpo/
87	ABB	/mubɑpo/	/bɑpo/	/bɑpo/
88	ABB	/nɑʧɑpo/	/ʧɑpo/	/ʧɑpo/
89	BAA	/pɑpo/	/mpɑpo/	/mpɑpo/
90	BAB	/sɑpo/	/musɑpo/	/sɑpo/
91	BAB	/pɑpo/	/mapɑpo/	/pɑpo/
92	ABB	/natɑpo/	/tɑpo/	/tɑpo/
93	BAA	/mapɑpo/	/mpɑpo/	/mpɑpo/
94	ABA	/ntɑpo/	/natɑpo/	/ntɑpo/
95	ABB	/nutɑpo/	/tɑpo/	/tɑpo/
96	BAA	/gɑpo/	/ŋgɑpo/	/ŋgɑpo/
97	BAA	/dɑpo/	/ndɑpo/	/ndɑpo/
98	BAB	/dɑpo/	/nɑdɑpo/	/dɑpo/
99	ABA	/mbɑpo/	/mabɑpo/	/mbɑpo/
100	BAB	/dɑpo/	/nudɑpo/	/dɑpo/
101	ABA	/ŋgɑpo/	/ŋagɑpo/	/ŋgɑpo/
102	ABB	/nɑpɑpo/	/pɑpo/	/pɑpo/
103	BAA	/sɑpo/	/msɑpo/	/msɑpo/
104	BAB	/sɑpo/	/mɑsɑpo/	/sɑpo/
105	ABA	/nʧɑpo/	/ʧɑpo/	/nʧɑpo/
106	BAA	/mɑsɑpo/	/msɑpo/	/msɑpo/
107	ABB	/muzɑpo/	/zɑpo/	/zɑpo/
108	ABA	/nʧɑpo/	/nɑʧɑpo/	/nʧɑpo/
109	ABB	/nuʧɑpo/	/ʧɑpo/	/ʧɑpo/
110	BAB	/pɑpo/	/nupɑpo/	/pɑpo/
111	BAA	/kɑpo/	/ŋkɑpo/	/ŋkɑpo/
112	BAB	/pɑpo/	/mupɑpo/	/pɑpo/
113	ABA	/mzɑpo/	/zɑpo/	/mzɑpo/
114	BAA	/nɑdɑpo/	/ndɑpo/	/ndɑpo/
115	ABB	/mazɑpo/	/zɑpo/	/zɑpo/
116	BAA	/nʤɑpo/	/nʤɑpo/	/nʤɑpo/
117	ABA	/mbɑpo/	/bɑpo/	/mbɑpo/
118	BAB	/nʤɑpo/	/nɑʤɑpo/	/nʤɑpo/

119	ABA	/mzɑpo/	/mɑzɑpo/	/mzɑpo/
120	BAA	/kapo/	/makapo/	/makapo/
121	ABB	/nʧapo/	/ʧapo/	/ʧɑpo/
122	BAB	/gapo/	/ŋgɑpo/	/gapo/
123	BAB	/sapo/	/msɑpo/	/sapo/
124	BAB	/mɑsɑpo/	/msɑpo/	/mɑsɑpo/
125	BAB	/pɑpo/	/mpɑpo/	/pɑpo/
126	ABA	/mapɑpo/	/pɑpo/	/mapɑpo/
127	ABA	/nudɑpo/	/dɑpo/	/nudɑpo/
128	ABA	/mupɑpo/	/pɑpo/	/mupɑpo/
129	ABB	/ntɑpo/	/tɑpo/	/tɑpo/
130	BAA	/zɑpo/	/muzɑpo/	/muzɑpo/
131	BAB	/mapɑpo/	/mpɑpo/	/mapɑpo/
132	ABB	/ntapo/	/natapo/	/natapo/
133	ABA	/nupɑpo/	/pɑpo/	/nupɑpo/
134	BAA	/bɑpo/	/mabɑpo/	/mabɑpo/
135	BAB	/dɑpo/	/ndɑpo/	/dɑpo/
136	ABA	/nɑdɑpo/	/dɑpo/	/nɑdɑpo/
137	ABB	/mbapo/	/mabapo/	/mabapo/
138	BAA	/bɑpo/	/mubɑpo/	/mubɑpo/
139	ABB	/ŋgɑpo/	/ŋagapo/	/ŋagapo/
140	BAA	/pɑpo/	/nɑpɑpo/	/nɑpɑpo/
141	ABA	/mɑsɑpo/	/sɑpo/	/mɑsɑpo/
142	ABA	/musɑpo/	/sɑpo/	/musɑpo/
143	BAA	/ʧapo/	/nuʧapo/	/nuʧapo/
144	BAA	/ʧapo/	/naʧapo/	/naʧapo/
145	BAB	/kapo/	/ŋkɑpo/	/kapo/
146	ABB	/mbapo/	/bɑpo/	/bɑpo/
147	ABA	/mukapo/	/kapo/	/mukapo/
148	BAB	/nɑdɑpo/	/ndapo/	/nɑdɑpo/
149	ABB	/mzɑpo/	/zɑpo/	/zɑpo/
150	BAA	/zɑpo/	/mɑzɑpo/	/mɑzɑpo/
151	BAB	/nʤɑpo/	/nʤɑpo/	/nʤɑpo/
152	BAA	/tɑpo/	/nutapo/	/nutapo/
153	ABA	/naʤapo/	/nʤapo/	/naʤapo/
154	BAA	/tɑpo/	/natapo/	/natapo/
155	ABB	/nʧapo/	/naʧapo/	/naʧapo/
156	ABB	/mzɑpo/	/mɑzɑpo/	/mɑzɑpo/
157	BAB	/nɑʤapo/	/nʤapo/	/nɑʤapo/
158	ABA	/nuʤapo/	/nʤapo/	/nuʤapo/
159	ABB	/ŋkɑpo/	/ŋakapo/	/ŋakapo/
160	BAB	/kapo/	/makapo/	/kapo/

VITA

EDUCATION

2014-2017	The University of Dar-es-Salaam, Bachelor of Arts (Education) with honors, Major in Swahili and Literature.

HONORS AND AWARDS

October 05, 2020	Phi Kappa Phi honors society; this is a distinct and prestigious academic honor society, membership is by invitation only to the top 10% of all academic majors.
September 21, 2020	Invitation to join Golden Key honor society; membership is by invitation-only to the top 15% of all academic majors who are sophomores, juniors, seniors or top-performing graduate students.
February 2, 2020	Invitation to join Gamma Beta Phi (GBP) honor society; The GBP is a national collegiate honor that recognizes students' contribution to public outreach and academic achievements.
2020 - Present	Graduate Instructor, Department of Modern Languages, The University of Mississippi.
2019-2020	Graduate Assistantship, Department of Modern Languages, The University of Mississippi.
6th December 2018	Acknowledgement from the Assistant Secretary, Department of State, Bureau of Education and Cultural Affairs, Dr. Marie Royce, for volunteering with the American Red Cross during the Hurricane Florence.
6th August 2018-	Congratulation letter from the president of the United States of America, Donald Trump, for being selected in the Department of State exchange program.
2018-2019	Fulbright foreign language teaching assistantship (FLTA), The University of North Carolina at Chapel Hill, USA.
2017-	Published at Mdigrii newsletter 3 as one among outstanding students in the College of Humanities at The University of Dar es Salaam. Pg. 28.
2017	First-class with honours, University of Dar es Salaam
2014-2016-	Certificate of recognition for support and awareness creation on East Africa Integration process, East Africa Community Youth Club.
2012-2014	Certificate of an outstanding student in Academics at Rutabo High School.
2012-2014	Certificate of an active anti-corruption activist, Rutabo high School.