What can L2 phonemes tell us about the L3? The role of L2 phonology in L3 speech

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Abstract

Speaking in a foreign language involves learning phonemes that may be influenced by previously learned sounds. Recent research reveals that mutual phonetic influences are not limited to L1-L2 transfer as once assumed, but also exist among the L1, L2 and L3, emphasizing the complexity of interlanguage. The acoustic properties in foreign language speech are understudied in the Philippines, where English is often an L2. In order to determine possible L2 effects on L3 phonology over time, this study examines changes in both vowel quality and quantity in a population of 22 Filipino students learning German. Eleven students had an intermediate level of proficiency (B1), while the rest were beginners. The study reveals that many interlingual vowel pairs shared overlapping phonetic spaces, with some exceptions for back vowels. The role of proficiency in German was more significant in distinguishing vowel durations between L2 and L3 and producing distinct L3 vowel pairs.

Keywords: *Phonetics, Phonology, L3, Multilingualism, German as a Foreign Language*

1. Introduction

A fairly large body of research on interlanguage phenomena and language acquisition examines the transfer of morphological, syntactical and lexical properties from the L1 or mother tongue, to a second language (L2) (Lado, 1957; Odlin, 1989; Shatz, 2016), a term which signifies languages learned after the mother tongue (Lightbown & Spada, 1993, p. 21).[*] An unfortunate consequence of this has been a relative dearth of interest in crosslinguistic effects on phonology, a circumstance that is further undergirded by the premise that L1 features are markedly persistent in the production of L2 speech. Even in an increasingly globalized and multilingual world where several languages can potentially be learned after the L1, assumptions of the Contrastive Analysis Hypothesis (CAH), where the L1 is posited to have particular predictive strength in L2 acquisition, remain an influential basis for targeted instructional materials for pronunciation, often written with a monolingual student in mind (see, for instance, Hirschfeld, Kelz, & Müller, 2002; Kelz, 1982).

While L2s were previously assumed to undergo similar processes of language acquisition regardless of quantity or order (see Lightbown & Spada, 1993, p. 23), it was the spread of English

[*] I would like to thank the two anonymous reviewers for their insights and feedback, the students who volunteered to participate in the study, Vincent Christopher Santiago for his advice, and the Digital Signal Processing Laboratory of the Electrical and Electronic Engineering Institute at the University of the Philippines Diliman for letting me use their facilities for the pilot study. All remaining errors are mine.

and greater global mobility, as well as the experiences that increasingly multilingual language learners brought into learning languages beyond both the L1 and L2 which spurred interest in the field of Third Language Acquisition (TLA) (Cenoz, Hufeisen & Jessner, 2001, p.1). An emergent theme that arose in TLA research was the role of the L2 as an additional source of linguistic influence on other languages learned beyond the L1, particularly when language learners perceived their L2 and third language(s), or L3s, to have more linguistic similarities than their L1 and L3 (Cenoz, 2001, p.10). For instance, the phenomenon of language learners with a non-Indo-European-L1 and an Indo-European-L2 who went on to learn an Indo-European-L3 has been previously explored in TLA studies on the role of an English-L2 in a German-L3 (see Marx, 2000). Further research has brought to light the complexities of L1-L2-L3 crosslinguistic influences, which may involve various transfer phenomena in the form of L2→L3, L1→L2, L2→L1, L3→L1, L3→L2, and so on (Williams & Hammarberg, 1998; Cenoz, 2001; Gut, 2010).

In light of this, the present study aims to provide insights into the vowel production of German learners in the Philippines with a Filipino-L1, English-L2 and German-L3. In the literature on TLA, many definitions of L3 focus on the chronological order of languages learned, for instance, Klein (1995, p. 420) and Hufeisen (1998, p. 169) posit that successive languages, or L3, L4 … Ln, represent foreign languages learned in chronological order beyond the L2. However, such a definition appears to focus on chronology rather than process, an alternative perspective to which can be found in Hammarberg (2001), who characterizes third languages as foreign language(s) that are actively being acquired, with the L2(s) representing "any other language that the person has acquired after L1" (p. 22) that is not being learned simultaneously with the L3. Hammarberg's definition is especially suitable for the target group: English is a language that is acquired after the L1 in the Philippines, while the test group was in the process of learning German as tests were being conducted. The languages of the participants also serve as an example of an L2 and L3 from the same language family, as in Marx's (2000) study.

For purposes of the discussion on vowels that follows, the term phone will be used to refer to distinct speech sounds, while the word phoneme shall refer to speech sounds that create distinctions in the meanings of words (Hall, 2011, p. 38). Phonemes can thus only be spoken of with respect to one particular language—for instance, /a/ and /a:/ are phonemes in German as they distinguish words like R/a/tten (rats) and r/a:/ten (to advise or guess), but [a] and [a:] are considered allophones in Filipino as vowel length in the language does not create differences in meaning. Vowel production in this study will further be measured by recording and comparing formants, or "[…] peaks in the spectra of vowels […] (that) correspond to the basic frequencies of the vibrations of the air in the vocal tract." (Ladefoged, 1996, p. 94). Formants, particularly the first and second formants (F1 and F2), are often used in acoustic phonetic studies to determine vowel quality and shall be used here as a basis of inter- and intralingual vowel comparison. The recognition of new sounds in a foreign language can potentially decrease the possibility of misunderstandings due to unclear speech, as well as facilitate communication between foreign language learners of different linguistic backgrounds, thus lending impetus to investigating how previously learned languages can positively impact the production of phonetic and phonological contrasts in an L3.

The three languages, Filipino, English, and German, offer an interesting contrast for contrastive phonetic studies, as while they share vowel phonemes—namely /a/, /i/, /o/, /u/, and partially /e/[1], these are distinguished from other vowels in the latter phonemic inventories by the

[1] The sound /e/ in English, while considered phonemic in Received Pronunciation (Wells, 1982), will not be used in the interlingual contrastive analyses that follow. Instead, the production of the diphthong /eɪ/, found in General

qualities of tenseness/laxness in English, which is commonly thought to stem from increased muscle tension during articulation (Hall, 2011, p. 27)[2], and both tenseness/laxness and vowel quantity in German. In terms of the five vowel phoneme inventories of each language, Filipino, which has its roots in Tagalog, comprises the five monophthongs mentioned above (De los Reyes et al., 2009), while General American, here used as the referent vowel inventory for the L2 due to American English being used as a norm for English in the Philippines (Tayao, 2008, p. 159) has a larger vowel inventory of up to fifteen vowels (Wells, 1982, p. 120). Lastly, the L3 German has a maximum of 24 vowels that include four found in French loanwords (Pätzold & Simpson, 1997, p. 220), representing the largest vowel inventory of the three languages.

In English, the differences between tense and lax vowels can be seen in minimal pairs that include vowels not present in Filipino, such as /eɪ/- /ɛ/, /i/-/ɪ/, /o/-/ɔ/, /u/-/ʊ/, while in German, the similar minimal pairs /e:/- /ɛ/, /i:/-/ɪ/, /o:/-/ɔ/, /u:/-/ʊ/ are distinguished by both vowel quantity (length) and tenseness/laxness. Due to vowel length being phonemic in German, German vowels are often twice as long as short vowels, whereas English tense/lax distinctions, while not phonemic in terms of vowel quantity, are associated with smaller ratios (Nimz, 2014, p. 316). This study thus attempts to describe the production of the vowels noted above in students of different language proficiency levels with the language constellation of Filipino-L1, English-L2, and German-L3. It further endeavors to determine whether an L2 with a tense/lax distinction and occasional differences in vowel duration that are absent from the L1 plays a role in both the production of tenseness/laxness and/or vowel length in the L3 through time and increased proficiency. While this study focuses primarily on the role of the L2, it takes into consideration that the L1 cannot be completely excluded as a source of crosslinguistic influence. For instance, a potential area of L1 transfer in this study is the vowel quality of front vowels /i/ and /e/, and back vowels /o/ and /u/ in the L2 and L3, as historical evidence of Tagalog, the basis of the national language Filipino, has revealed its roots in a three-vowel system where "[i] and [e] were values of a single phoneme, and [o] and [u] of another" (Reid & Schachter, 2008, p. 834). Contemporary empirical studies in Philippine languages have shown at least [o] and [u] to have barely significant formant differences in oral speech (Delos Reyes et al., 2009).

A cross-sectional research design is thus utilized to address the following research questions through the examination of vowel production in the selected population.

a) What is the relationship between L3 German vowels and similar English vowels?
b) How can the role of the L2 be characterized over time? What aspects of vowel production cannot be explained by L2 influence?
c) What are the characteristics of intralingual vowel quality and quantity of intermediate and beginner learners of German?

2. Acquiring Sounds

A number of language acquisition theories have been developed since the Contrastive Analysis Hypothesis (CAH) to account for the difficulties of adult learners in learning or acquiring phonology. The capacity of very young children to acquire a language has often been described as a dynamic cognitive phase in which acquisition and learning occur at a more rapid pace than in adults (Lenneberg, 1967a, p. 59). This holds true not just for syntax and lexicon but for phonology,

American, will be contrasted with formants of the German phoneme /e:/. General American is more commonly used as an instructional reference in the Philippines (Tayao, 2008).

[2] It is important to note that experimental phonetics has not produced consistent empirical evidence to confirm this assumption. Other definitions, for example, focus on the position of the tongue root to create tenseness or laxness (Hall, 2011, p. 27).

as research has adequately demonstrated the relative ease by which non-L1 sounds are acquired at young ages (Lenneberg, 1967a; 1967b). Studies on cognitive aspects of language acquisition have hypothesized that the 'plasticity' that characterizes the learning processes in younger children decreases rapidly through time and past a critical period, it is no longer plausible to achieve near-native levels of language proficiency, despite intensive training (Lenneberg, 1967b, p. 180). In line with this, the concept of lateralization postulates that the ideal physiological features to accurately reproduce and learn phonemes reach their peak before the offset of the critical period, although the ability to learn new languages past this period, while diminished, is not as drastically limited as once conceived (Krashen, 1973, p. 72; Johnson & Newport, 1989, p. 63).

The phonetic and phonological output in older learners of a foreign language has thus often been based upon the concept of transfer, which in a similar fashion to the assumptions of the CAH predicts that phonological units and rules from the L1 are activated in L2 production, either aiding or inhibiting successful language acquisition. However, as direct transfer was often unable to account for sounds that deviated from the L1, a more complex process was inferred, in which "a separate linguistic system based on the observable output which results from a learner's attempted production of a TL norm," (Selinker, 1972, p. 214) or interlanguage, was activated. The interlanguage is largely to considered to be dynamic, featuring elements from both the L1 and L2 and being subject to change over time (Hammarberg, 2001). Nevertheless, it has been argued that the time dimension counts for little in developing native-like pronunciation (Scovel, 1969), as the phenomenon of conflating L1 and L2 phonemes and suprasegmental features despite a language learner having spent a significant number of years in a country where the target language is spoken persists in many migrant contexts. Selinker (1972) refers to this process as fossilization (p. 215), and research on L2 posits pronunciation as being exceptionally prone to this process.

The assumptions of L2 phonological changes over time were examined in more detail by Flege (1995) in the Speech Learning Model for bilinguals (SLM). The development of phonetic categories for new sounds is characterized in SLM as a process in which the language learner relates phonemes of one language with another (pp. 238-239). Perceptually linked sounds, or similar-sounding interlingual phonemes (such as German /u/ and English /u/), are initially inhibited from phoneme categorization due to equivalence classification and eventually come to resemble each other, whereas L2 vowels that are discerned as distinct from L1 sounds are more likely to develop a distinct phonetic category through time (p. 239). In Best's (1995) Perceptual Assimilation Model, a new sound may be assimilated into native phones that appear to be similar. The following possibilities are then likely to emerge: 1) the sound is assimilated into two phonemes 2) a single native category, 3) the phone attains a category goodness type (assimilated into a native category with certain categories perceived as more similar) or 4) is not assimilable into any known L1 phonemes and therefore understood as a non-speech sound (p. 194-195).

Until recently, however, these assumptions were primarily studied in the context of L1 and L2 relationships. The recognition of ubiquitous multilingualism has prompted the closer examination of the role of L2s in languages learned thereafter, or L3s. This focus has not only increased the complexity of features in the interlanguage but has also expanded the traditional model of the contrastive analysis hypothesis to a three-way model of mutual influences (see Cenoz, Hufeisen, & Jessner, 2001, p. 2). While some studies have shown that L2 influences were absent from the L3 production (see Llisteri & Poch-Olivé, 1987, p. 137), research has been conducted with conflicting results providing greater nuancing of L2 influences. For example, a study on dynamics in pronunciation conducted by Williams and Hammarberg (1998) revealed nuances of the role of L2 in L3 speech due to the initial suppression of L1 as a non-foreign language. The

speech of the subject in the study was rated at the beginning stages of learning Swedish as an L3 by native speakers, revealing German L2 influences in speech. Recorded speech from a later stage of the learning process, however, revealed more prominent phonetic influences from her L1 English, suggesting not only the 'foreign language effect' or the impact of previously learned foreign languages, but also a time dimension could be associated with the scope of L2 phonological influences. Other studies such as Wrembel (2010) further demonstrated that the influence of a German L2 characterized the speech of beginner level English students from Poland, who were mostly misidentified as German native speakers in contrast to advanced learners, whose mother tongue could be discerned with more accuracy. The influence of L3 properties themselves can demonstrate the complexity of interactions between languages. In a study on vowel reduction and speech rhythm, Gut (2010) discounted a pervasive L1 influence on tests administered in the participants' L2 and L3 (either English or German) (p. 35). While accommodating the possibility of an L2 influence, the study suggested that L3 phonological properties also played a significant role in determining vowel reduction and speech rhythm (p. 19). Cenoz (2001) further postulates that language distance or psychotypology (the perceived degree of similarity between two known languages) may play a role in determining the degree of L1 or L2 transfer to the L3 (p. 10). The fact that English may be regarded as linguistically "closer" to German in comparison to a non-Indo-European L1 may thus encourage students to draw phonemes from English in order to produce German language targets (see Marx, 2000; Kärchner-Ober, 2009)

3. Learning a third language in the Philippine context

In a multilingual society such as the Philippines, a number of challenges beset the operationalization of the concepts of L1, L2, and L3 as idealized categories representing either the chronological acquisition of language or the contextual nature of language acquisition. While English is widely institutionalized, there is little indication that it has achieved L1 status across a broad spectrum of the population. Both Filipino and English are largely used in media, education, and official functions, whereas Filipino and/or regional languages tend to be used by many at home and in social situations (Bautista & Bolton, 2004). The fact that regional languages are spoken mostly within a domestic and informal context indicate that Filipino may also act as an institutionalized L2, particularly for residents who live outside the capital and neighboring Tagalog-speaking provinces. In order to avert any connotations arising from the learning/acquisition and chronological dimension of the L2, the L3 has been defined in this study as a language that is currently being learned (Hammarberg, 2001, p. 22). This may be one language or many languages that are being simultaneously learned that distinguish themselves significantly from Filipino, a regional language, or English, as these languages are no longer actively being 'learned' in a classroom setting the way a foreign language is learned.

The influence of the English language and English-language phonemes is another crucial issue in terms of the use of Filipino, the national language (RA 7104, 1991), which was the result of various historical and political processes starting from the intent to create a single language from elements of indigenous languages (Sibayan, 1986, pp. 351-352). The political background and continuing contestation over the implementation of a language perceived to be primarily Tagalog-centric has implications for what can be reasonably considered as Filipino's phoneme inventory. As the languages spoken in the Philippines are primarily Austronesian and closely related, and the influence of the Spanish and English lexicon is pervasive across the official languages, it must be noted that any basic phonemic inventory of Filipino would comprise of at most five vowels. The thresholds of Filipino vowel space were thus portrayed by outlining the

outer limits of average F1 and F2 formant values for Ilocano, Cebuano, and Tagalog (Delos Reyes et al., 2009)[3]. Complicating the matter is the question of a Filipino vowel inventory can be considered as separate from or including Taglish, a code-switching variety that combines Tagalog and English, in that Taglish adds a further layer of complexity to empirical research in phonology due to frequent code-switching and generational differences, among other factors.

The sociolinguistic features of Philippine English are manifested phonologically into what Llamzon (1997, quoted in Tayao, 2004, p. 81) classifies as the acrolect, mesolect, and basilect groups. These groups are differentiated primarily by their contextual usage of English, with speakers of the acrolect using the English language in various personal and professional contexts, and those speaking mesolectal and basilectal varieties in limited contexts (Tayao 2008, pp. 159-160). Phonologically, the acrolect has been described as comprising all phonemes in General American English (Llamzon, 1997, quoted in Tayao, 2004, p. 81), which has been confirmed in empirical studies such as Lesho (2018), where it was demonstrated that for the most part, the acrolect variety of Philippine English shares features of General American vowels. The mesolectal and basilectal groups, in contrast, are not postulated to generally or consistently produce all phonemes from General American (Tayao, 2008, p.173).

There have been few studies on the phonological aspects of German language learning in the Philippines, with Cruz (2015) featuring vowel duration contrasts between beginner-level German students and native speakers, as well as Neri (2006) and Kelz (1982), who detailed contrastive approaches to Filipino and German to serve as guides for the teaching of Phonetics in FLL classes. Evidence of phonological transfer from other European Languages taught as a foreign language include tendencies in Filipino Learners of Spanish, where phonetic-phonological errors accounted for only 8% of the total number of errors found in monologic data of Spanish speech, although it was noted that confusion between /aʊ/ and /o/, /o/ and /u/, and /i/ and /e/ appeared sporadically throughout the recordings (Sibayan & Rosado, 2012, p. 93). In other contexts where German is learned as an L3, there has been significant work done on how new vowels are distinguished from known vowels, such as in Lipinska (2015), who found that there were difficulties in creating a category for the German vowel /œ/ in L3 learners with English as an L2, and Polish as an L1 (p.88). The Lipinska study also hinted at a potential limitation of the method of conducting vowel elicitations as orthography may have influenced the pronunciation of the vowel (p.87).

4. Method

4.1 Participants

A total of 22 students from the University of the Philippines participated in the study (10 males, 12 females). Information on language use and other pertinent details were collected by an instrument adopted from the Language Experience and Proficiency Survey (LEAP) (Marian, Blumenfeld, & Kaushanskaya, 2007) for the purposes of the study (Table 1). The ages of the participants ranged from 17-27 with a mean age of 20.18 years old.

Eleven participants were in intermediate level German classes as the experiment was being conducted (roughly corresponding to Common European Framework of Reference for Languages (CEFR) level B1+ based on their textbooks, hereafter referred to as the B group), with at least two to three years of

[3] While Filipino is largely based on Tagalog, it has, since its promulgation, taken on a national character with many emergent varieties that have not been adequately studied from the perspective of acoustic phonetics. This study will utilize the expanded vowel chart in Delos Reyes et al. (2009) to approximate a maximal formant range for the vowels in the language that consider the ongoing process of its standardization and nationalization (Delima, 2017, p. 5).

experience and one class on phonetics[4], while eleven participants were in beginner's classes (A1 based on the textbooks used in their classes, hereafter the A group) who had studied German for less than a year. At the time of data gathering, intermediate students were German majors under the Department of European Languages. The other group comprised of students taking up German as a foreign language elective and came from varying degree programs.

Eleven students were chosen as the basis of comparison as they represented a majority of the total number of students taking intermediate classes at the university at the time of data gathering (84.6%). The survey revealed that eight languages other than Filipino, English or German were spoken among the surveyed population. All students indicated that they were able to speak and understand both English and Filipino prior to participating in the study.

Table 1

Personal Survey

Survey Descriptives			
		Languages known (other than English, Filipino and German)	
Participants	22		
Average Age	20.18 years	Mandarin Chinese	2
Age Range	17-27	Italian	3
Courses		Spanish	4
German	11	Bisaya	4
Other	11	French	7
Economics	1	Hiligaynon	1
Chemistry	1	Japanese	2
Music	1	Russian	1
Library Science	1	Average number of year learning English	17.55
Sociology	1	Average number of years learning Filipino	17.91
Computer Science	2	Average number of years learning German	2.4
Psychology	1	Average English use (at home)	3.59
Social Work	1	Average Filipino use (at home)	4.18
Art Studies	1	Average Media Consumption (English)	4.73
Geography	1	Average Media Consumption (Filipino)	3
Gender		Average Media Consumption (German)	1.86
Male	10	Level (German)	
Female	12	*A1*	11
		B1	11

[4] The class on Phonetics and Phonology focuses on both theory and practice of German pronunciation and is taken in the third year (5th semester) of the European Languages program.

4.2 Stimuli

The stimuli used in the experiment were vowel phonemes with a tense/lax distinction found in English and German, namely /i/, /i:/, /ɪ/, /eɪ/[5], /e:/ /ɛ/, /o/[6], /o:/ /ɔ/, /u/, /u:/, /ʊ/, taken from Wells (1982) and Pätzold & Simpson (1997). Four Filipino monophthongs /e/, /i/, /o/, /u/ were additionally recorded to discern general patterns in the participants' vowel spaces.

The vowels were located in a /kVl/ environment which was either monosyllabic or stressed in both German and English if the word was disyllabic. While perceptually similar Filipino vowels /e/, /i/, /o/, and /u/ were not the primary focus of the study, tri-, di,- or monosyllabic Filipino words where vowels appeared in a /kVl/ context (with the exception of *kerida*) were used for reference, although no emphasis was placed on stress. As the other native speaker values used for comparison in the study, namely, derived from Hillenbrand, Getty, Clark, & Wheeler 1995 (English); Pätzold & Simpson, 1997 (German); Delos Reyes, Santiago, Tadena, & Zubiri, 2009 (Filipino), were not necessarily elicited in the same /kVl/ environment, the native speaker formants likewise serve as an approximation of vowel formants for the purposes of comparing general tendencies. The majority of the analyses in the study thus involve the relationships between vowels within the respective A and B groups and between the L2 and L3; in other words, how the participants construct vowel spaces for their known languages, and which vowel productions appear to act as intra- or interlingual allophones.

The words used in the study were read out loud by the participants from three separate word lists in German, English, and Filipino. The words appeared along with other stimuli that are to be employed in other studies. Vowels measured in the study were recorded at 44100 Hz and 1411 kbps with a C01U Pro Samson condenser microphone in a quiet room. Formants were measured by the first vowel peak to the onset of the post-vocalic consonant. This was determined by a decrease in amplitude and differences in the waveform in PRAAT (Boersma & Weenink, 2015).

5. Results

5.1 Intralingual Differences

The F1, F2, and F3 values of intralingual differences were Bark-transformed for the purposes of the analysis. The Bark difference representation is part of Syrdal and Gopal's (1986) perceptual model of vowel recognition, a speaker-independent normalization procedure that reflects how the human ear perceives pitch while reducing between-speaker variability (p. 1086).

Intralingual F1 and F2 values of the German minimal pairs /e:/ - /ɛ/, /i:/ - /ɪ/, /o:/- /ɔ/, /u:/ - /ʊ/ were compared across both language proficiency levels.[7] The averages of both groups reveal that intermediate learners produced lower F1 values than the A group for /i:/, /e:/, /o:/, /u:/, and /ʊ/. The female B group additionally produced lower F1 values for German /ɔ/ than in the female A group. As German vowels are typically produced with lower F1 and F2 mean values than English vowel phonemes, the F1 lowering of the intermediate group indicates that changes in vowel height were discerned by the B group as determinant of phonemic categories in German. The F2 values of the B group tended, however, to be higher than their A1 counterparts, revealing that lower F2

[5] In Wells (1982) /eɪ/ is classified as a phoneme of General American and serves as one of the stimuli for the comparisons in this study.

[6] Wells (1982, p. 120) includes /o/ in his depiction of English vowel phonemes. It must be noted, however, that this phoneme has many allophones, including [oʊ], used phonemically in some notations.

[7] Normalization through the bark difference metric was applied to present a visual overview of vowel productions per language proficiency level. Ranges and average formant values for males and females can be found in Appendix B for a more detailed perusal.

values characteristic of native speech did not contribute to creating new phonetic spaces for L3 vowels.

Upon closer examination, the per-vowel results of intralingual production show changes in F2, creating vowel distinctions in the beginner's group, while the intralingual vowel production of intermediate learners exhibited changes in both F1 and F2 between the vowel categories /e:/ - /ɛ/ (Figures 1 and 2) and /o:/- /ɔ/ (Figures 5 and 6), and F1 distinctions between the categories /i:/ - /ɪ/ (Figures 3 and 4) and /u:/ - /ʊ/ (Figures 7 and 8). No discernible distinctions were found in the /o:/- /ɔ/ data in both groups (Figures 5 and 6). Instead, differences between groups were found in larger overlaps in the vowel spaces of the /i:/ - /ɪ/ pairs and /u:/ - /ʊ/ vowels in the beginners' group. Taken together, the vowel spaces for intralingual pairs were generally more distinct in the intermediate learners, suggesting that differentiation increases with one or a combination of the variables of proficiency, experience, or reflection.

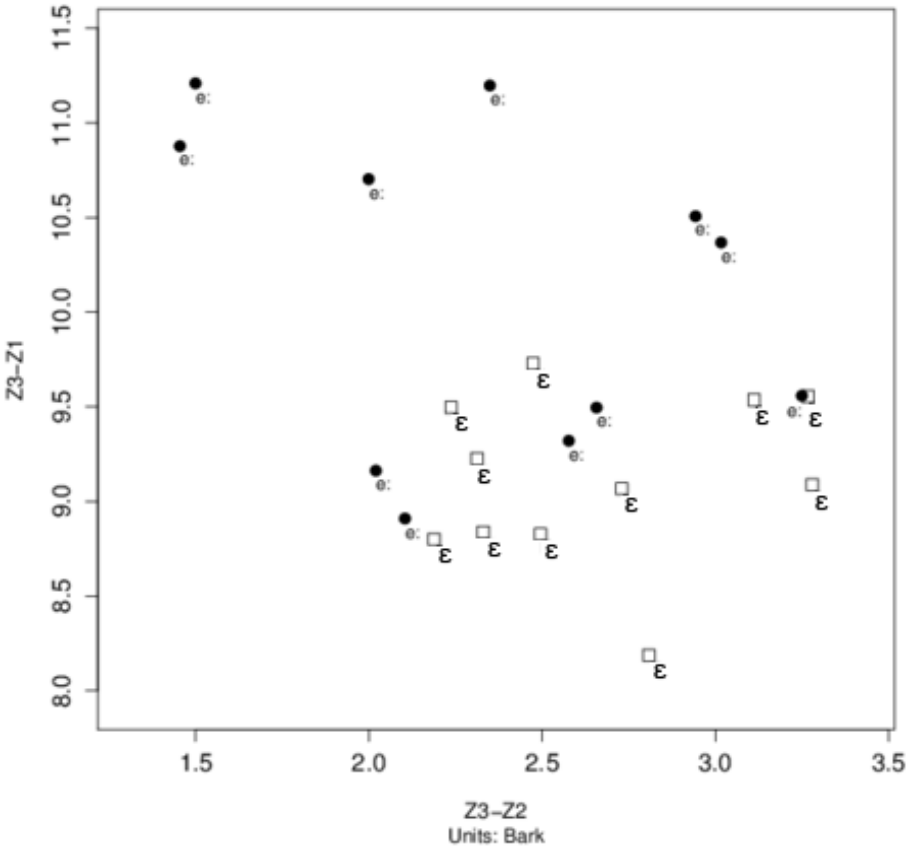

Figure 1. Intralingual comparisons, /e:/ - /ɛ/, A group[8]

[8] Figures 1-8 and 13-18 were all produced with NORM: The vowel normalization and plotting suite of the University of Oregon (Thomas & Kendall, 2015).

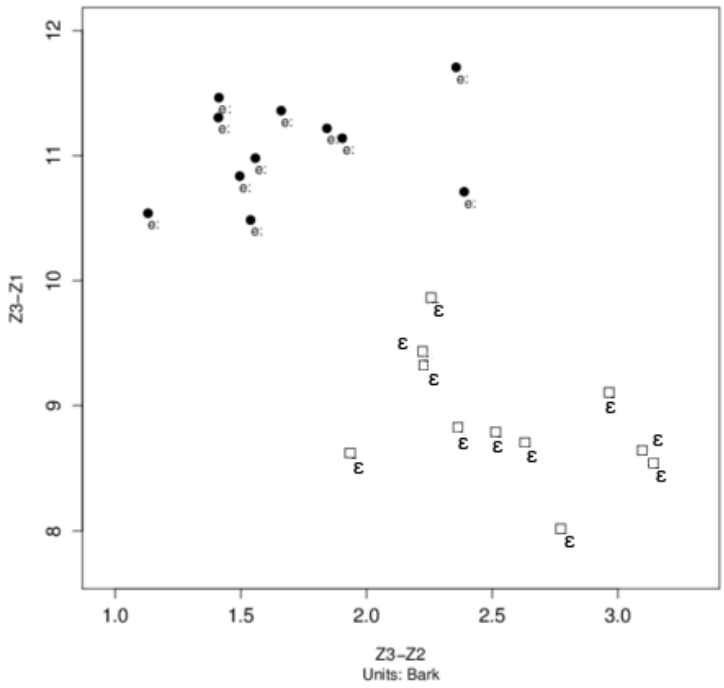

Figure 2. Intralingual comparisons, /e:/ - /ɛ/, B group

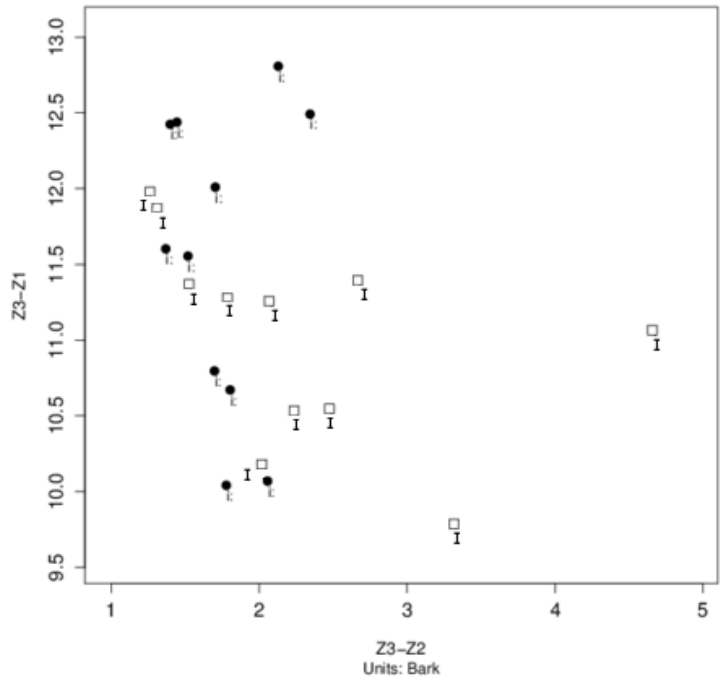

Figure 3. Intralingual comparisons, /i/- /ɪ/, A group

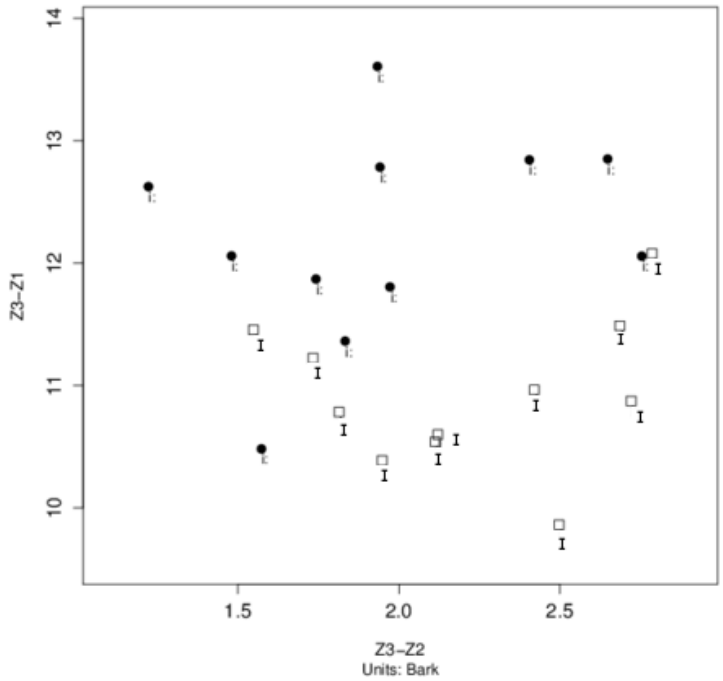

Figure 4. Intralingual comparisons, /i/- /ɪ/, B group

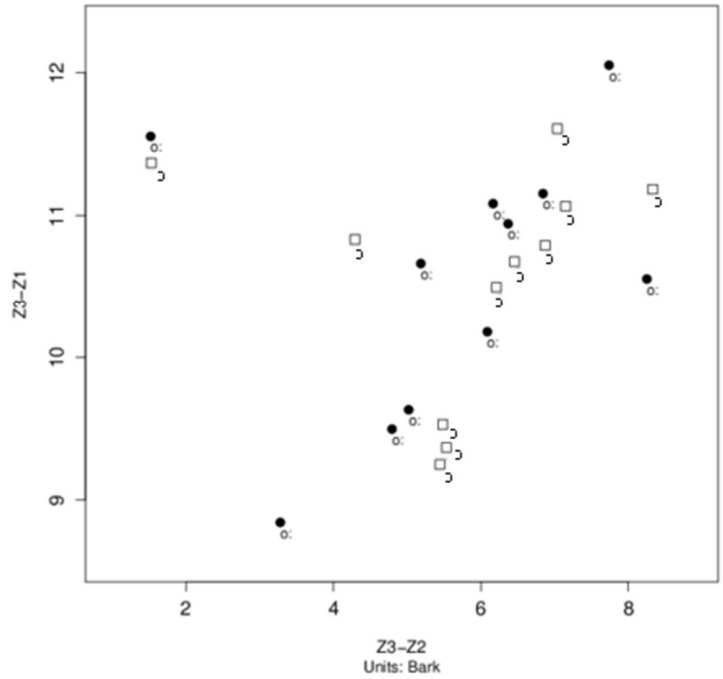

Figure 5: Intralingual Comparisons, /o:/-/ɔ/, A group

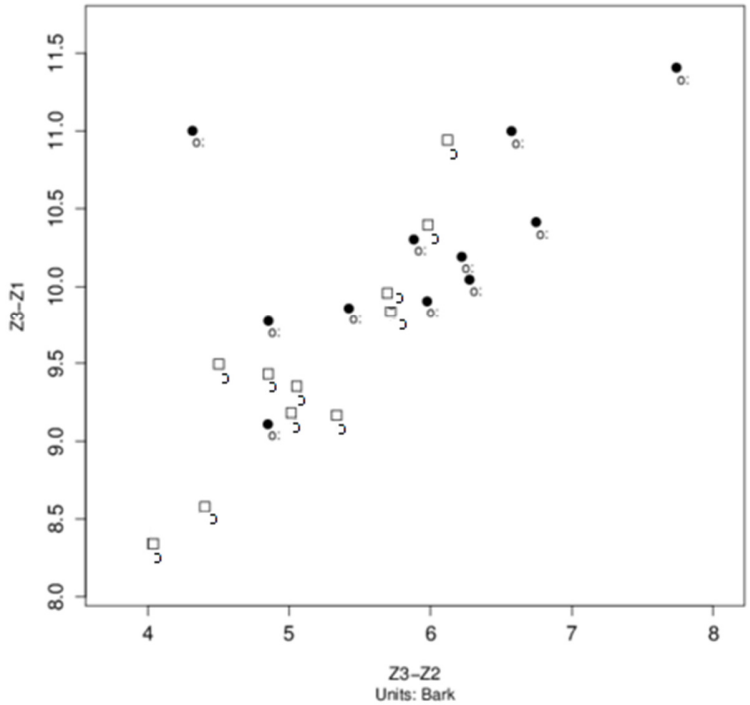

Figure 6: Intralingual Comparisons, /o:/-/ɔ/, B group

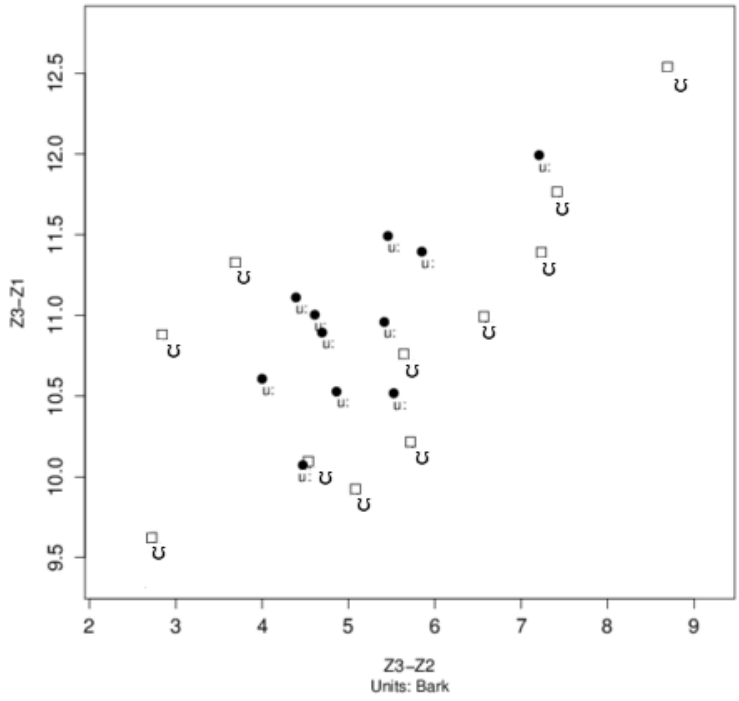

Figure 7. Intralingual comparisons, /u:/ - /ʊ/, A group

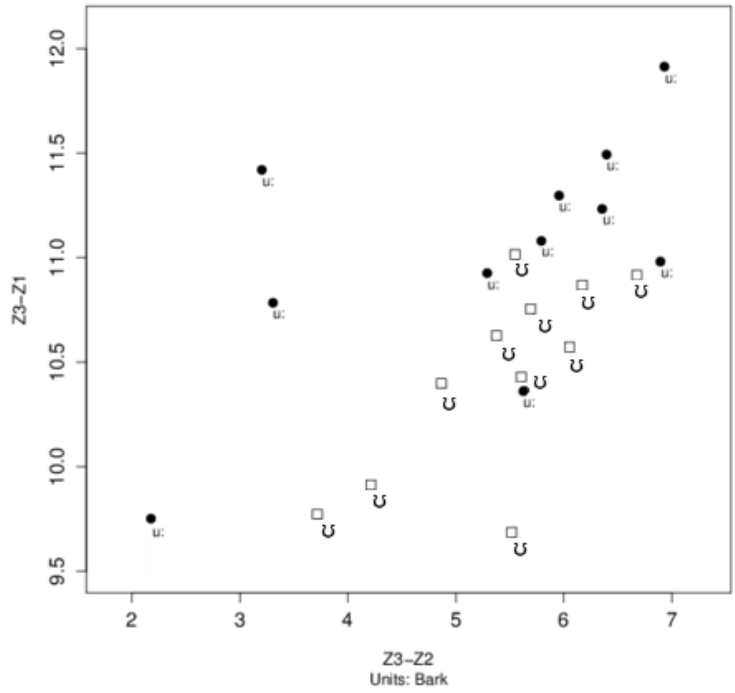

Figure 8. Intralingual comparisons, /u:/ - /ʊ/, B group

5.2 Interlingual Differences

Formant values for the vowels used in the study were collected from the participants' elicitations and compared with vowel formants from studies on native speakers (see Appendices B1-B5). Overall, a majority of the F1 and F2 values for German vowels in the male A and B groups were higher than native speaker values with the exception of the production of /ɔ/ (lower F1), with similar results in the female A and B groups. Lower values for F2 in the female groups for /e:/, /ɛ/, and /ɔ/ were also discovered for German (Appendices B1 and B2).

The mean values of German vowels of the groups typically remained close in vowel space to their English equivalents, although in certain cases the mean formant values of German vowels were found outside of the vowel space of English. Native speaker recordings indicate that English vowel phonemes generally have higher mean values for F1 and F2 than German vowels (Hillenbrand, et al., 1995; Pätzold & Simpson, 1997; see also Appendices B1 to B5), indicating that German vowels are "high, fronted, rounded, and more extreme" (Delattre, 1964, p. 83) in comparison to those found in English. The mean F1 and F2 values of German and English vowels for both males and females in groups A and B show that F1 values in English production were inconsistent with the patterns found in native speakers, being higher in the speaker's productions of /ɪ/, /eɪ/ (B group only), and /ɛ/ and /u/ (both groups). F2 values were higher in the group's productions of /i/ and /eɪ/ (both groups) as well as /o/ (B group only) (See Appendices B3 and B4).[9]

[9] It must nevertheless be noted that Hillenbrand et al. (1995) recorded vowel patterns for what was notated as /e/ and /o/, which have a high degree of diphthongal allophones in English that are sometimes presented as phonemes in General American, as is the case of /eɪ/ in Wells (1982).

Despite the fact that the production of English vowels in the target groups did not maintain consistently higher values in comparison with German vowels, the results indicate that both learner groups recognized F1 changes when distinguishing both interlingual and intralingual phonemic categories. The F1 and F2 values for German vowels were also typically higher than the ranges found in Filipino, suggesting that the learners were able to create separate categories for the larger number of vowel phonemes in the L3 (See Appendix B5).

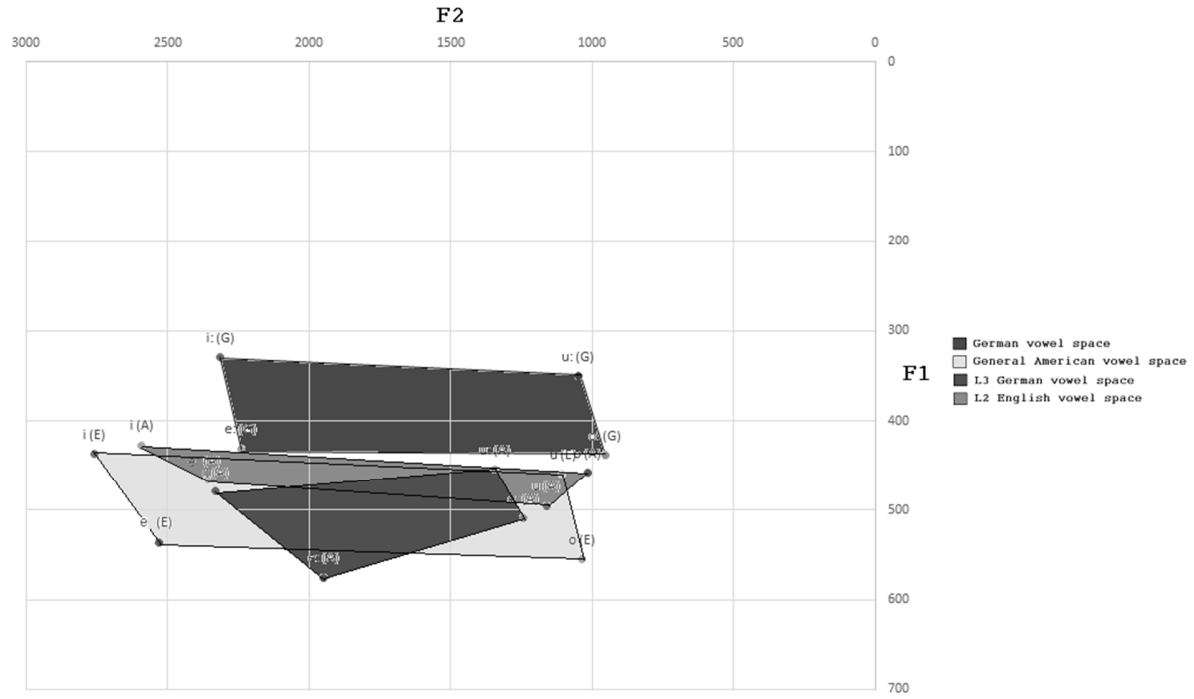

Figure 9. Average vowel formants (Cardinal Vowels), A group, female

The formant values for most groups (see Figures 9, 11, and 12 below) show that the participants' productions of the German /e:/ vowel were primarily located in a distinct vowel space from the English diphthong /eɪ/ whose F1 values neared ones that are more closely associated with /i/, likely due to its diphthongal nature . The mean values for German vowels /i:/ and /ɪ/ in the A female group were found in close proximity to one another (Appendix B2), as well as in their productions of /u/ (English) in comparison to /o:/ (German) (Figure 9), which point towards possible interlingual allophones. The mean values of the A male group's vowel production for /u:/, /e:/ and /eɪ/ appeared to be in separate vowel spaces, while their group means for /u/, /o:/, and /ɔ/ (English) were found to be in close proximity (Figure 11 and Appendix B3). In the B female group, the productions of /u/ (English) and /o:/ (German), /u/ (English) and /ɔ/ (German), and /ɪ/ (both German and English), /i:/ and /e:/ also had only slight differences in F1 and F2 values (Appendices B2 and B4), suggesting an allophonic treatment of front and back vowels that is characteristic for a historical three-vowel system in Tagalog (Reid & Schachter, 2008, p. 834). A similar tendency for interlingual back vowels, though less pronounced, was found in the male intermediate group.

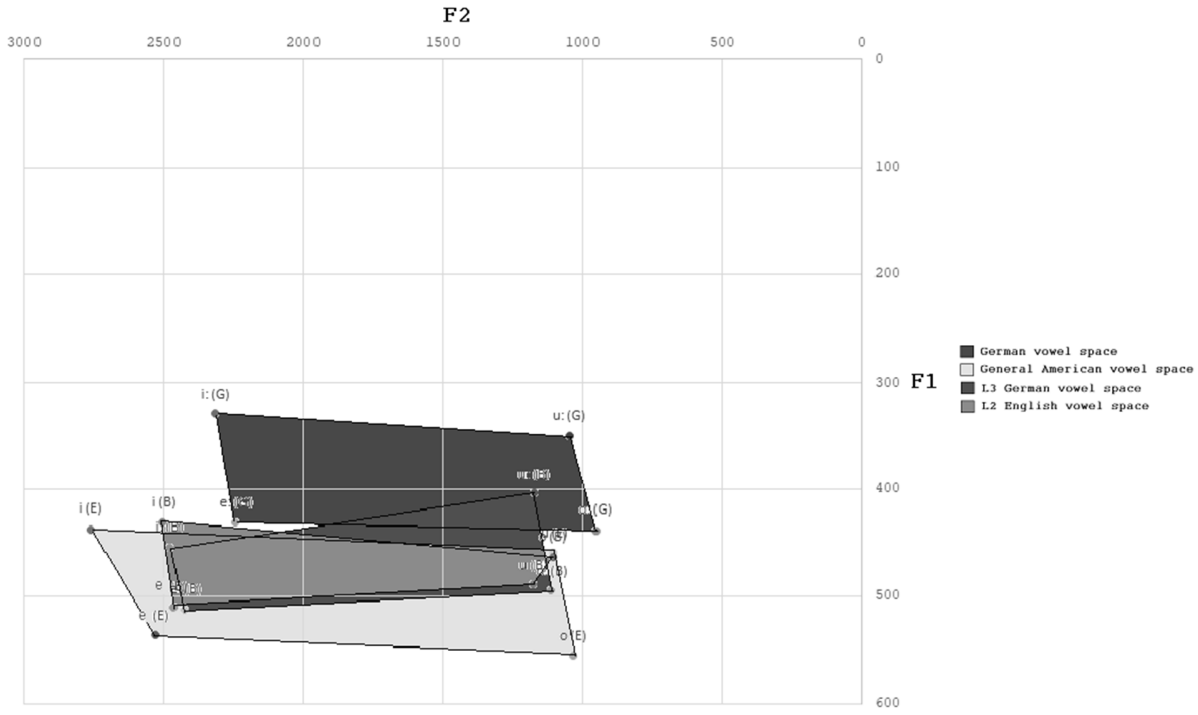

Figure 10. Average vowel formants (Cardinal Vowels), B group, female

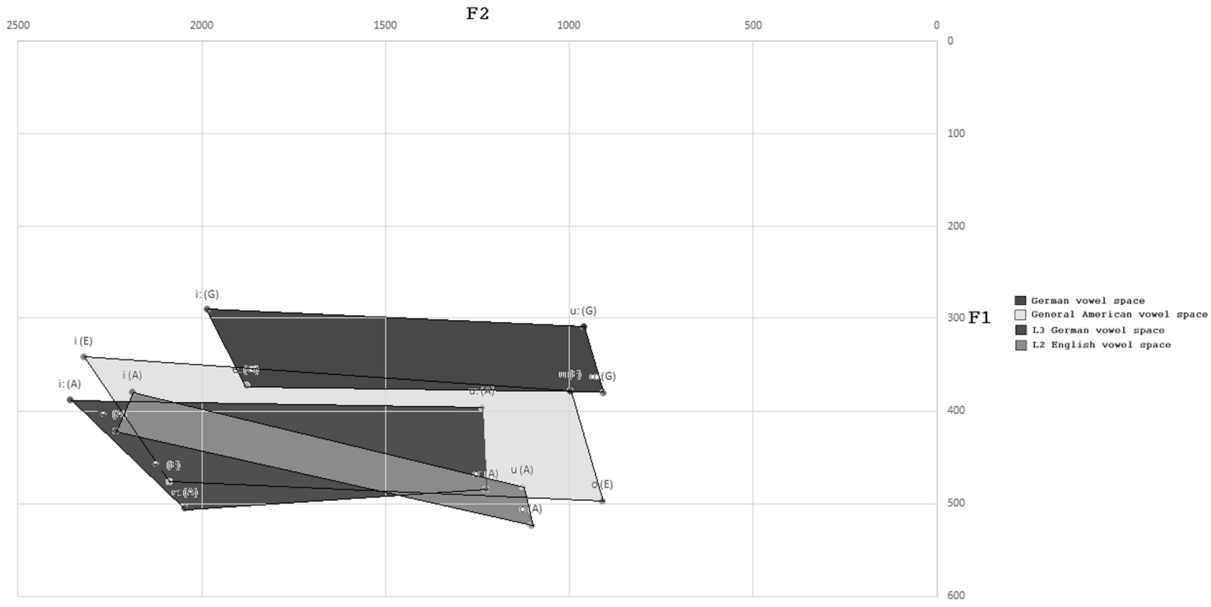

Figure 11. Average vowel formants (Cardinal Vowels), A group, male

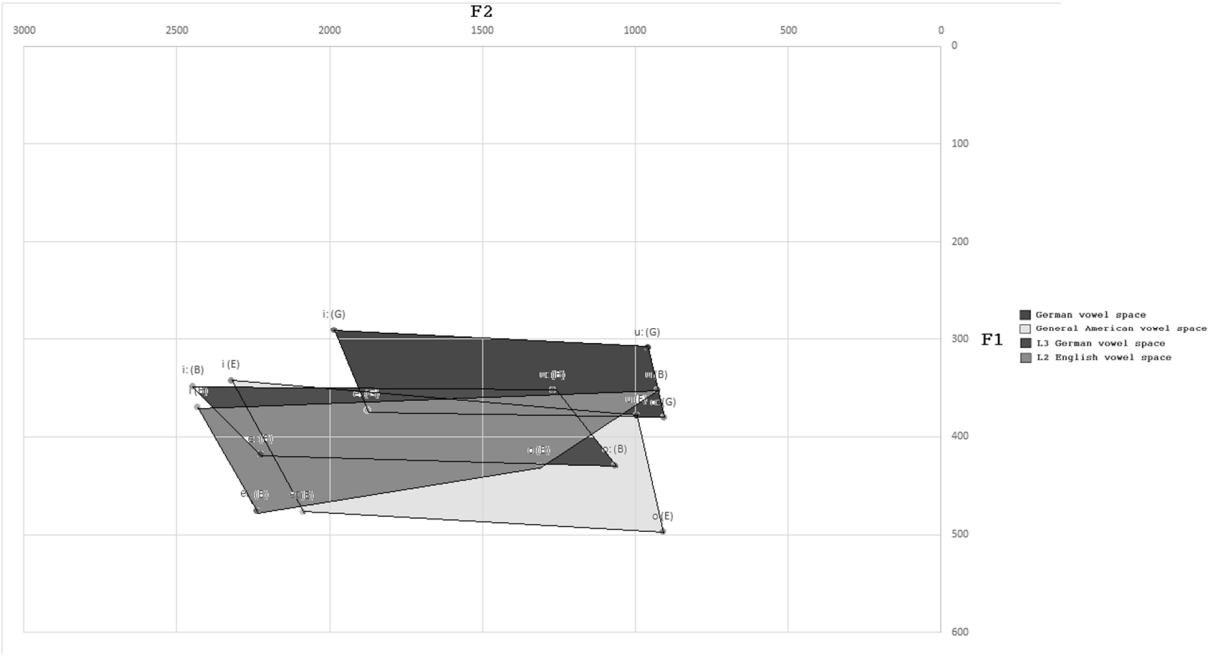

Figure 12. Average vowel formants (Cardinal Vowels), B group, male

A closer examination of group values for the individual formants (see Figures 13-28) revealed that the interlingual vowel pairs /e:/ - /eɪ/ (Figure 13), /ɛ/ - /ɛ/ (Figure 15), and /u:/-/u/ (Figure 25) were typically found in distinct vowel spaces in the A group, while interlingual contrasts in the A group, namely /i:/ - /i/ (Figure 17), and /ɪ/ - /ɪ/ (Figure 19), /o/ - /o:/ (Figure 21), /ɔ/ - /ɔ/ (Figure 23), and /ʊ/ - /ʊ/ (Figure 27) show a high degree of assimilation. The /e:/ - /eɪ/ vowel pairs were less distinct in the B group (Figure 14), although evidence of merging was found for interlingual front vowel pairs /i:/ - /i/ (Figure 18) and /ɪ/ - /ɪ/ (Figure 20). While exhibiting slight overlaps, interlingual back vowel pairs in the B group appeared to produce distinct phonetic spaces for English and German vowels compared to those of the A group, with higher F1 and F2 values for /o:/ as opposed to /o/ (Figure 22). This tendency to produce lower English back vowels was also noted in the mean comparisons in Appendix B. The phenomenon of higher F1 and F2 values for German was further discovered in /ɔ/ (Figures 23 and 24) and /ʊ/ (Figures 27 and 28) in relation to their English counterparts. Conversely, in /u:/ - /u/ comparisons, elicitations of English /u/ vowels tended to have higher F1 values than the results for German /u:/ (Figures 25 and 26).

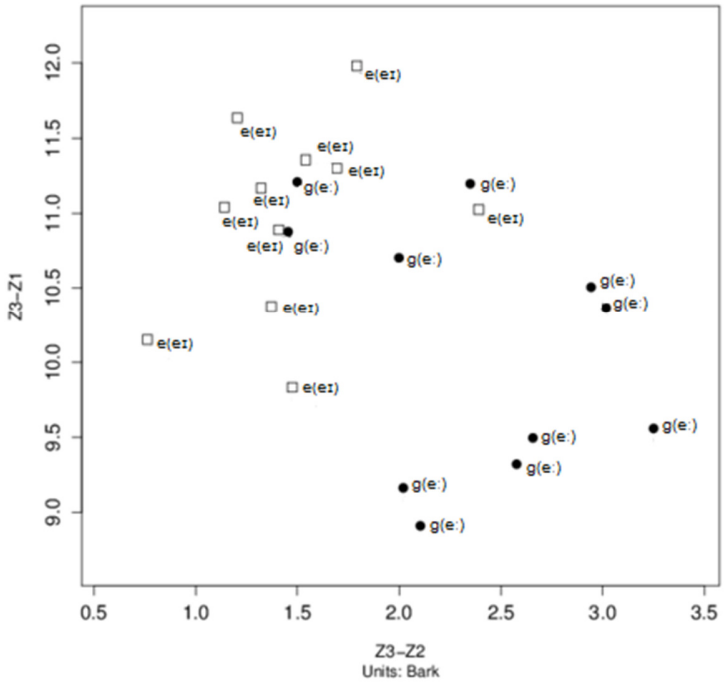

Figure 13. Interlingual Vowel Comparisons, German /e:/ - English /eɪ/, A group

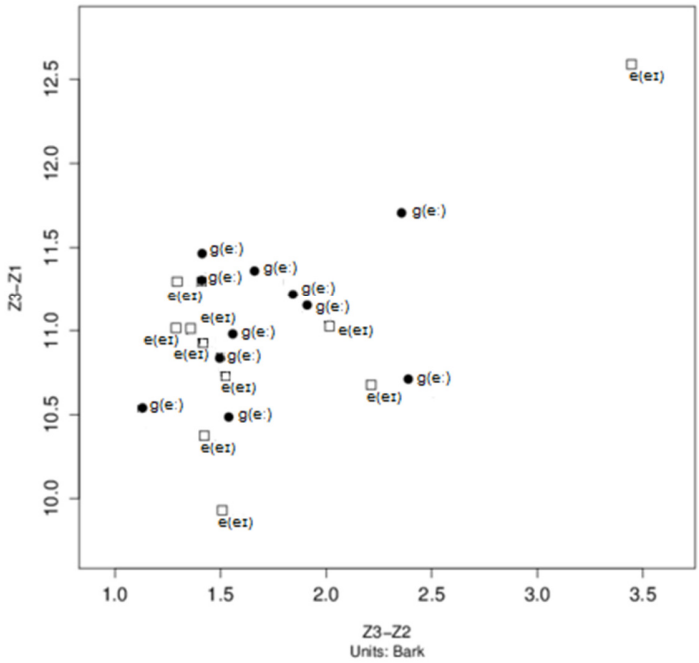

Figure 14. Interlingual Vowel Comparisons, German /e:/- English /eɪ/, B group

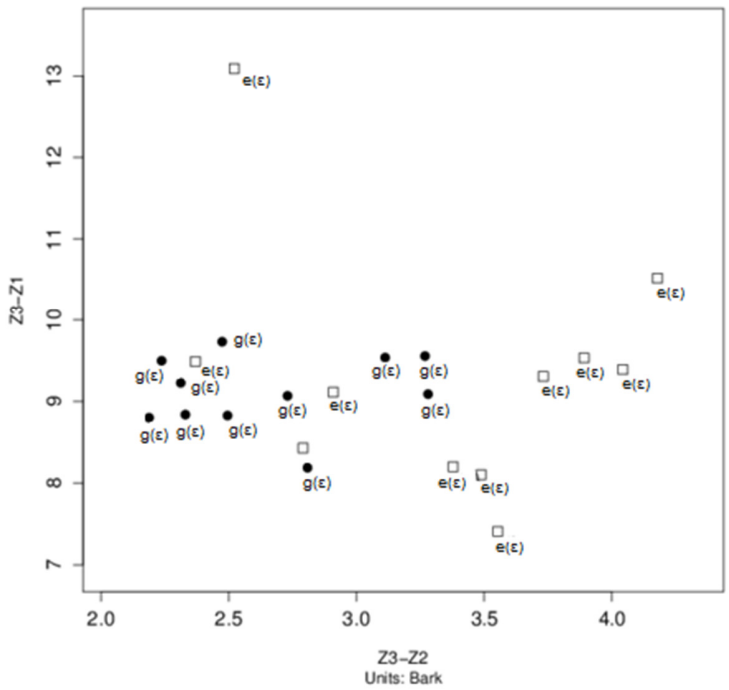

Figure 15. Interlingual Vowel Comparisons, German /ɛ/ - English /ɛ/, A group

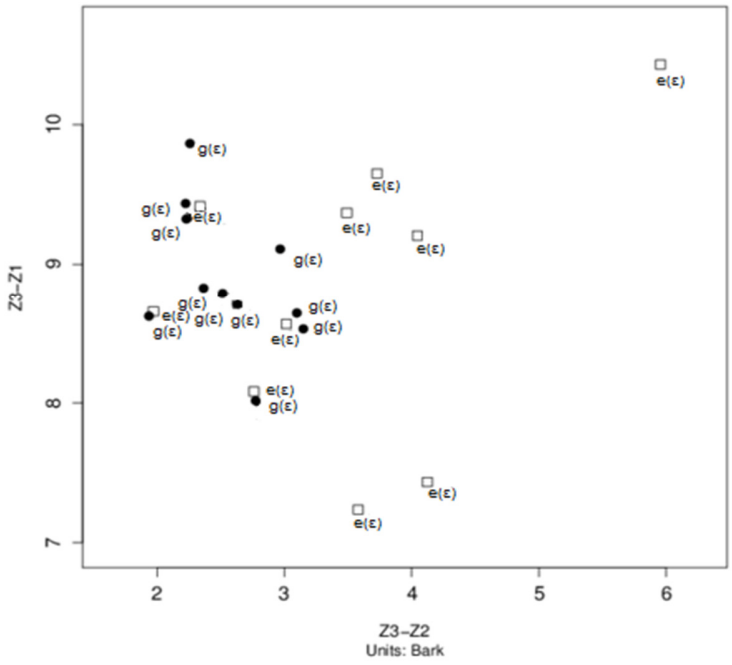

Figure 16. Interlingual Vowel Comparisons, German /ɛ/ - English /ɛ/, B group

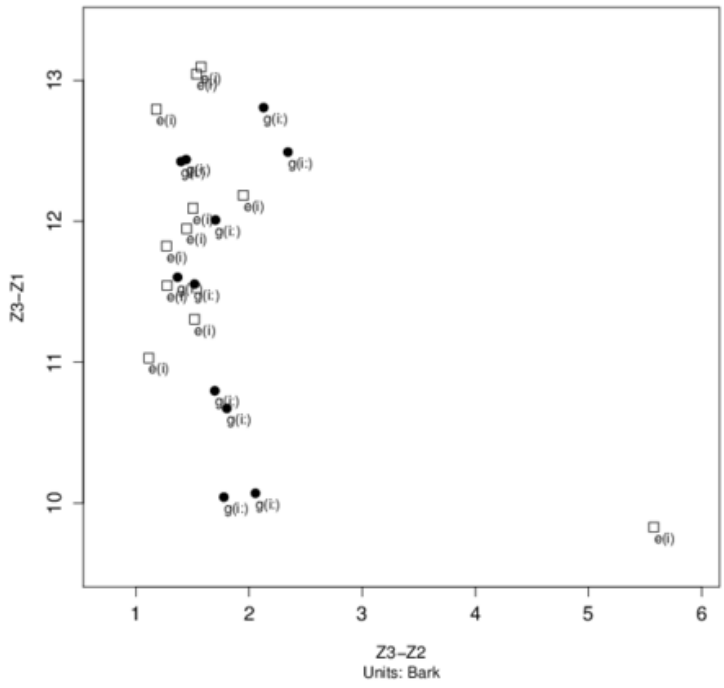

Figure 17. Interlingual Vowel Comparisons, German /i:/- English /i/, A group

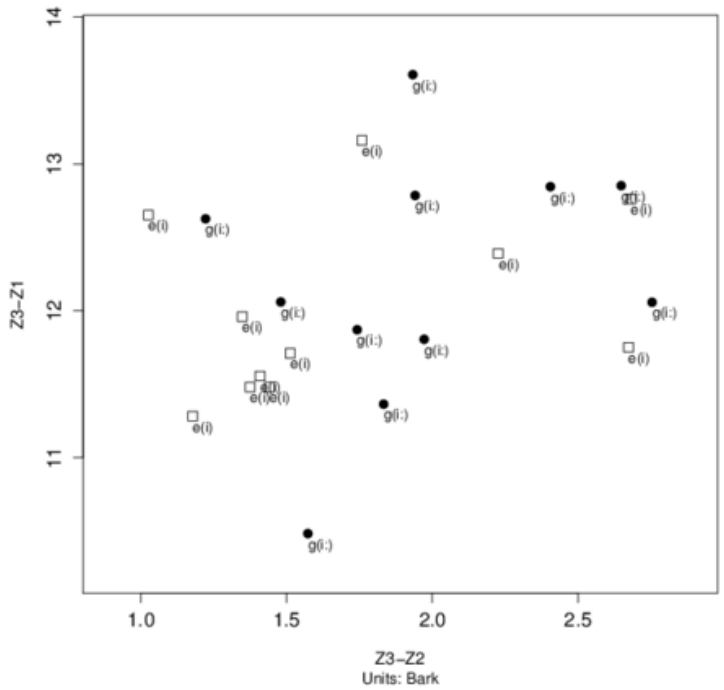

Figure 18. Interlingual Vowel Comparisons, German /i:/- English /i/, B group

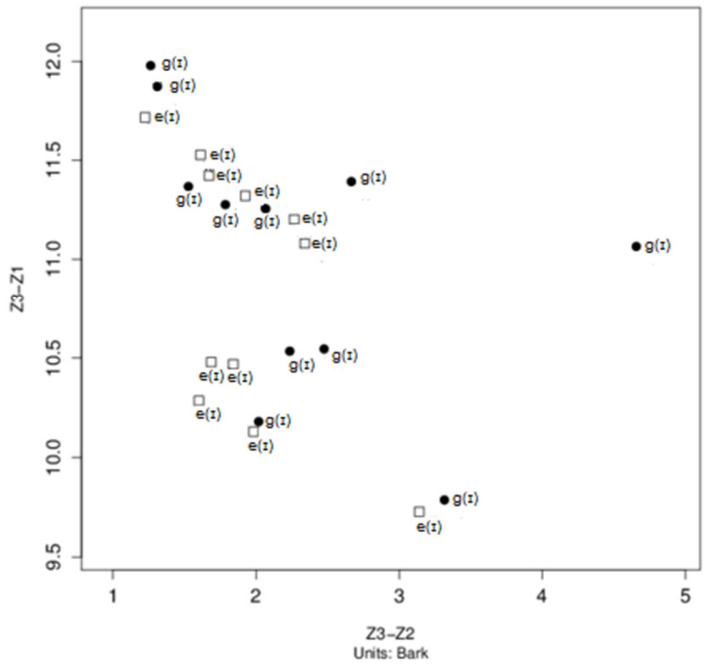

Figure 19. Interlingual Vowel Comparisons, German /ɪ/ - English /ɪ/, A group

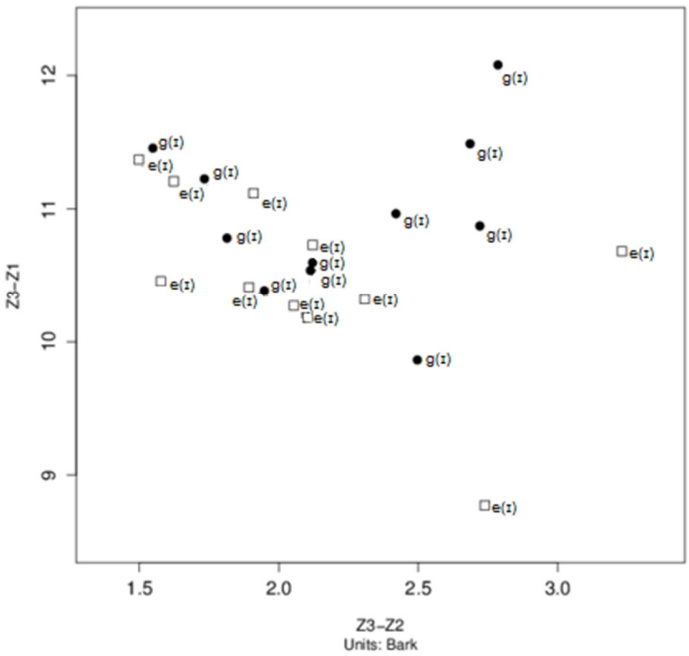

Figure 20. Interlingual Vowel Comparisons, German /ɪ/- English /ɪ/, B group

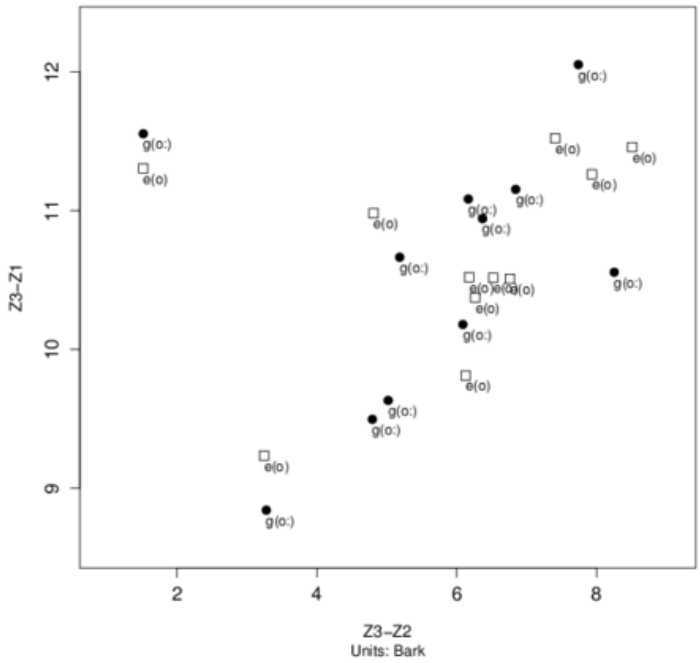

Figure 21. Interlingual Vowel Comparisons, German /o:/- English /o/, A group

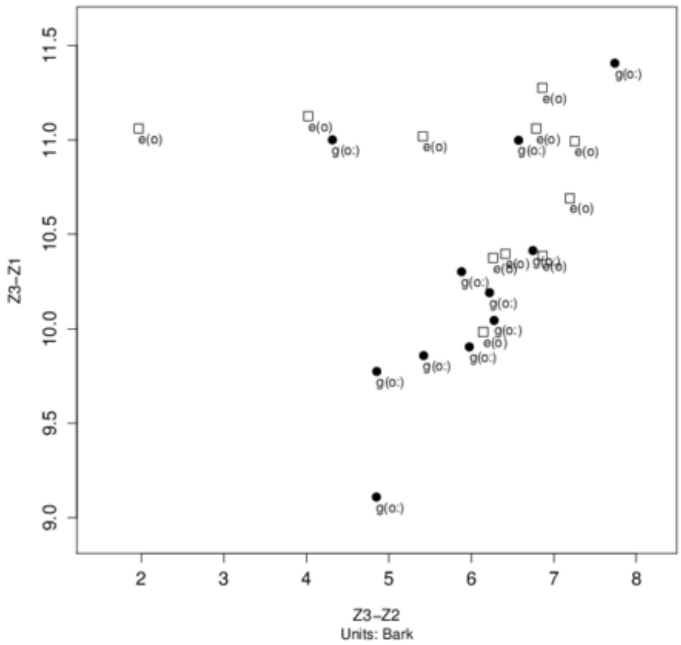

Figure 22. Interlingual Vowel Comparisons, German /o:/- English /o/, B group

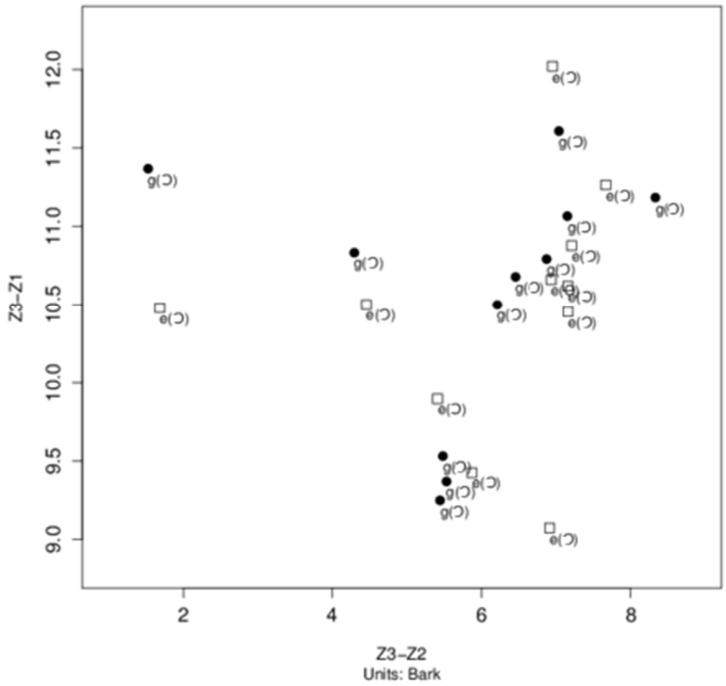

Figure 23. Interlingual Vowel Comparisons, German /ɔ/ - English /ɔ/, A group

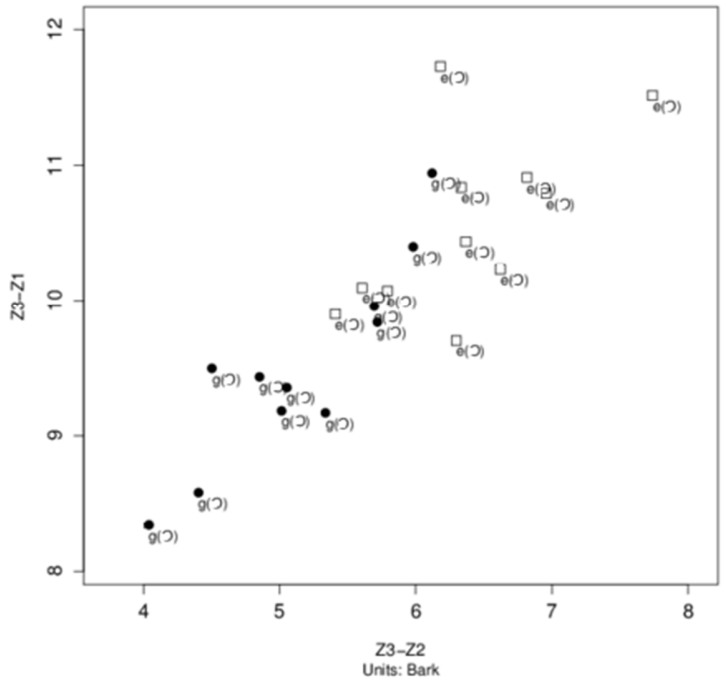

Figure 24. Interlingual Vowel Comparisons, German /ɔ/ - English /ɔ/, B group

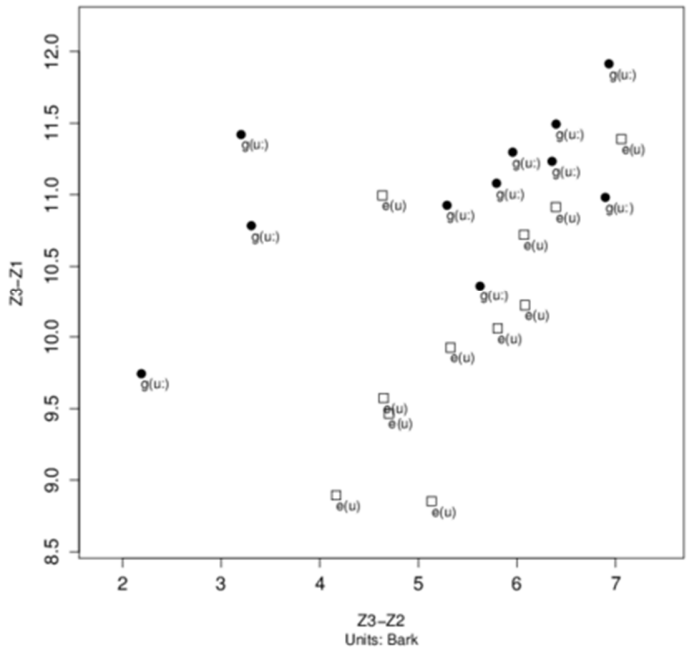

Figure 25. Interlingual Vowel Comparisons, German /u:/- English /u/, A group

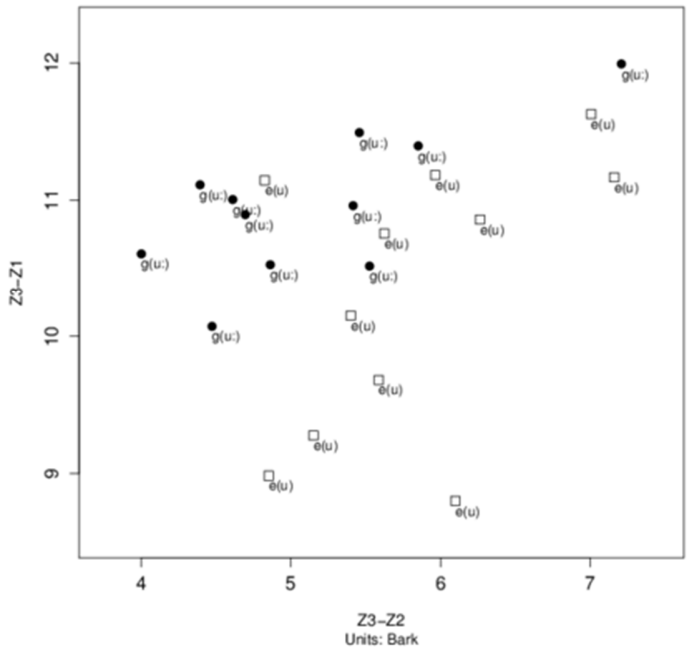

Figure 26. Interlingual Vowel Comparisons, German /u:/ - English /u/, B group

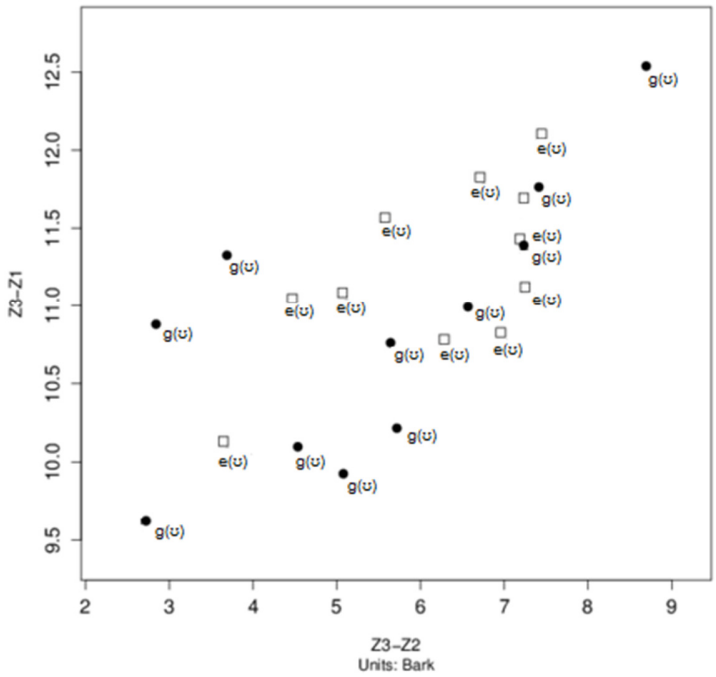

Figure 27. Interlingual Vowel Comparisons, German /ʊ/- English /ʊ/, A group

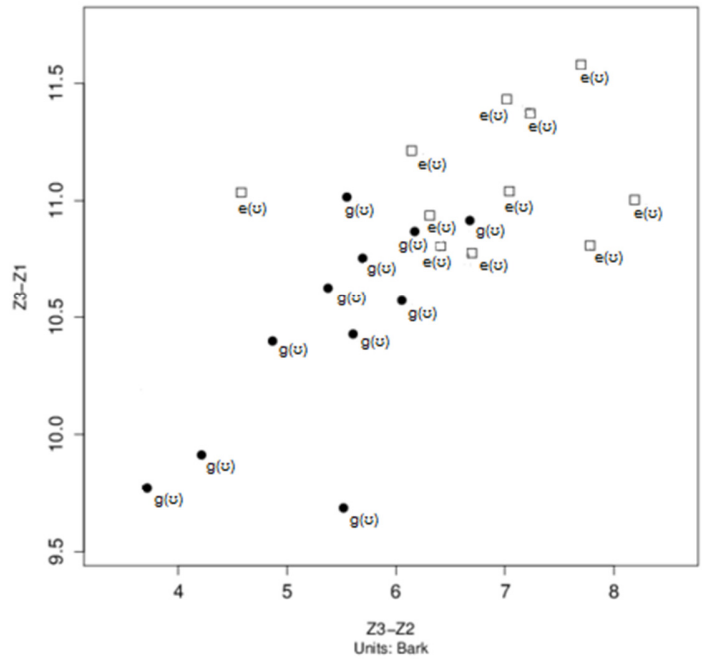

Figure 28. Interlingual Vowel Comparisons, German /ʊ/- English /ʊ/, B group

The evidence illustrates that intermediate training was associated with nascent vowel categories for /o:/ (Figure 22), and to a certain extent /i:/ (Figure 18), yet it appeared that the /e:/-/eɪ/ vowel spaces in turn became less distinct for intermediate learners in contrast to beginners (Figures 13 and 14). It is apparent, however that several values for /i/ in English tended to have slightly higher F2 values in the B group despite overlapping vowel spaces (Figure 18), while the production of German /ɪ/ in the same group exhibited lower F1 and F2 values (Figure 20). This indicates that differentiation for front vowels appears to manifest in at least some of the surveyed population.

5.3 Tenseness/Laxness and Vowel Duration

One of the main distinctions between the English-L2 and German-L3 is vowel duration, which is phonemic in German but not in English. German vowels are often twice as long as short vowels, whereas English tense vowels, which occasionally (although not phonemically) manifest as longer in duration compared to their lax counterparts, have ratios that fall between 1 and 2 (Nimz, 2014, p. 316). Vowel duration values taken from the participants demonstrated significant differences between both intra– and interlingual differences in the A and B groups (Table 2). Mean German vowel durations for long vowels in the B group were 1.18 times longer than those in the A group, whereas mean vowel durations for English tense vowels as well as Filipino vowels remained relatively homogeneous between both groups. A further distinction of the B group from the A group is the ratio between German long and short vowels (Table 2). As German long vowels are often twice as long as short vowels, it is evident that the B group was able to produce vowel durations nearing those of native speakers. Nevertheless, the beginner group was able to produce ratios between German long and tense and short and lax vowels that were larger than the ratio between English tense and lax vowels (ratios of 1.276 and 1.185, respectively). The mean vowel duration values for German vowels in both groups were lower than both English and Filipino lax vowels. It appears that despite a greater ratio between German vowels than English vowels in the A group, English long vowel durations still superseded those of the German group, indicating that the difference in ratio arose from a lowering of duration in German short vowels. Additionally, ratios between English vowels were slightly lower in the intermediate group in comparison to the beginners' group.

Table 2

Vowel Duration and Ratios

Average Vowel Duration	**A1**	**B1**	**Ratio**	**A1**	**B1**
German Long Vowels	0.125	0.148	German Vowels	1.276	1.741
German Short Vowels	0.098	0.085	English Vowels	1.185	1.142
English Long Vowels	0.128	0.129	German-English Long Vowels	0.977	1.147
English Short Vowels	0.108	0.113			
Filipino Vowels	0.1	0.095			

Table 3

Wilcoxon Signed Ranks Test for Vowel Duration: German and English Phonemes (long-tense and tense vowels)

Tense Vowels **Wilcoxon Signed Ranks Test**	**A1**	**B1**
German-English /iː/ - /i/	Z= -0.711, p < 0.477	Z= -2.227, p < .026*
German-English /eː/ - /eɪ/	Z= -1.154, p < 0.130	Z= -2.756, p < .006*
German-English /oː/ - /o/	Z= -1.245, p < 0.213	Z= -2.090, p < .037*
German-English /uː/ - /u/	Z= -2.268, p < .023*	Z= -2.227, p < 0.008*

Table 4

Wilcoxon Signed Ranks Test for Vowel Duration: German and English Phonemes (short-lax and lax vowels)

Short Vowels **Wilcoxon Signed Ranks Test**	**A1**	**B1**
German-English /ɪ/ - /ɪ/	Z= -0.178, p < 0.859	Z= -2.940, p < 0.003*
German-English /ɛ/ - /ɛ/	Z= -0.623, p < 0.53	Z= -0.489, p < 0.624
German-English /ɔ/ - /ɔ/	Z= -0.890, p < 0.373	Z= -1.580, p < 0.114
German-English /ʊ/ - /ʊ/	Z= -2.581, p < 0.01*	Z= -2.936, p < 0.003*

Table 5

Intralingual Wilcoxon Signed Ranks Test for Vowels (German)

Vowel Length Within Languages (G) **Wilcoxon Signed Ranks Test**	**A1**	**B1**
German /iː/ - /ɪ/	Z= -1.689, p < 0.91	Z= -2.934, p < 0.003*
German /eː/ - /ɛ/	Z= -2.045, p < 0.41*	Z= -2.936, p < 0.03*
German /oː/ - /ɔ/	Z= -1.778, p < 0.75	Z= -2.045, p < 0.041*
German /uː/ - /ʊ/	Z= -2.491, p < 0.013*	Z= -2.756, p < 0.006*

Table 6

Intralingual Wilcoxon Signed Ranks Test for Vowels (English)

Vowel Length Within Languages (E) **Wilcoxon Signed Ranks Test**	**A1**	**B1**
English /i/ - /ɪ/	Z= -2.578, p < 0.010*	Z= -2.578, p < 0.010*
English /eɪ/ - /ɛ/	Z= -2.845, p < 0.004*	Z= -2.934, p < 0.003*
English /o/- /ɔ/	Z= -2.224, p < 0.026*	Z= -2.225, p < 0.026*
English /u/ - /ʊ/	Z= -2.845, p < 0.004*	Z= -2.847 p < 0.004*

The Wilcoxon Signed Ranks test, which compares two related samples for significant differences, was chosen to determine differences between pairs of vowel duration values collected per group. A non-parametric test was deemed suitable for the data as log10 normalization measures failed to control for skewness and kurtosis and could not approximate normal distribution for certain stimuli. The test was conducted on the vowel duration contrasts for intralingual and interlingual pairs to determine if differences between the intermediate and beginners' groups were significant. The tests showed that differences between English tense and lax vowels were significant for both groups (Table 6). Key differences between the groups are found in the results for the B group, which indicate that intermediate learners distinguished both intralingual and interlingual vowel pairs in terms of vowel duration (Tables 3 and 5). This was not true for lax vowel pairs, for which the intermediate group showed two out of four significant differences (Table 4).

6. Discussion

The results of the study illustrate that interlanguage manifests itself differently in vowel quantity and quality. The hypothesis that the L1 determines the vowel space of an L2, as well as any other languages learned beyond the first, does not conclusively predict the results of the study. The interlingual results demonstrate evidence for the role of an L2 with a perceptually linked phonemic inventory acting as a more reliable guide to production than a limited L1 phonemic inventory differing in both vowel length and quality, lending support to studies such as Wrembel (2010), Williams and Hammarberg (1998), Hammarberg (2001), and Cenoz (2001), in which language distance and language status were key elements of determining the degree of transfer of L2.

Not only can the L2 act as a template for learning new sounds in an L3, but factors such as intralingual distinctions over time cannot clearly be accounted for by L2 influences alone. German appears to have improved back vowel distinctions between similar interlingual vowel pairs, but mean results show that despite this, German back vowels appear to be paired with dissimilar vowels in English. In addition, interlingual /e:/ (German) - /eɪ/ (English) vowel spaces became less distinct from one another in intermediate German learners demonstrating some evidence for the hypothesis of Flege (1995), which predicts that diaphones would eventually assimilate into the same vowel space. While the intermediate group might not have lived extensively in the country of origin, it is interesting to note that this result appeared only after three to four years of training and one phonetics class and might need to be studied further. Comparing the results with Best's (1995) Perceptual Assimilation Model reveals that different features of the vowel are taken as distinct for the surveyed population, as there was a tendency towards changing vowel height rather than backness. German phonemes were partially assimilated with unrelated known phonemes, and while this could be a result of F1 and F2 adjustments to accommodate L3 norms in contrast to L2, it could plausibly also be due to the close phonetic space of back vowels in Filipino (Delos Reyes et al. 2009). The continuing influence of the L1 should thus be considered in further studies. Moreover, while front vowels typically remained in a single category, category goodness appeared to apply in many of the cases, in which decisions were made about which known phonemes were related to the phonemes of German.

The intralingual vowel production results show that intermediate learners were able to more clearly separate within-German vowel pairs than the beginners' group. The study demonstrated evidence that attempts toward distinctive intralingual vowel spaces were being created in the intermediate learner's group, with F1 and F2 distinctions and fewer instances of merging than the

beginners' group in both /i/ - /ɪ/- and /o/ - /ɔ/vowel pairs. Results with a higher degree of merging such as in the vowel spaces for /e:/ - /ɛ/ and /u:/ - /ʊ/ further showed more differentiation in the intermediate group. Proficiency and advanced training could thus account for subtle changes in vowel space and the creation of phonemic categories, but not necessarily native-like speech.

The vowel duration results demonstrate that the effects of higher language proficiency can be found in German vowel durations that are significantly different from those found in English long vowels as well as in the differentiation between long and short vowels in German. The vowel duration for German long vowels also exhibited the highest differences between the beginner and intermediate learner groups, suggesting that L3 phonemic categories can become more distinct over time, nuancing the results on beginner's vowel lengths in Cruz (2015), who suggested that beginners are influenced by English and Filipino vowel durations (p. 98). The finding may also suggest that the L3 distinctions themselves may be responsible for incremental changes in vowel space rather than the influence of the L2 (see, for instance, Gut, 2010, p.19).

7. Conclusion

The initial research questions of this study were if and to what degree the L2 influenced the L3 in the production of vowel phonemes and if there were any differences between intermediate and beginning learners of German. The results provide evidence that the role of English as an L2 can be contributory to a German L3 in the selected student population where a non-Indo-European L1 is present, as explored in Marx (2000). As it was unclear from the results of the cross-sectional investigation whether or not the main contributory factor to changes in vowel production were the individual differences in the group, proficiency, time spent learning the language or the class taken by the B group on phonetics, it is recommended that future studies attempt to further nuance the role of each of these aspects.

However, there are a number of features that may develop as a result of further exposure to the language such as distinctions between long and short and tense and lax vowels within German. While formant values may not mirror native speakers', it appears that the interlanguage of the learners adjusts to accommodate vowel qualities that are perceived as distinct of the target language phonemes. Furthermore, while it is often implicitly required from textbooks that foreign language learners try to emulate native speaker sounds, there is reason to believe that even when not approaching native language vowel quality and quantity, there is an effort from FLL learners to create appropriate phonemic categories to distinguish different vowels that may facilitate communication.

This study focuses on the influences of L2 on the vowel production of Filipino learners of German as an L3, although the discussion has revealed that influences from the L1 cannot completely be neglected. While the L2 production of these learners is at a level where the L2 is prevalently used in a professional context and in the consumption of various English-language media, the study does not take into consideration the role of reading in the production of sound. The reading of word lists involves the additional step of transforming graphemes into phonemes, which may lead to deviations in the data when a word is not familiar to the reader. This process has been theorized in dual-route models of reading aloud, such as the dual route cascaded model for reading aloud by Coltheart, Rastle, Perry, Langdon, and Ziegler (2001). This model theorizes three routes for reading aloud, a lexical semantic route, a lexical non-semantic route and a Grapheme Phoneme Conversion route (GPC) (pp. 215-217). The lexical non-semantic route, and GPC route can provide insights into the processes of decoding known and unknown words, such as in the case of the A group participants, who may not have previously encountered words or

phonotactic combinations in the German list. While the lexical non-semantic route activates an orthographic lexicon that contains the spellings of the words before activating an entry in the phonological lexicon in order to say the word out loud, the GPC route involves a complex process of decoding orthographic information based on known grapheme-phoneme conversion rules. These rules include context-based phonotactical qualities of written words. It is at this point where interlingual influences may appear in vowel production.

The context of the words was also presented in one form, a wordlist where vowels were embedded in a /kVl/ context. This context was chosen for its suitability for interlingual stimuli. This method was chosen to avoid any prosodic effects that may result from saying words embedded in a sentence. Further studies may take spontaneous speech or sentences as a basis for analysing phrasal utterances such as in Lesho (2018). As the subjects of the study were predominantly acrolects, studies on L3 learning and L2 influence can be studied further in mesolect and basilect groups in order to further test L1 and L2 interaction, particularly since the foreign language program in the Philippines will be implemented across educational levels.

References

Bautista, M. L. S. & Bolton, K. (eds.) (2004). Special issue on 'Philippine English: Tensions and Transitions'. *World Englishes, 23*(1), 1-210.

Best, C. (1995). A direct realist view of cross-language speech perception. In W. Strange (Ed.), *Speech perception and linguistic experience: Theoretical and methodological issues in cross-language speech research* (pp. 171-204). Timonium MD: New York Press.

Boersma, P., & Weenink, D. (2015). *Praat: Doing phonetics by computer* [Computer program]. Version 6.0.05. http://www.praat.org

Cenoz, J. (2001). The effect of linguistic distance, L2 status and age on cross-linguistic influence in Third Language Acquisition. In J. Cenoz, B. Hufeisen, & U. Jessner (Eds.), *Cross-linguistic influence in Third Language Acquisition: Psycholinguistic perspectives* (pp. 8-20). Clevedon: Multilingual Matters.

Cenoz, J., Hufeisen, B., & Jessner, U. (2001). Introduction. In J. Cenoz, B. Hufeisen, & U. Jessner (Eds.), *Cross-linguistic Influence in Third Language Acquisition: Psycholinguistic perspectives* (pp. 1-7). Clevedon: Multilingual Matters.

Coltheart, M., Rastle, K., Perry, C.; Langdon, R., & Ziegler, J. (2001). DRC: A dual-route cascaded model of visual recognition and reading aloud. *Psychological Review, 108*(1)*,* 204-256.

Cruz, F. A. (2015). Miete oder Mitte? A preliminary study of vowel length contrasts in Filipino learners of German as a foreign language. *Philippine Journal of Linguistics, 46*, 89-100.

Delattre, P. (1964). Comparing the vocalic features of English, German, Spanish, and French. *International Review of Applied Linguistics in Language Teaching, 2*(2), 71-97.

Delima, P.G. (2017). *Filipino: The national language of education.* Manila: Komisyon sa Wikang Filipino.

Delos Reyes, J., Santiago, P.J., Tadena, D., & Zubiri, L.A. (2009). Acoustic characteristics of the Filipino vowel space. In *Proceedings of the 6th National Natural Language Processing Research Symposium*. De la Salle University, Manila, Philippines.

Flege, J. (1995). Second-language speech learning: Findings and problems. In W. Strange (Ed.), *Speech perception and linguistic experience: Theoretical and methodological issues* (pp. 233-277). Timonium, MD: New York Press.

Gut, U. (2010) Cross-linguistic influence in L3 phonological acquisition. *International Journal of Multilingualism, 7*(1)*,* 19-38.

Hall, T. A. (2011). *Phonologie: Eine Einführung*. Berlin/New York: Walter de Gruyter.

Hammarberg, B. (2001). Roles of the L1 and L2 in L3 production and acquisition. In J. Cenoz, B. Hufeisen, & U. Jassner (Eds.), *Cross-linguistic influence in third language acquisition: Psycholinguistic perspectives* (pp. 21-41). Clevedon: Multilingual Matters Ltd.

Hillenbrand, J., Getty, L. A., Clark, M. J., & Wheeler, K. (1995). Acoustic characteristics of American English vowels. *Journal of the Acoustic Society of America, 97*(5)*,* 3099-3111.

Hirschfeld, U., Kelz, H.P., & Müller, U. (Eds.) (2002). *Phonetik Interantional.Grundwissen von Albanisch bis Zulu.* Grimma: Popp.

Hufeisen, B. (1998). L3- Stand der Forschung—Was bleibt zu tun? In B. Hufeisen & B. Lindemann (Eds.), *Tertiärsprachen: Theorien, Modelle, Methoden* (pp. 169-183). Tübingen: Stauffenburg Verlag.

Johnson, J. & Newport, E. (1989). Critical period effects in second language acquisition. *Cognitive Psychology, 21,* 60-99.

Kärchner-Ober, R. (2009). *The German Language is completely different from the English Language: Besonderheiten des Erwerbs von Deutsch als Tertiärsprache nach Englisch und einer nicht indogermanischen Sprache*. Tübingen: Stauffenberg Verlag Brigitte Narr GmbH.

Kelz, H. P. (1982). *Deutschunterricht für Südostasien*: *Analysen und Konzepte*. Bonn: Dümmler.

Klein, E. C. (1995). Second versus third language acquisition: Is there a difference? *Language Learning, 45*(3), 419-465.

Krashen, S. (1973). Lateralization, language learning, and the critical period: Some new evidence. *Language Learning, 23*(1)*,* 237-248.

Ladefoged, P. (1996). *Elements of Acoustic Phonetics.* Chicago/London: The University of Chicago Press.

Lado, R. (1957). *Linguistics across cultures: Applied linguistics for language teachers.* Ann Arbour: University of Michigan Press.

Lenneberg, E. H. (1967a). The biological foundations of language. *Hospital Practice, 2*(12), 59-67.

Lenneberg, E. H. (1967b). *Biological foundations of language*. New York: Wiley.

Lesho, M. (2018). Philippine English (Metro Manila acrolect). *Journal of the International Phonetic Association, 48*(3), 357-370.

Lightbown, P. M. & Spada, N. (1993). *How languages are learned.* Oxford: Oxford University Press.

Lipinska, D. (2015). Production of L3 vowels: Is it possible to separate them from L1 and L2 sounds? *Research in Language, 13*(1), 77-92.

Llamzon, T.A. (1997). The phonology of Philippine English. In M.L.S. Bautista (Ed.), *English is an Asian language: The Philippine context* (pp. 41-48). Carlton, Australia: The Macquarie Library Pty Ltd.

Llisteri, J., & Poch-Olivé, D. (1987) Phonetic interference in bilingual's learning of a third language. In *Proceedings of the Xth International Congress of Phonetic Sciences* (Vol. 5 pp. 134-147). http://liceu.uab.es/~joaquim/publicacions/Llisterri_Poch_87_L3_Bilinguals.pdf

Marian, V., Blumenfeld, H. K., & Kaushanskaya, M. (2007). The language experience and proficiency questionnaire (LEAP Q): Assessing language profiles in bilinguals and multilinguals. *Journal of Speech, Language and Hearing Research, 50*(4), 940-967.

Marx, N. (2000). Denglish bei nicht indoeuropäischen Muttersprachlern? *Zeitschrift für Interkulturelle Fremdsprachenunterricht, 5*(1), 1-19. http://zif.spz.tu-darmstadt.de/jg-05-1/beitrag/marx.htm

Neri, P. (2006). *Eine kontrastive Analyse der deutschen und philippinischen Phonologie in Hinblick auf den Kurs „German 45" an der Universität der Philippinen.* (Unpublished master thesis).

Nimz, K. (2014). Predicting vowel length production in an L2: Phonetic versus phonological contrastive analyses. In E. Cyran, & J. Szpyra-Kozlowska (Eds.), *Crossing phonetics-phonology lines* (pp. 313-336). Cambridge: Cambridge Scholars Publishing.

Odlin, T. (1989). *Language transfer: Cross-linguistic influence in language learning*. Cambridge: Cambridge University Press.

Pätzold, M., & Simpson, A. P. (1997). Acoustic analysis of German vowels in the Kiel Corpus of Read Speech. In A. P. Simpson, K. J. Koller, & T. Rettstadt (Eds.), *The Kiel Corpus of Read/Spontaneous Speech—Acoustic database, processing tools and analysis results* (pp. 215-247). Kiel: Arbeitsberichte des Instituts für Phonetik und digitale Sprachverarbeitung der Universität Kiel.

Reid, L. & Schachter, P. (2008). Tagalog. In B. Comrie (Ed.), *The world's major languages* (pp. 833-855). London: Routledge.

Scovel, T. (1969). Foreign accents, language acquisition and cerebral dominance. *Language Learning, 19,* 245-254.

Selinker, L. (1972). Interlanguage. *International Review of Applied Linguistics, 10*(3), 209-232.

Shatz, I. (2016). Native language influence during Second Language Acquisition: A large-scale learner corpus analysis. *The Proceedings of the Second Language Research Forum (PacSLRF)* (pp. 175-180). Hiroshima: Japan Second Language Association.

Sibayan, A.M. & Rosado, E. I. (2012). Of errors and self-repairs: The Spanish interlanguage of Filipino learners. *Philippine Journal of Linguistics, 43,* 85-103.

Sibayan, B. P. (1986). Filipino and the Filipino's renewed search for a linguistic symbol of unity and identity. In J. A. Fishman (Ed.), *The Fergusonian impact Vol. 2 Sociolinguistics and the sociology of language* (pp. 351-360). Berlin: Mouton de Gruyter.

Syrdal, A. K. & Gopal, H. S. (1986). A perceptual model of vowel recognition based on the auditory representation of American English vowels. *Journal of the Acoustic Society of America, 79*(4), 1086-1100.

Tayao, M.L.G. (2004). The evolving study of Philippine English phonology. *World Englishes, 23*(1), 77-90.

Tayao, M.L.G. (2008). A lectal description of the phonological features of Philippine English. In M.L.S. Bautista, & K. Bolton (Eds.), *Philippine English: Linguistic and literary perspectives* (pp. 157-174). Hong Kong: Hong Kong University Press.

Thomas, E. & Kendall, T. (2015). The vowel normalization and plotting suite (NORM). Retrieved from http://lingtools.uoregon.edu/norm/norm1.php

Wells, J. C. (1982). *Accents of English: An introduction.* Cambridge: Cambridge University Press.

Williams, S. & Hammarberg, B. (1998). Language switches in L3 production: Implications for a polyglot speaking model. *Applied Linguistics, 19*(3)*,* 295-333.

Wrembel, M. (2010). L2-accented speech in L3 production. *International Journal of Multilingualism, 7*(1)*,* 75-90.

Appendix A: Word List

Kehle	Kult	cool
Keller	kale	cook
Kiel	kelp	kerida
killen (colloquial)	keel	kilig
Kohler	kill	Kolget
Kolk	coal	kulang
Kuhle	colt	

Appendix B: Formant Values

Appendix B1

German Vowel Formant Values, Male

	German (m) (Simpson & Pätzold, 1997)		**A (m)**		**B (m)**	
Vowel	*F1*	*F2*	*F1*	*F2*	*F1*	*F2*
iː	266-337 (290)	1813-2106(1986)	336-441 (388)	2084-2549 (2357)	311-392 (348)	2121-2624 (2448)
ɪ	303-380 (343)	1640-1956(1803)	365-556 (433)	1515-2460 (1938)	374-571(461)	1873-2127(2017)
eː	328-436 (372)	1700-2006(1879)	413-585 (505)	1702-2398 (2047)	376-474 (418)	2073-2358 (2227)
ɛ	443-552(498)	1517-1755(1639)	577-715(615)	1620-1877(1737)	551-752(667)	1578-1886(1747)
oː	352-429(380)	774-1009(907)	375-634(485)	727-1723(1226)	371-474(429)	869-1530(1068)
ɔ	455-550(506)	992-1127(1060)	367-603(497)	905-1491(1125)	465-705(588)	1035-1420(1216)
uː	283-343(309)	835-1145 (961)	323-460(396)	923-1445(1238)	278-411(352)	880-1635(1271)
ʊ	332-439(382)	966-1165(1058)	352-490(434)	886-1626(1241)	373-471(424)	1068-1445(1237)

Appendix B2

German Vowel Formant Values, Female

	German (f) (Simpson & Pätzold, 1997)		**A1 (f)**		**B1 (f)**	
Vowel	*F1*	*F2*	*F1*	*F2*	*F1*	*F2*
iː	292-385(329)	2125-2496(2316)	368-559(479)	2032-2620 (2333)	357-624(454)	2139-2670(2479)
ɪ	350-442(391)	1905-2348(2136)	367-539(482)	2085-2555 (2274)	417-554(503)	2044-2600(2233)
eː	382-495(431)	1949-2472(2241)	495-643(575)	1838-2177(1951)	454-553(512)	2215-2559(2424)
ɛ	517-687(592)	1774-2100(1944)	557-667(616)	1834-1964(1903)	593-697(635)	1694-2098(1866)
oː	395-487(438)	789-1102(953)	415-616(509)	1008-1579(1244)	402-550(495)	868-1302(1114)
ɔ	509-660(573)	1055-1279(1174)	423-668(544)	1046-1292(1152)	482-594(536)	1113-1269(1219)
uː	319-405(350)	885-1220(1048)	403-490(454)	1148-1549(1345)	324-492(404)	975-1594(1175)
ʊ	387-504(450)	1074-1302(1184)	425-496(455)	1107-1411(1266)	404-493(448)	961-1640(1248)

Appendix B3

English Vowel Formant Values, Male

	English (m) (Hillenbrand et al., 1995)		**A1 (m)**		**B1 (m)**	
Vowel	*F1*	*F2*	*F1*	*F2*	*F1*	*F2*
i	342	2322	260-620(379)	1300-2462(2190)	307-415(369)	2076-2726(2432)
ɪ	427	2761	370-503(439)	1603-2371(2020)	430-519(477)	1828-2049(1963)
e/eɪ	476	2089	375-475(421)	2000-2534(2234)	440-507(475)	1953-2365(2238)
ɛ	580	1799	334-807(577)	1374-2299(1670)	486-779(683)	1417-1783(1687)
o	497	910	394-682(523)	809-1402(1104)	390-461(430)	859-2208(1315)
ɔ	652	997	399-554(483)	872-1698(1166)	422-530(500)	1108-1221(1165)
u	378	997	404-578(481)	920-1364(1128)	428-553(465)	1001-1326(1107)
ʊ	469	1122	351-575(438)	825-1728(1300)	340-411(352)	810-999(929)

Appendix B4

English Formant Values, Female

	English (f) (Hillenbrand et al., 1995)		**A1 (f)**		**B1 (f)**	
Vowel	*F1*	*F2*	*F1*	*F2*	*F1*	*F2*
i	437	2761	339-480(427)	2513-2674(2593)	342-521(431)	2195-2785(2501)
ɪ	483	2365	416-563(458)	2028-2574(2236)	428-705(531)	1879-2414(2228)
e/eɪ	536	2530	415-582(466)	2269-2532(2361)	470-571(510)	2280-2561(2465)
ɛ	731	2058	589-756(668)	1567-1935(1713)	606-921(728)	1526-1962(1694)
oː	555	1035	422-478(458)	968-1090(1014)	437-505(463)	896-1633(1108)
ɔ	781	1136	470-668(559)	976-1237(1110)	442-623(518)	943-1267(1107)
uː	459	1105	361-570(495)	956-1281(1161)	412-643(489)	488-1403(1178)
ʊ	519	1225	377-422(406)	921-1049(982)	380-468(418)	715-1453(994)

Appendix B5

Filipino Formant Values, Male and Female

	Filipino (Delos Reyes et al., 2009)		**A1 (m)**		**B1 (m)**		**A1(f)**		**B1(f)**	
Vowel	*F1*	*F2*	*F1*	*F2*	*F1*	*F2*	*F1*	*F2*	*F1*	*F2*
i	338	2315	362-506(411)	1285-2504 (2103)	340-441(385)	2103-2264(2210)	389-480(441)	2180-2587(2404)	391-510(464)	2332-2650(2475)
e	541	2185	497-572 (526)	1742-2230(1933)	463-546(507)	1729-1925(1841)	511-599(543)	1819-2197(2072)	512-595(556)	2028-2286(2172)
o	476	1134	464-547(497)	1079-1304(1166)	469-535(492)	1097-1173 (1123)	461-637(568)	1146-1729(1310)	478-620(531)	977-1238(1139)
u	482	1049	366-436(398)	987-1131(1144)	371-476(420)	1007-1408(1141)	398-572(454)	1001-1139(1097)	381-479(427)	927-1488(1167)