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Development of Psychometrically Equivalent Speech Recognition Threshold Materials for Native Cebuano Speakers

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ABSTRACT

Development of Psychometrically Equivalent Speech Recognition Threshold Materials for Native Cebuano Speakers

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While there is a clear and immediate need for reliable speech audiometry materials to evaluate the speech recognition threshold (SRT), these recorded materials are not available in Cebuano, a language of the Philippines with 15.8 million speakers. The purpose of this study was to develop, digitally record, evaluate, and psychometrically equate a set of Cebuano trisyllabic words for use in measuring the SRT. To create the SRT materials, common Cebuano trisyllabic words were digitally recorded by a male talker of Cebuano and presented for evaluation to 20 native speakers of Cebuano with normal hearing. Based on psychometric performance, a set of 21 trisyllabic words with a psychometric function slope >7%/dB that allowed threshold adjustments to the pure tone average were selected and digitally adjusted. The resulting mean psychometric function slopes at 50% for the 21 SRT trisyllabic materials was 10.2%/dB. The results of the current study are comparable to those found in other languages. Digital recordings of the trisyllabic words are available on compact disc.

Keywords: speech audiometry, speech recognition threshold, SRT, Cebuano, Philippines

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DESCRIPTION OF THESIS STRUCTURE

This thesis, Development of Psychometrically Equivalent Speech Threshold Materials for Native Cebuano Speakers, is part of a larger research project, and portions of this thesis may be published as part of articles listing the thesis author as a co-author. The body of this thesis is written as a manuscript suitable for submission to a peer-reviewed journal in speech-language pathology. An annotated bibliography is presented in Appendix A, which addresses the relevance and quality of sources cited in this work.

Introduction

Comprehensive Audiometric Testing

Audiological testing establishes the presence, degree, type, and nature of a hearing impairment. While a battery of tests may be used during these evaluations, a comprehensive audiological assessment includes otoscopy, tympanometry, acoustic reflex, air and bone pure tone audiometry, and speech audiometry. Otoscopy is the physical inspection of the external ear canal and tympanic membrane. Tympanometry provides information on the status of the tympanic membrane and middle ear function. The acoustic reflex helps investigate middle ear function during the presentation of intense sounds. The comprehensive use of these evaluations allow the clinician to better understand the cause, degree, and nature of a hearing impairment.

Pure tone testing is conducted via air and/or bone conduction to determine the lowest intensity of selected frequencies that are detectable by a listener 50% of the time. Selected frequencies range from 125 Hz to 8000 Hz, with testing conducted at octave and sometimes midoctaves. Pure tone measures are not restricted by language or dialectal markers. While pure tone audiometry provides an initial idea of a hearing impairment, it does not reveal a listener's ability to hear or understand complex auditory signals, such as speech (Egan, 1979; Ramkissoon, 2001). To better understand the listener's ability to recognize speech stimuli, various speech audiometry tests may be utilized.

Speech audiometry helps the clinician to diagnose hearing impairment and determine appropriate treatment plans in part by measuring a listener's hearing threshold for speech and is used to supplement pure tone audiometry results (American Speech-Language-Hearing Association, 1988). Speech audiometry is typically composed of speech recognition threshold (SRT) and the word recognition score (WRS). These tests may be administered using recorded or monitored live voice presentation; however, recorded materials are preferred (American Speech-Language-Hearing Association, 1988). Recorded materials allow consistency between tests and clinicians, increasing reliability, which makes it the preferred method for speech audiometric evaluations (American Speech-Language-Hearing Association, 1988; Hirsh et al., 1952). To determine a listener's ability to interpret a speech signal with contrasting stimuli, SRT and WRS may be conducted in noise or in quiet. The WRS assesses a listener's ability to understand and repeat words that are presented at supratheshold intensity levels; however, SRT is the focus of the present study.

The SRT is defined as the lowest intensity level at which a listener can recognize and correctly repeat presented words 50% of the time (Egan, 1979; Martin & Clark, 2009). In English, common spondaic words, or words with equal stress on each syllable, are used to establish the SRT. The SRT is used to corroborate pure tone testing results. A normal SRT is within 10 dB of the pure tone results; pure tone and SRT differences greater than 10 dB indicate an equipment malfunction, an auditory pathology, atypical auditory sensitivity, or pseudohypacusis (American Speech-Language-Hearing Association, 1988; Hamid & Brookler, 2006).

The American Speech-Language-Hearing Association (1988) details the procedure to obtain the SRT. This procedure includes instructions, familiarization, measuring the threshold, and calculating the SRT. The listener is presented with instructions on the type of stimuli and method for response during testing. Then the listener is familiarized to the words, presented audibly or in a written list. The familiarization process reduces the chance that the results are adversely affected by the listener's vocabulary. The starting level is then established. After establishing the starting level, the threshold is determined using one of two methods: the 2 dB method or the 5 dB method. In each method, words are presented until five or six words are incorrect or all five words at one level are incorrect, using 2 or 5 dB decrements at correct answers, respectively. To calculate the SRT, the number of correct answers is subtracted from the starting level with a corresponding +1 or +2 correction factor. The evaluation is conducted using a closed-set of familiar words (American Speech-Language-Hearing Association, 1988).

To increase reliability, homogeneity of audibility or homogenous loudness presentation levels across words must be equal to the listener's ability to recognize the word (Hirsh et al., 1952). Spondaic words are used because they possess steeper psychometric slopes than monosyllabic words, allowing the clinician to efficiently determine the patient's SRT (Martin & Clark, 2009; Ramkissoon, Proctor, Lansing, & Bilger, 2002). Testing in other languages may be conducted using trisyllabic words rather than bisyllabic words based on the composition of the language and the resulting psychometric slopes (Nissen et al., 2011; Nissen, Harris, Jennings, Eggett, & Buck, 2005). However, while familiarization is a key component to obtaining the SRT, it is not always possible due to limited testing materials in the listener's native language. Testing in the listener's non-native langauge may result in test results that do not accurately portray the listener's auditory capabilities (American Speech-Language-Hearing Association, 1988; Ramkissoon, 2001). Unfortunately, limited materials exist for testing in many languages, resulting in non-ideal conditions for measuring the SRT. While efforts have been made to expand the availibility of testing in languages other than English, many countries are still lacking clinicial resources. Cebuano, the second most common language in the Philippine islands, is one under-resourced language affected by limited standardized SRT testing materials. There is a need for recorded and standardized speech audiometry materials in Cebuano. Therefore, the purpose of this study was to develop, record, evaluate, and equate trisyllabic Cebuano words for use in measurement of the SRT.

The Cebuano Language

The Philippines are home to more than 100 languages that belong to the Austronesian family. The language families of the Philippines are broken up further into three subgroups: Northern Philippine, Meso-Philippine, and Southern Philippine. Cebuano is a member of the Meso-Philippine group and originated in the Cebu province (McFarland, 2004). Cebuano is considered the primary Bisayan language with 15.8 million speakers in the Philippines and is the second most common native language of the Philippines, exceeded by Filipino (Cebuano, 2016).

In 1937, Filipino, often synonymous with Tagalog, became the national language of the Philippines, and in 1974, the Bilingual Education Policy (BEP), which required a bilingual education to be provided in Filipino and English, was enacted (Rodriguez, 2014). Research conducted by Rodriguez (2014) found that the BEP was met with significant push back from the Cebuano community. This push back resulted in the adoption of English for the majority of educational and governmental settings in Cebuano regions (Gonzalez, Bernardo, Bautista, & Pascasio, 2000). However, while English instruction grew more commonplace, knowledge of English, outside of borrowed words, was not guaranteed due to limited educational opportunities. According to the 2010 United States Census, there are over 400,000 residents in the United States who identify as “Other Pacific Island Language” speakers, including Cebuano (Ryan, 2013). Of those residents, 11.7% reported that they spoke English “not well” and 1.1% indicated that they spoke English “not at all” (Ryan, 2013, p. 3).

English is not the only language to have impacted Cebuano. Indeed, the effects of Spanish missionaries, who colonized the Philippines in the 1600-1800s is seen in Spanish phrases that remain colloquial in Cebuano. Additionally, due to the central location of the language's origin, Cebuano borrowed from nearby languages, including Bikol, Hiligayon, and Tagalog, creating a pseudo-similarity to other Philippine languages that is misleading (McFarland, 2004). Cebuano has adapted over time due to globalization, although the language remains largely without dialects; however, some adjustments to the composition and structure have transpired (Cebuano Alphabet, 2015).

The Cebuano alphabet was initially composed of 15 consonants: /b/, /k/, /d/, /g/, /h/, /l/, /m/, /n/, /ŋ/, /p/, /r/, /s/, /t/, /w/, and /j/ (Wolff, 1966). Cebuano also uses seven vowels: /a/, /I/, /u/, /aʊ/, /aI/, /eI/, and /uI/ (Thompson, 2013). Modern language adaptations have expanded the alphabet to include consonants /f/, /dʒ/, /kw/, /v/, and /ks/ - and vowels - /ai/ and /oʊ/ (Cebuano Alphabet, 2015).

Cebuano is an agglutinative language with a verb initial structure. An agglutinative language adds morphemes to the base morpheme without adapting the syllables upon adding them to the word. Therefore, Cebuano is predominately a polysyllabic language, with the highest concentration of words being bi- or trisyllabic (Wolff, 1966). Additionally, although Cebuano is a verb initial language, the main weight of the sentence is given to the subject, which marks verbs for voice: active, objective, locative, and instrumental (Ghazali, 1990). This final subject dictates the context and prosody of the rest of the sentence (Bell, 1978).

Cebuano uses rising and falling pitch. Words possessing more than a single vowel are given conversational stress; however, overall, vowel sounds in Cebuano are shorter in duration than those in English (Wolff, 1966). As a quantity-sensitive stress language, Cebuano increases stress to syllables with an increase in phonemes. Primary stress is determined by the weight of the second to last syllable, although in the absence of a heavy penult, or second to last syllable, the final syllable is awarded primary stress (Shyrock, 1993).

Due to the limited clinical resources available for testing speech audiometry in Cebuano, there is a need for recorded and standardized speech audiometry materials in Cebuano, which is why the purpose of this study was to develop, record, evaluate, and equate trisyllabic Cebuano words for use in measurement of the SRT.

Method

Subjects

The subjects of this study were native Cebuano speakers from the Philippines. A total of 20 native subjects (18 female, 2 male) participated in the evaluation of the developed trisyllabic words for speech recognition testing in Cebuano. The subjects' ages ranged from 21 to 63 years (M = 38.3). The subjects were bilingual, speaking English at a basic conversational proficiency or better, with pure tone air conduction thresholds of ≤20 dB HL at all octave and mid-octave frequencies from 125 to 8000 Hz in at least one ear, which is referenced in Table 1. The mean pure tone average for the 20 subjects was 5.5 dB HL. Each subject also had acoustic admittance between 0.3 and 4.3 mmhos with peak pressure between -10 and +50 daPa (American Speech-Language-Hearing Association, 1990). Subjects were recruited through phone, email, word of mouth, and social media. An informed consent document, approved through the Brigham Young University Institutional Review Board, was signed by each of the subjects. A copy of the informed consent document can be found in Appendix B.

Materials

Word lists. Trisyllabic Cebuano words were selected as the stimuli for SRT testing. A preliminary corpus of 147 words was drawn from a list of high frequency Cebuano words used

Table 1

Pure-tone Threshold (dB HL) Descriptive Statistics for 20 Normally Hearing Cebuano Subjects

Frequency (Hz)	*M*	*Minimum*	*Maximum*	*SD*
125	8.3	0.0	20.0	5.7
250	5.8	0.0	20.0	5.9
500	4.8	-5.0	15.0	5.3
750	4.5	-5.0	15.0	5.6
1000	5.3	-10.0	15.0	7.0
1500	10.5	-5.0	20.0	7.6
2000	6.5	-5.0	15.0	6.5
3000	5.5	-5.0	20.0	6.5
4000	4.8	-5.0	15.0	6.0
6000	7.3	-5.0	20.0	9.2
8000	8.5	-10.0	20.0	7.6
PTA	5.5	-1.7	13.3	4.3

Note. PTA = arithmetic average of thresholds at 500, 1000, & 2000 Hz.

on the internet (Scannell, 2007). The initial list was reviewed and finalized by two native speakers of Cebuano, with extensive translation experience, to ensure that each list was representative of common and appropriate words in spoken Cebuano. From the initial corpus, 27 words were excluded because (a) words were considered inappropriate or culturally insensitive, or (b) words were considered uncommon by native judges. A pilot study of one subject was conducted with the remaining 120 words presented at increasing intensity levels. The 30 most difficult to perceive words by the subject were eliminated from the corpus, and the remaining 90 words were used in data collection.

Talkers. Initial test recordings were made using two male native Cebuano speakers, who self reported speaking Cebuano on a regular basis. Both talkers were from Cebu City in the Philippines. After the initial recordings were made, a panel of six Cebuano judges evaluated the performance of each talker, rank ordering the talkers from best to worst based on vocal quality, Cebuano accent, and pronunciation. The highest ranked talker was selected for all subsequent recordings. The evaluation sheet for the Cebuano talkers can be found in Appendix C.

Recordings. Recordings were made in an Acoustic Systems' double-walled sound booth located on the Brigham Young University campus in Provo, Utah, USA. The sound booth exceeded standards for maximum permissible ambient noise levels for audiometric test rooms for ear uncovered conditions (American National Standards Institute, 1999). A Larson-Davis model 2541 microphone was positioned approximately six inches from the talker at a 0° azimuth and was covered by a 3-inch foam windscreen. The microphone was connected to a Larson-Davis model PRM902 microphone preamp, which was coupled to a Larson-Davis model 2221 preamp power supply run on C cell batteries. The preamp power supply was set to 30 dB SPL for the talker. The signal was digitized by an Apogee AD8000 24-bit analog-to-digital converter and subsequently stored on a hard drive for later editing. A 44100 Hz sampling rate with 24-bit quantization was used for all recordings, and every effort was made to utilize the full range of the 24-bit analog-to-digital converter.

During the recording sessions, the talker was asked to pronounce each target word at least four times, with a slight pause between each production. The talker was asked to speak at a natural rate with normal intonation patterns. Any word judged to be poorly recorded (due to peak clipping, extraneous noise, etc.), mispronounced, or produced with an unnatural intonation pattern was rerecorded or eliminated from the study prior to individual evaluation.

To avoid possible list effects, the first and last repetitions of each word were excluded from the study, unless it was judged to be the best pronunciation of the word by a Cebuano-speaking judge. The Cebuano-speaking judge rated the medial repetitions of each word for perceived quality of production, and the best production of each word was selected for individual evaluation. After the word selection process, the intensity of each word to be included in the test materials was edited as a single utterance using Adobe Audition (Adobe, 2005) and Sadie Disk Editor software (SADiE, 2004) to yield the same average root mean square power as that of a 1000 Hz calibration tone, to equate test word threshold audibility (Harris, McPherson, & Hansen, 2015; Wilson & Strouse, 1999). The edited words were then individually saved as 24-bit wav files.

Procedure

To decrease the possibility of listener fatigue, the individuals evaluated the recordings, with rest periods during the test session. Trisyllabic SRT words and bisyllabic WRS words were evaluated in one session, although this researcher only evaluated these data on the trisyllabic SRT words.

The randomization and presentation of the words to the individuals was controlled by custom software. The signal was routed through the computer to the external input of a Grason Stadler model 1761 audiometer. The stimuli were then routed from the audiometer to the subject via a single TDH-50P headphone placed on the test ear.

Testing was conducted monaurally in the listener's ear that exhibited the lowest PTA. If the threshold differences between the ears were minimal, the test ear was randomly determined. All testing was conducted in a double-walled sound suite that met ANSI S3.1 standards for maximum permissible ambient noise levels for the ears not covered condition using one-third octave-bands (American National Standards Institute, 1999). Prior to each session of data collection, the external inputs to the audiometer were calibrated to 0 VU using a 1 kHz calibration tone. The audiometer was calibrated prior to, weekly during, and at the conclusion of data collection. Audiometric calibration was performed in accordance with ANSI S3.1 specifications (American National Standards Institute, 2004).

The 90 trisyllabic words were presented to each of the subjects, starting at 2 dB below their pure tone average. If the individual repeated any of the words correctly during the initial presentation, the intensity was decreased in 2 dB steps and the entire list of words was randomized and played again. This process was repeated until the individual failed to correctly repeat any word of the 90 trisyllabic words. Subsequently, the words were presented at 2 dB above the initial intensity and thereafter at increasing intensities of 2 dB until the individual repeated all 90 words correctly, or until the presentation level reached 20 dB HL. Each subject listened to all 90 trisyllabic words, in a sequence determined randomly. Individuals were instructed to repeat the presented words verbally; these repetitions were then scored as correct or incorrect by a Cebuano-speaking judge. To be considered a correct response, the listeners were required to match the presented stimuli in both lexical tone and pronunciation. Presenting the words at differing intensity levels allowed for the subsequent calculation of the psychometric threshold and slope for each word. To allow familiarization with the test materials, subjects were presented with a copy of the trisyllabic word list, and they listened to the words at 50 dB HL before SRT testing began. Prior to administering the SRT test words, the following instructions were given to the individuals:

> You will hear lists of Cebuano words at a number of different loudness levels. Each word is three syllables in length. At the very soft levels it may be difficult for you to hear the words. Please listen carefully and repeat out loud the word that you hear. If you are unsure of a word, you are encouraged to guess. If you have no guess, say "I don't know," or wait silently for the next word. Do you have any questions?

Results

After the raw data were collected, logistic regression was used to obtain the regression slopes and regression intercepts for each of the 90 trisyllabic words. These values were then inserted into a modified logistic regression equation that was designed to calculate percent correct recognition at different intensity levels. The original logistic regression equation follows:

$$\log\frac{p}{1-p} = a + b \times i \tag{1}$$

In Equation 1, p is the proportion correct at any given intensity level, a is the regression intercept, b is the regression slope, and i is the presentation level in dB HL. When Equation 1 is solved for p and multiplied by 100, Equation 2 is obtained where P is percent correct recognition:

$$P = \left(1 - \frac{\exp(a+b\times i)}{1+\exp(a+b\times i)}\right) \times 100 \tag{2}$$

In Equation 2, *P* is percentage of correct recognition, *a* is the regression intercept, *b* is the regression slope, and *i* is the presentation intensity in dB HL. By inserting the regression slope, regression intercept, and presentation level into Equation 2, it is possible to predict the percent correct recognition at any specified intensity level. Percentage of correct recognition was calculated for each of the trisyllabic words for a range of -10 to 20 dB HL in 2 dB increments.

In order to calculate the intensity level required for a given proportion, Equation 1 was solved for *i* (see Equation 2). Then it is possible to calculate the threshold (intensity required for 50% intelligibility), the slope (%/dB at threshold), and the slope (%/dB) from 20 to 80% for each psychometric function by inserting the desired proportions into Equation 2 (Harris et al., 2015; Taylor, 2012). Equation 2 can be simplified to Equation 3 to solve for the 50% correct recognition threshold:

$$\text{Intensity required for 50\% intelligibility } (dB) = \frac{-a}{b} \tag{3}$$

Calculations of threshold (intensity required for 50% intelligibility), slope at 50%, and slope from 20 to 80% were made for each trisyllabic word using the logistic regression slopes and intercepts. As the function approaches extremes, the resulting line becomes more curved; the function appears almost linear in the vicinity of 50% intelligibility. Previous efforts to create speech audiometry materials in other languages included calculations for psychometric functions of slopes for 50% and slopes for 20 to 80% intelligibility (Harris et al., 2015; Taylor, 2012); the inclusion of both calculations for this study allows the comparison of these results to previous and future studies. Psychometric functions for each trisyllabic word were calculated with Equation 2 using the logistic regression intercept and slope values. After calculating the regression intercepts, one word was so deviant that it was removed from the study and will not be considered in future calculations, resulting in 89 words being evaluated further for performance. Mean performance for each of the remaining 89 trisyllabic words is presented in Table 2. The slopes at 50% ranged from 6.4%/dB to 18.3%/dB (*M* = 10.5). Thresholds for the 89 trisyllabic words ranged from 8.9 to 23.1 dB HL (*M* = 16.3).

To reduce test time and increase reliability, words used to measure SRT should be homogeneous with respect to threshold of audibility and to the slope of the psychometric function (Wilson & Strouse, 1999). Therefore, the 21 words that had slopes that were > 7%/dB that allowed adjustments to .2 dB of the PTA were selected for inclusion in the final list of trisyllabic words. The threshold, slope at threshold, and slope from 20 to 80% for the 21 selected trisyllabic words are presented in Table 3. See Appendix D for the list of 21 selected trisyllabic words and definitions.

To decrease the variability that existed among the thresholds of the 21 selected words, the intensity of these words was digitally adjusted so that the 50% threshold of each word was equated to the mean PTA of the subjects. The necessary adjustments for each of the 21 selected words for the recordings are presented in Table 3. Figure 1 displays the mean psychometric functions for the selected 21 trisyllabic words before and after intensity adjustment to equate 50% thresholds (panels B-C). Figure 1 further demonstrates the psychometric slopes of the entire group of 90 words (panel A).

Discussion

The purpose of this study was to create a set of trisyllabic Cebuano words that are familiar and homogeneous with regards to audibility and function of the psychometric slopes. The resulting mean for the psychometric function slopes for all 89 words at 50% was 10.5%/dB.

Table 2

Mean Performance for all 90 Cebuano Male Talker Trisyllabic Words

#	Word	a[a]	b[b]	Slope at 50% [c]	Slope 20-80%[d]	Threshold[e]	ΔdB[f]
1	amahan	4.87685	-0.39117	9.8	8.5	12.5	7.3
2	asawa	6.13538	-0.44317	11.1	9.6	13.8	8.7
3	balaod	4.65193	-0.39367	9.8	8.5	11.8	6.6
4	balita	6.61139	-0.39009	9.8	8.4	16.9	11.8
5	barangay	5.74898	-0.43169	10.8	9.3	13.3	8.1
6	buhaton	8.01736	-0.46884	11.7	10.1	17.1	11.9
7	dakbayan	6.08746	-0.36808	9.2	8.0	16.5	11.4
8	dalunggan	16.50771	-0.72184	18.0	15.6	22.9	17.7
9	daotan	3.49767	-0.29362	7.3	6.4	11.9	6.7
10	dapita	8.07243	-0.37122	9.3	8.0	21.7	16.6
11	gabii	7.97912	-0.52223	13.1	11.3	15.3	10.1
12	gibuhat	6.74838	-0.38659	9.7	8.4	17.5	12.3
13	gihatag	6.82776	-0.43841	11.0	9.5	15.6	10.4
14	gihimo	6.55499	-0.33035	8.3	7.1	19.8	14.7
15	giingnan	9.59436	-0.52434	13.1	11.3	18.3	13.1
16	giingon	9.39596	-0.50143	12.5	10.9	18.7	13.6
17	gisaad	6.31301	-0.46335	11.6	10.0	13.6	8.4
18	gisugo	7.51937	-0.47420	11.9	10.3	15.9	10.7
19	gisulat	7.50092	-0.49373	12.3	10.7	15.2	10.0
20	gitawag	5.48236	-0.42877	10.7	9.3	12.8	7.6
21	gitugyan	7.91737	-0.48288	12.1	10.4	16.4	11.2
22	higayon	13.06910	-0.73355	18.3	15.9	17.8	12.6
23	himaya	7.02184	-0.41622	10.4	9.0	16.9	11.7
24	ibabaw	5.73378	-0.36478	9.1	7.9	15.7	10.5
25	igsoon	6.02433	-0.47909	12.0	10.4	12.6	7.4
26	inahan	6.90471	-0.38708	9.7	8.4	17.8	12.7
27	kaaway	3.63686	-0.34427	8.6	7.5	10.6	5.4
28	kahadlok	3.76238	-0.29553	7.4	6.4	12.7	7.6
29	kalayo	5.12762	-0.36289	9.1	7.9	14.1	8.9
30	kalipay	9.35162	-0.51389	12.8	11.1	18.2	13.0
31	kaliwat	10.52158	-0.50844	12.7	11.0	20.7	15.5
32	kaluoy	6.50692	-0.34693	8.7	7.5	18.8	13.6
33	kanako	5.14299	-0.28944	7.2	6.3	17.8	12.6
34	kanunay	14.16993	-0.69458	17.4	15.0	20.4	15.2
35	katawhan	6.52241	-0.43716	10.9	9.5	14.9	9.7
36	kauban	5.03120	-0.46249	11.6	10.0	10.9	5.7
37	lalaki	7.94106	-0.51604	12.9	11.2	15.4	10.2
38	maayo	6.55605	-0.44947	11.2	9.7	14.6	9.4
39	madugay	10.12512	-0.45025	11.3	9.7	22.5	17.3
40	mamati	8.60308	-0.37275	9.3	8.1	23.1	17.9
41	masabtan	8.19682	-0.45262	11.3	9.8	18.1	12.9
42	mensahe	9.89831	-0.47397	11.8	10.3	20.9	15.7
43	milagro	12.41129	-0.57399	14.3	12.4	21.6	16.4
44	moadto	7.81204	-0.53342	13.3	11.5	14.6	9.5
45	nabahin	12.41129	-0.57399	14.3	12.4	21.6	16.4
46	nadungog	8.05559	-0.41234	10.3	8.9	19.5	14.4
47	naghatag	5.28621	-0.28777	7.2	6.2	18.4	13.2

48	naglingkod	9.20332	-0.46674	11.7	10.1	19.7	14.5
49	nagpuyo	8.20692	-0.40961	10.2	8.9	20.0	14.9
50	nagsugod	4.21494	-0.25494	6.4	5.5	16.5	11.4
51	nagtudlo	5.02507	-0.27355	6.8	5.9	18.4	13.2
52	nakita	6.78906	-0.32651	8.2	7.1	20.8	15.6
53	namatay	9.23432	-0.51436	12.9	11.1	18.0	12.8
54	niabot	9.04927	-0.49613	12.4	10.7	18.2	13.1
55	niadto	7.05611	-0.41526	10.4	9.0	17.0	11.8
56	niana	7.45053	-0.34021	8.5	7.4	21.9	16.7
57	niini	8.48835	-0.38445	9.6	8.3	22.1	16.9
58	paagi	4.63305	-0.26862	6.7	5.8	17.2	12.1
59	pag-abot	5.15206	-0.37070	9.3	8.0	13.9	8.7
60	pag-ampo	4.64884	-0.38290	9.6	8.3	12.1	7.0
61	pag-antos	4.16328	-0.41310	10.3	8.9	10.1	4.9
62	pag-ayo	6.35553	-0.35287	8.8	7.6	18.0	12.8
63	pagbalik	5.32332	-0.27588	6.9	6.0	19.3	14.1
64	pagbuhat	5.18358	-0.35523	8.9	7.7	14.6	9.4
65	pagbuot	4.35521	-0.31681	7.9	6.9	13.7	8.6
66	pagdawat	6.40367	-0.35286	8.8	7.6	18.1	13.0
67	paghari	5.20914	-0.33724	8.4	7.3	15.4	10.3
68	pagkaon	3.66897	-0.34013	8.5	7.4	10.8	5.6
69	paglaom	2.62334	-0.29371	7.3	6.4	8.9	3.8
70	pagpatay	2.94028	-0.31076	7.8	6.7	9.5	4.3
71	pagsalig	5.79859	-0.47299	11.8	10.2	12.3	7.1
72	pagsimba	4.13657	-0.45373	11.3	9.8	9.1	3.9
73	pagsulod	3.92977	-0.42232	10.6	9.1	9.3	4.1
74	pagtabang	4.60579	-0.36937	9.2	8.0	12.5	7.3
75	pagtuman	6.77203	-0.39727	9.9	8.6	17.0	11.9
76	pagtuo	6.95645	-0.47055	11.8	10.2	14.8	9.6
77	pagtuon	4.68489	-0.32752	8.2	7.1	14.3	9.1
78	panahon	6.31208	-0.35314	8.8	7.6	17.9	12.7
79	propeta	6.60073	-0.43928	11.0	9.5	15.0	9.8
80	pultahan	7.59150	-0.49275	12.3	10.7	15.4	10.2
81	silingan	13.10909	-0.64933	16.2	14.1	20.2	15.0
82	simbahan	6.61284	-0.37807	9.5	8.2	17.5	12.3
83	sumala	5.19002	-0.33316	8.3	7.2	15.6	10.4
84	tan-awa	5.57819	-0.36859	9.2	8.0	15.1	10.0
85	tibuok	6.85540	-0.45676	11.4	9.9	15.0	9.8
86	tinuod	7.46598	-0.38491	9.6	8.3	19.4	14.2
87	trabaho	6.77986	-0.34732	8.7	7.5	19.5	14.3
88	unsaon	6.87723	-0.44826	11.2	9.7	15.3	10.2
89	usahay	5.13933	-0.39180	9.8	8.5	13.1	7.9
	M	6.90157	-0.41868	10.5	9.1	16.3	11.1
	Min	2.62334	-0.73355	6.4	5.5	8.9	3.8
	Max	16.50771	-0.25494	18.3	15.9	23.1	17.9
	Range	13.88437	0.47862	12.0	10.4	14.1	14.1
	SD	2.51650	0.09583	2.4	2.1	3.5	3.5

[a] *a* = regression intercept. [b] *b* = regression slope. [c] Psychometric function slope (%/dB) at 50% was calculated from 49.999 to 50.001%. [d] Psychometric function slope (%/dB) from 20-80%. [e] Intensity required for 50% intelligibility. [f] Change in intensity required to adjust the threshold of a word to the mean PTA of the subjects (5.5 dB HL).

Table 3

Mean Performance for 21 Selected Cebuano Male Talker Trisyllabic Words

#	Word	a[a]	b[b]	Slope at 50% [c]	Slope 20-80%[d]	Threshold[e]	ΔdB[f]
1	amahan	4.87685	-0.39117	9.8	8.5	12.5	7.0
2	balaod	4.65193	-0.39367	9.8	8.5	11.8	6.3
3	barangay	5.74898	-0.43169	10.8	9.3	13.3	7.8
4	daotan	3.49767	-0.29362	7.3	6.4	11.9	6.4
5	gabii	7.97912	-0.52223	13.1	11.3	15.3	9.8
6	gisulat	7.50092	-0.49373	12.3	10.7	15.2	9.7
7	gitawag	5.48236	-0.42877	10.7	9.3	12.8	7.3
8	ibabaw	5.73378	-0.36478	9.1	7.9	15.7	10.2
9	kaaway	3.63686	-0.34427	8.6	7.5	10.6	5.1
10	kalayo	5.12762	-0.36289	9.1	7.9	14.1	8.6
11	kauban	5.03120	-0.46249	11.6	10.0	10.9	5.4
12	lalaki	7.94106	-0.51604	12.9	11.2	15.4	9.9
13	maayo	6.55605	-0.44947	11.2	9.7	14.6	9.1
14	pagbuhat	5.18358	-0.35523	8.9	7.7	14.6	9.1
15	paglaom	2.62334	-0.29371	7.3	6.4	8.9	3.4
16	pagpatay	2.94028	-0.31076	7.8	6.7	9.5	4.0
17	pagsimba	4.13657	-0.45373	11.3	9.8	9.1	3.6
18	pagsulod	3.92977	-0.42232	10.6	9.1	9.3	3.8
19	pagtuo	6.95645	-0.47055	11.8	10.2	14.8	9.3
20	pagtuon	4.68489	-0.32752	8.2	7.1	14.3	8.8
21	tibuok	6.85540	-0.45676	11.4	9.9	15.0	9.5
	M	5.28927	-0.40692	10.2	8.8	12.8	7.3
	Min	2.62334	-0.52223	7.3	6.4	8.9	3.4
	Max	7.97912	-0.29362	13.1	11.3	15.7	10.2
	Range	5.35577	0.22862	5.7	4.9	6.8	6.8
	SD	1.56891	0.07058	1.8	1.5	2.3	2.3

[a]*a* = regression intercept. [b]*b* = regression slope. [c]Psychometric function slope (%/dB) at 50% was calculated from 49.999 to 50.001%. [d]Psychometric function slope (%/dB) from 20-80%. [e]Intensity required for 50% intelligibility. [f]Change in intensity required to adjust the threshold of a word to the mean PTA of the subjects (5.5 dB HL).

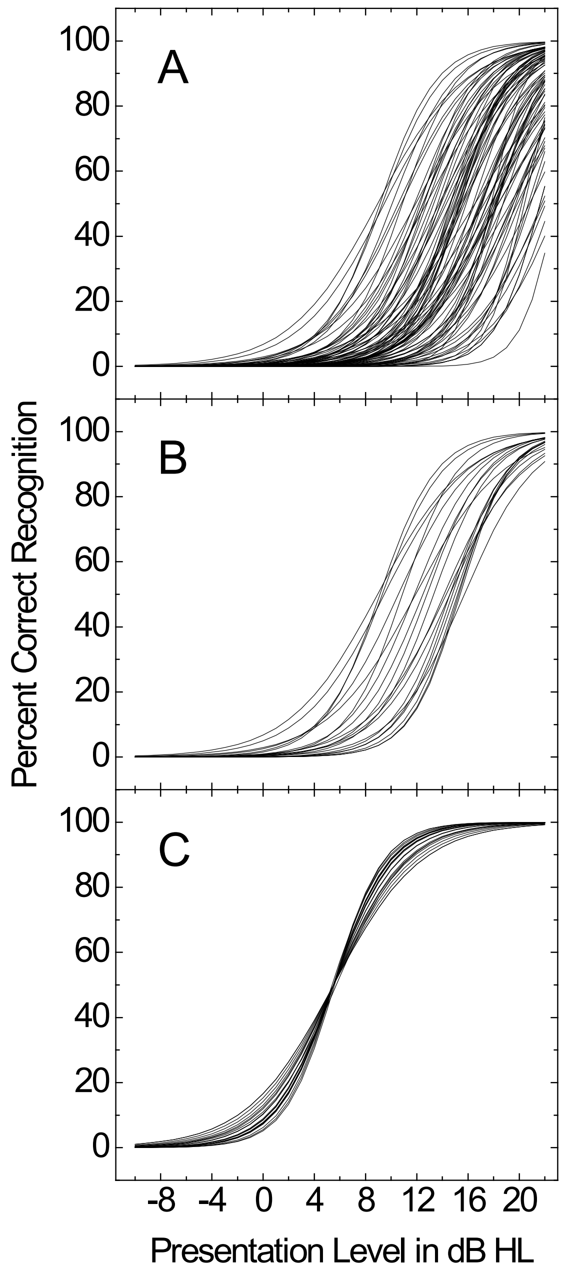

Figure 1. Mean psychometric functions for Cebuano trisyllabic words for recordings. All 89 unadjusted words (Panel A), 21 selected unadjusted words (Panel B), and 21 selected adjusted words (Panel C). The selected words were digitally adjusted to have 50% thresholds equal to the mean PTA (5.5 dB HL; +/- 0.2 dB) for the 20 normally hearing subjects.

The mean slopes were skewed to the right compared to previous language studies (Harris et al., 2015; Nissen et al., 2005; Taylor, 2012). While the reason is unclear, the result was that each of the 21 selected trisyllabic words required an increase of intensity when adjusting the slopes to the mean PTA.

In English, the mean slope for spondaic words is reported to be between 7.2%/dB and 10%/dB, which is comparable to the 10.2%/dB mean slope of the 21 selected trisyllabic Cebuano words (Hirsh et al., 1952; Wilson & Strouse, 1999). Nissen et al. (2005) reported that in developing Mandarin trisyllabic SRT materials, the resulting mean psychometric function slopes at 50% for the selected male and female recordings were 11.3%/dB and 12.1%/dB, respectively. In Vietnamese, bisyllabic SRT words resulted in the psychometric functions of the mean slope at 50% intelligibility to be 11.3%/dB for a male talker and 10.2%/dB for a female talker (Harris et al., 2015). However, these similarities in the mean slope of the psychometric functions are not seen in all other languages' materials. A related study using Cantonese trisyllabic SRT words found the mean slope of the psychometric functions at 50% intelligibility to be 14.5%/dB for the male talker and 14.9%/dB for the female talker (Nissen et al., 2011). Additionally, in Tagalog or Filipino, another common language in the Philippines, the mean slope for trisyllabic SRT words was 4.3%/dB for a male talker, which was substantially lower than the slope reported in this study (Taylor, 2012).

Conclusions and Future Research

This purpose of this project was to develop speech audiometry materials in Cebuano; however, additional research and resources are needed for Cebuano. The current study involved individuals with normal hearing who were bilingual or multilingual, using a single presentation of the materials to each participant, and testing conducted in quiet. Areas for future research include determining the performance of this work with different populations, including monolingual Cebuano speakers, exploring test-retest-reliability, and testing under various listening conditions. The development of speech audiometry materials using normal hearing adults does not ensure the psychometric equivalence for individuals with hearing impairment (Nissen et al., 2011). Therefore, the selected Cebuano trisyllabic words from this study should be used in further research to compare the SRT with the PTA of normal hearing and hearing impaired populations, to determine the validity of this project's materials for different populations. Additionally, test-retest reliability was not assessed in this study, but should be to determine the reliability of the present results. An assessment of the developed materials in different listening conditions would also be beneficial as some clinicians see more applicability in testing under noise conditions, opposed to testing without noise (Hamid & Brookler, 2006; Martin & Clark, 2009).

The purpose of this study was to develop, digitally record, evaluate, and psychometrically equate a set of Cebuano trisyllabic words for use in the measurement of the SRT. A set of 21 familiar Cebuano trisyllabic words was selected and digitally adjusted to be homogeneous with respect to audibility and psychometric function slope for SRT testing. The audiometry materials created by this project have been produced for availability on compact disc or download. This electronic source allows the clinician to select words to use from longer stimuli lists and present the stimuli in random order with the use of a computer (Nissen et al., 2005). Words considered unsuitable by the clinician may be omitted from the presentation. Appendix E contains a track list and definition of the final materials. The goal is that these materials will benefit clinicians working with Cebuano populations as well as establish a baseline for future research into Cebuano speech audiometry.

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APPENDIX A

Annotated Bibliography

American National Standards Institute. (1999). *Maximum permissible ambient noise levels for audiometric test rooms*. ANSI S3.1-1999. New York: ANSI.

Summary: The purpose of this article is to specify the standards for maximum permissible noise levels during audiometric testing. The utilization of these standards ensure the accuracy of hearing tests for pure tone, speech, and masking signals. Maximum permissible ambient noise levels are specified between 125 to 8000 Hz with the conditions of the test room, insert earphones, supra-aural earphones, ears covered, and ears not covered.
Relevance to the current work: The standards outlined in this article were used to obtain compliance standards during audiological testing. In addition, the standards assisted in normalizing the presentation of trisyllabic Cebuano words to create an accurate representation of speech recognition.

American National Standards Institute. (2004). *Methods for Manual Pure tone Threshold Audiometry*. ANSI S3.21-2004. New York: ANSI.

Summary: This article discusses standardization of audiometers to maintain consistency between different audiometers, allowing for test-retest reliability. Standard compliance addresses requirements for safety, equipment setup, and calibration. Speech audiometry levels for calibration are specified for presentation of stimuli.
Relevance to the current work: To ensure test-retest reliability across settings, the equipment used in this study's data collection process complied with the standards set by ANSI in this document.

American Speech-Language-Hearing Association. (1988). Guidelines for determining threshold level for speech. *ASHA, 30*(3), 85-89.

Summary: This article serves as a revision to previous guidelines regarding the determination of threshold level for speech. In addition to the recommendation of a standard speech threshold procedure to increase clinical comparisons, the article defines common terminolgy. In English, there is a high correlation between the threshold for spondaic words and the pure tone average, allowing speech threshold audiometry to be used as a test of validity for pure tone testing. Spondaic words are homogenous in audibility and used standardly in speech recognition testing. While the selection of stimulus words may be changed for individual clinical populations, an audiometer, calibrated to specified standards, within a standardized testing environment, is utilized to reduce errors across tests. The spondaic words are either recorded or spoken, although recorded materials are preferred for their standardization, and the client either repeats back the stimulus item or conveys understanding by alternate means. The instructions for the task are presented in a language the the client will understand, and the client is familiarized to the task prior to its initiation. To begin, the clinician presents a word at 30

to 40 dB above their estimated speech recognition threshold. If a correct response is provided, the presentation is then decreased by 10 dB decrements, until the client provides an incorrect response. When an incorrect response is given, an additional word is played at that level. If the correct answer is provided at this time, the clinician continues to decrease the presentation level by 10 dB until the client is inaccurate on two consecutive words at the same presentation level. The presentation level is then raised 10 dB; this defines the starting level. At the starting level, present two words and then at each 2 dB decrement, until five out of six are incorrect. If during initial testing, the client does not correctly identify fix out the six words at the starting level, the presentation is increased 4 to 10 dB. Threshold is calculated by subtracting total number of correct responses from the starting level and then correcting by a factor of one.
Relevance to the Current Work: This procedure provides the standardized process for determining speech recognition thresholds, based on the relationship between pure tone testing and speech recognition tasks. The procedure outlined in the article provided a basis for those used in the current study.

American Speech-Language-Hearing Association. (1990). Guidelines for screening for hearing impairments and middle-ear disorders. *ASHA, 32*(Supplement 2), 17-24.

Summary: This article provides guidelines for the identification of individuals with hearing impairments or middle-ear disorders. Children and young adults are the main potential clients targeted by the article. Screening protocols include static admittance, ear-canal volume, tympanometric width, and acoustic reflex measures. Static admittance is calculated by subtracting the admittance of the ear-canal volume from the peak admittance. The etiology of an absence of an acoustic reflex is not exclusive to a middle-ear disorder. Ear-canal volumes that are over the range of 0.6-1.5 cm^3 in adults are an indication but not conclusive to a middle ear perforation.
Relevance to the Current Work: Hearing screening procedures were utilized in the current study, including acoustic admittance and reflex measures.

Bell, S. (1978). Two differences in definiteness in Cebuano and Tagalog. *Oceanic Linguistics, 17*(1), 1-9.

Summary: This article compares definiteness in Cebuano and Tagalog. While in Tagalog and several other Philippine languages, the final subject of a verb sentence is definite, Cebuano allows indefinite nouns to function as the subject of verbal sentences. Cebuano also allows definite final objects, which are nonexistent in Tagalog. However, like other Philippine languages, final subject in Cebuano is configured around the context. In Cebuano, *sa* is the marker for definite final objects and *ug* is the marker for indefinite final objects. Whether or not these differences are the result of other differences between the languages is not speculated on in this article.
Relevance to the current work: The differences referenced here indicate that while there are similarities in Cebuano and other Filipino languages, they are in no case the same language, and do not follow the same semantic or syntactic rules. The similarities, while undeniable, are not enough to establish tests in a non-native language, which is important as this work is to create audiological tests for native Cebuano speakers.

Blust, R. (1979). Coronal- noncoronal consonant clusters: New evidence for markedness. *Lingua: International Review of General Linguistics 47*, 102-117.

Summary: This article summarizes similarities and differences between the Tagalog and Cebuano languages, specifically looking at coronal-noncoronal consonant clusters. These were then studied to substantiate claims that Tagalog uses progressive and regressive assimilation and metathesis. Cebuano data provided additional data regarding the ordering of hemonasalic stops to coronal-noncoronal and voicing metathesis, which is still seen in the language. Indeed, the data taken from Cebuano leads to the hypothesis of a universal hierarchy in the unmarking, which Tagalog is more advanced in than Cebuano.
Relevance to the current work: This article provides information regarding key differences between Cebuano and Tagalog.

Bradlow, A. R., & Pisoni, D. B. (1999). Recognition of spoken words by native and non-native listeners: talker-, listener-, and item-related factors. *Journal of the Acoustical Society of America, 106*(4 Pt 1), 2074-2085.

Objective: This goal of this study was to determine the interactions between the talker, listener, and item-related factors that influenced speech perception through spoken words that were digitally recorded.
Design: Two word lists were recorded at three speaking rates: one list of easy words with few lexical neighbors and one list of difficult words with multiple neighbors. Intelligibility data looked at two separate groups: native and nonnative English speakers.
Study Sample: Experiment 1 used 20 native English speakers (6 males, 14 females) with ages from 20 to 42 years from Indiana University. Experiment 2 used 20 nonnative English speakers (8 males, 12 females) with ages from 21 to 33 years who had studied English at least two years from Indiana University. Nonnative speakers spoke eight native languages. Subjects were reported with normal hearing.
Results: Experiment 1 revealed that easier words were more intelligible at slow and medium speeds than the fastest setting. Additionally, exposure to the speaker's voice increased intelligibility scores for native English speakers. Experiment 2 demonstrated that nonnative English speakers used phonetic information in their identification of words; however, more difficult words received low intelligibility scores regardless of the rate of presentation.
Conclusions: Nonnative speakers used phonetic information for word identification; however, due to the lowered vocabulary familiarity with the language, lower scores were observed that could not be corrected entirely by reducing the speed or increasing familiarity with the words in the task.
Relevance to the Current Work: The use of nonnative English speakers and digitally recorded word lists are similar to the current study.

Buckey, J., Fellows, A., Jastrzembski, B., Maro, I., Moshi, N., Turk, M., . . . Kline-Schoder, R. (2013). Pure tone audiometric threshold assessment with in-ear monitoring of noise levels. *International Journal Audiology, 52*(11), 783-788. doi:10.3109/14992027.2013.821207

Objective: The purpose of this study was to determine the reliability of threshold measurements collected without the use of a sound booth, using in-ear probes and noise-attenuating hearing protectors.
Design: A laptop-based hearing test system with a 1/3 band study was used for initial audiological tests: threshold audiometry, distortion production otoacoustic emissions, and gap detection testing. The device was calibrated to ensure reliability of results.
Study Sample: Three main subject groups were used: a US group, a Tanzania group, and a normal-hearing group for calibration. 100 subjects were used for the US group (M_{US} = 39 years); Adult Tanzanian included 624 subjects (M_{AT} =39 years); Pediatric Tanzanian included 197 subjects (M_{PT} = 10 years).
Results: In-ear noise measurement results are repeatable. The in-ear noise levels met the maximum permissible ambient noise levels for uncovered ears; however, the dB SLP levels did not meet requirements for 0 dB HL between 2000-4000 Hz.
Conclusions: Audiometric tests may be conducted using in-ear measurements as well as noise-attenuating hearing protectors.
Relevance to the Current Work: Access to sound-proof facilities to conduct audiometric testing is rare in the Philippine Islands. This method could be used to obtain an accurate view of the native Cebuano speakers' dB HL without the requirement of locating a sound booth.

Cebuano. (2016). *Ethnologue: Languages of the world* (19th edition). Retrieved from http://www.ethnologue.com/language/ceb

Summary: This page provided statistics regarding the Cebuano language. It gave information on the concentration of Cebuano speakers, including the population, the areas in which the language is used, and basic classification.
Relevance to the Current Work: This page provides key statistics to help establish the validity of creating test materials in Cebuano.

Cebuano Alphabet. (2015). Retrieved from http://learn101.org/cebuano_alphabet.php

Summary: The page is a tutorial in how to speak Cebuano. It provides basic information regarding the alphabet use of Cebuano. It covers the basic alphabet used as well as expansions that have taken place over time as Cebuano has adopted words from other languages.
Relevance to the Current Work: This page provides insight into the construct of the Cebuano language.

Di Berardino, F., Tognola, G., Paglialonga, A., Alpini, D., Grandori, F., & Cesarani, A. (2010). Influence of compact disk recording protocols on reliability and comparability of speech audiometry outcomes: acoustic analysis. *Journal of Laryngology and Otology, 124*(8), 859-863. doi:10.1017/S0022215110000782

Objective: This study compared compact disc recording protocols to evaluate their reliability for speech audiometry testing.
Design: Initially, a track containing one list of spondee words was acoustically analyzed. These tracks were presented to normal hearing listeners and then the psychometric curves were compared.
Study Sample: Four different compact disks with phonetically balanced word lists used in clinical testing were selected. Twelve bilaterally normal hearing volunteers (6 men and six women) with a mean age of 23 years old. Subjects yielded normal results for pure tone audiometry, immittance audiometry, and a mean hearing level of 10 dB HL or less.
Results: Major differences exist between the level of the speech material and the calibration signal recorded. The differences in the speech recognition thresholds and maximum inteligibility thresholds demonstrated statistically significant results as indicated by the Friedman test ($p < 0.0001$). The difference between the first two compact discs and the second two were statistically significant ($p < 0.005$).
Conclusions: The results indicate that the recording protocol makes a significant impact on the compact disks, and to develop reliable data, the recording gains used in the recording should be checked and compensations made for differences in levels.
Relevance to the Current Work: The conclusions in the study are relevant to the current work as the use of psychometric functions and compact disks are utilized.

Dumdum, S., Mo, T., & Mojares, R. (2004). In conversation: Cebuano writers on Philippine literature and English. *World Englishes, 23*(1), 191-198.

Summary: This transcribed conversation is from three authors discussing the history of Cebuano and the effects of other languages over time. In the discussion, Cebuano is described as highly concrete, but difficult to convey abstract language. In an effort to converse in less abstract terms, Cebuano has borrowed words from other languages. In addition, the subjects discussed the marketability of writing in their native language opposed to writing for a larger market audience.
Relevance to the current work: This conversation provides a view of how Cebuano writers view the language and the limitations inherent in using Cebuano.

Egan, J. P. (1979). Basic aspects of speech audiometry. *Ear, Nose, and Throat Journal, 58*(5), 190-193.

Summary: This article details the necessity of speech audiometr, as well as the differences between speech detection and speech recognition testing. The author then describes the methods of testing. Initially the patient is familiarized with the word list at a comfortable listening level. Then, the spondee words are presented to the patient at 25 dB above the pure tone average, with a decrease of 5 dB with each word, as the patient repeats the stimuli. These decrements continue until the patient responds incorrectly or does not

respond. The presentation level is then increased 5 dB. This method is to determine where the patient identfies words correctly 50 percent of the time. These scores are also used to corroborate the pure tone thresholds. The speech recognition threshold and word discrimination scores are then used to identify the patient's degree and type of hearing impairment. These scores may also be used to determine appropriateness of aural rehabilitation or hearing aids.
Relevance to the Current Work: This article provides the method for conducting speech audiometry testing. In addition, this article provides the rationale for conducting spech audiometry.

English to Binisaya - Cebuano Dictionary and Thesaurus. (2016). Retrieved from http://www.binisaya.com/cebuano/

Summary: This website is a Cebuano dictionary. The site provides definition, part of speech, and usage in sentences for words.
Relevance to the Current Work: This dictionary was used to determine the definition and part of speech of words in the corpus.

Fuentes, G. G. (2000). The status of implementation of the 1987 Policy on Bilingual Education in Cebuano and Hiligayon tertiary institutions. *Philippine Journal of Linguistics, 31*(2), 115-125.

Objective: The purpose of this study was to review the effects of the 1987 Bilingual Education Policy on bilingual language proficiency in English and Filipino. The policy was enacted by the National Board of Education and was a revision of the original policy written in 1974.
Design: A survey method was used to obtain data on three questions regarding the implementation of the Bilingual Education Policy in schools. Results were taken qualitatively and quantitatively. Filipino was defined as Tagalog in this study.
Study Sample: A total of 24 schools from four non-Tagalog provinces, including Cebu, Negros Oriental, Negros Occidental, and Iloilo, that were originally sampled before the 1987 policy was enacted were reviewed. Two school administrators, two faculty members, and two student leaders for a total of six respondants from each school were interviewed. Four classroom observations from each school were incorporated as well: two social science classes, one math class, and a natural science class.
Results: Of the 24 schools surveyed, it was revealed that none of the schools were compliant with the Bilingual Education Policy standards, citing a lack of support from the government in implementation as the cause.
Conclusion: The researcher concluded that Cebuanos do not think of Filipino as a language of national identity. In addition, a significant portion of Cebuanos compared to Ilonggos and Negresnses, believed that the Bilingual Education Policy would not guarantee the development of nationalism. English is the preferred method of instruction between English and Tagalog for these populations as well, with 72% of Cebuanos resisting the use of Tagalog in the education system. English is viewed as the language of education, and allows increased chances of economic success.

Relevance to the current work: This study reveals the feelings and views of a portion of the Cebuano-speaking population regarding English and Filipino, or Tagalog in this article. The Cebuano population displayed a preference for instruction in English. As a community, the Cebuano group expressed a disapproval of Tagalog as the language of the Philippines, and their independence from it.

Ghazali, K. (1990). Nominative nominals and focus construction in Cebuano. *Philippine Journal of Linguistics, 21*(2), 51-56.

Summary: This article discusses key characteristics of the Cebuano language in addition to topics and verbs in sentences. Cebuano is the language used by between seven and ten million individuals in the Visayan Islands as well as Northern and Central Mindanao. At the time of the study, Cebuano has the greatest amount of native speakers, which is only outranked by Tagalog, due to an increase in numbers as it is the basis of the Philippine national language. Cebuano sentences possess a topic and a predicate, and there are two forms of sentences: verbal and non-verbal. Verbs are absent in non-verbal sentences and exist in an assortment of forms. As a verb-initial language, Cebuano sentences have a verb followed by nominal phrases. However, although the verb initiates the sentence, the topic, or subject, is given the most weight in the sentence. Based on the topic of the sentence, the verb is marked for voice: active, objective, locative, and instrumental.
Relevance to the current work: This article provides general information on the Cebuano language, its users, and some of the specific functions of the language.

Gonzalez, A., Bernardo, A., Bautista, M. L., & Pascasio, E. (2000). The Social Sciences and policy making in language. *Philippine Journal of Linguistics, 31*(2), 27-37.

Summary: This paper discusses languages in the Philippines over time, looking at the impact of education, multimedia, government, and technology. While in 1937 Filipino, an off-shoot of Tagalog, was made the national language, Cebu minimalized the language, singing the national anthem in Cebuano and teaching in English in schools. However, in the media, particularly radio, Philippine languages are more common than English, except in written media. The government operate in Filipino or English, with English becoming more common at higher levels.
Relevance to the current work: This paper discusses the general language situation in the Philippines. It refers to the Cebuano's negative reaction to a national language that continues to be seen, which affects the educational systems in Cebu and surrounding areas.

Graham, J. (2016). *Psychometrically Equivalent Trisyllabic Words for Testing Spanish Pediatric Speech Recognition Thresholds* (Unpublished master's thesis). Brigham Young University, Provo, UT.

Objective: The purpose of this study was to determine the validity of using psychometrically equivalent trisyllabic Spanish words for testing the speech recognition threshold of pediatrics.

Design: 28 common Spanish trisyllabic words were selected and recorded by male and female native Spanish speakers. These materials were presented to native Spanish listeners for evaluation in 2 dB increments.
Study Sample: Twenty normal hearing children were selected for this study. All were native Spanish speakers, and they ranged in age from 4 to 8 years.
Results: 12 trisyllabic words were found to have acceptable steep psychometric function slopes. These words were digitally adjusted so that their intensities would match the mean pure tone average for the listeners. The mean slopes for the selected trisyllabic words were 9.8%/dB HL to 8.3%/dB HL for the female talker.
Conclusions: After digital adjustment, the trisyllabic words were found to be homogeneous with respect to audibility and psychometric function slope, which were then committed a compact disc for future clinical use.
Relevance to Current Work: This study provides insight into the development of trisyllabic speech audiometry materials for non-native English speakers.

Hamid, M., & Brookler, K. (2006). Speech audiometry. *Ear, Nose, and Throat Journal, 85*(12), 810-811.

Summary: This article provides an overview of the methods and purpose for speech audiometry testing. Key speech audiometry terms were defined in the article: speech recognition threshold (SRT), word recognition score (WRS), most comfortable loudness, and uncomfortable loudness. Levels at which referrals should be made for additional assistance were briefly discussed.
Relevance to the Current Work: This article introduced the purpose and testing methods used in speech audiometry testing, including obtaining an SRT, which is the primary focus of this study.

Harris, R. W., McPherson, D. L., & Hansen, C. M. (2015). Vietnamese speech audiometry materials [Compact Disc]. Provo, UT: Brigham Young University.

Objective: The purpose of this study was to develop psychometrically equivalent bisyllabic Vietnamese words for testing the speech recognition threshold.
Design: 89 common Vietnamese bisyllabic words were selected and recorded by male and female native Vietnamese speakers. These materials were presented to native Vietnamese listeners for evaluation in 2 dB increments.
Study Sample: Twenty normal hearing subjects were selected for this study. All were native Vietnamese speakers, and they ranged in age from 18 to 26 years.
Results: 48 bisyllabic words were found to have acceptable steep psychometric function slopes. These words were digitally adjusted so that their intensities would match the mean pure tone average for the listeners. The mean slopes for the selected bisyllabic words were 9.1%/dB HL to 17.1%/dB HL for the female talker.
Conclusions: After digital adjustment, the bisyllabic words were found to be homogeneous with respect to audibility and psychometric function slope, which were then committed a compact disc for future clinical use.
Relevance to Current Work: This study provides insight into the development of bisyllabic speech audiometry materials for non-native English speakers.

Hirsh, I. J., Davis, H., Silverman, S. R., Reynolds, E. G., Eldert, E., & Benson, R. W. (1952). Development of materials for speech audiometry. *Journal of Speech and Hearing Disorders, 17*(3), 321-337.

Objective: This study was developed to create a series of speech audiometry materials to replace recorded PAL Auditory Test 14 and 9 and Egan's phonetically balanced (PB) lists. The resulting lists were entitled C.I.D. Auditory Test W-2 and C.I.D. Auditory Test W-22.

Design: 84 spondaic words were originally selected for Test W-1, which was then reduced to include six randomizations of 36 spondaic words on a single list, recorded by a male talker. The words were selected by a group of judges based on familiarity. Test W-1 was then used to evaluate the speech audibility threshold of six listeners, who further narrowed the list by repeating words from presentation level in two dB increments from -6 to 4 dB SPL. Words that were considered highly difficult were eliminated to result in 36 spondaic words. A second test was conducted to obtain speech thresholds from familiar and unfamiliar listeners. Based on these presentations, difficult or easy words were then adjusted up or down 2 dB respectively.

Test W-2 was created for a quick estimate of the intelligibility threshold. The 36 words were utilized again; however, the words were decreased 3 dB for every 3 words, and the subject listened to all of the six lists of W-2 to obtain threshold levels.

Test-W22 consisted of 200 monosyllabic, phonetically-balanced words, divided into four 50-word lists, which were used to determine the listener's speech recognition impairment. The list was narrowed down to 120, based on the Psycho-Acoustic Laboratory ratings of five listeners. The 120 words were then divided into six groups of 20 words each, which were presented to three groups.

The first group listened to all the lists at a comfortable listening level, before listening to the lists in random order from 20 to 70 dB SPL in 10 dB increments. The second group was familiarized with the words on the lists, which were then randomized and presented at 15 dB SPL increments. The last group were familiarized with the words at 100 dB SPL, and then listening again at 50, 40, 30, 20, and 10 dB SPL.

The completed version of W-22 was presented to 15 listeners in groups of 5 at 80 dB SPL to establish the maximum articulation score, and then again at 25 dB SPL to confirm scores near threshold.

Study Sample: Six subjects with normal pure tone averages, were initially used for the creation of Test W-1 materials. An additional twelve listeners, half familiarized, were then used. To evaluate Test W-2 materials, 14 listeners from the W-1 evaluation were used. For Test W-22 material evaluation, 15 subjects with normal hearing, divided into three groups of five were used.

Results: For Test W-1, absolute thresholds were 21 dB SPL for inexperienced listeners and 20 dB SPL for experienced listeners. For Test W-2, the absolute threshold was 17.7 dB SPL. An analysis of variance showed no significant differences in difficulty between the the W-2 discs. Test W-22 results determined no differences consistent between the scores on the four lists.

Conclusions: The results show that the difference in thresholds for W-1 and W-2 are attributable to the number of words in the tests. The intelligibility of spondaic words

increases at a more rapid pace with intensity increases than that of phonetically balanced monosyllabic words.
Relevance to the Current Work: This article is one of the initial studies regarding recorded and psychometrically equated speech audiometry materials, and the importance of steep intelligibility slopes in speech recognition testing.

Lanaria, L. (2009). Lawas: An anthropo-theological discourse on the body in a Cebuano-Visayan language context. *Philippine Quarterly Of Culture and Society, 37*(1), 55-82.

Summary: This article explores the importance of expressions using *lawas* or body in the Cebuano language. The author summarizes its usage across multiple types of idioms. The use of *lawas* in the language also helps to illuminate parts of the Filipino culture.
Relevance to the current work: While this article discussed one aspect of the Cebuano language, it was not in a manner that was beneficial to this researcher at this time.

Luzares, C. E. (1997). Gender differences in language use in Cebuano: An exploratory study. *Dōshisha literature, 40*, 39-53.

Objective: This exploratory study compared the gender differences in using the Cebuano language.
Design: A series sicture cards depicting work situations were used. An inherent issue with the behavior demonstrated one of the characters was shown, with the resulting consequences. Subjects were then requested to write a letter, explaining the sitation to an individual who had not seen the pictures. Subjects were told to write the letters as if they had seen the situation at their own place of work. Due to the differences in the subjects, the author stated the study was exploratory as statistical measures could not be used with reliability in the situation.
Study Sample: 30 women and 27 men attending the University of San Carlos in Cebu City were the subjects of the study. The women were mostly engaged in professional work at the time, and all were graduate students. The average age of the women and men in the study was 28.5 and 18.9 years of age, respectively. The men were primarily undergraduate students, and only two were engaged as professional workers at the time of the study.
Results: The women, on average, wrote longer letters than the males, and professionals wrote more than students; however, female professionals wrote 38.75% more than their male counterparts. Women wrote more about the situation that their male counterparts, using almost twice the amount of indirect, abstract, situational and interpretational language. The female writers used more features than the men including details, thoughts and feelings, and the completeness of the story.
Conclusions: While the study appeared to show that Cebuano men and women utilize the language differently to communicate, the results are not conclusive due to the differences in the samples.
Relevance to the Current Work: This study demonstrated the different communication patterns seen in Cebuano that are used by men and women.

Martin, F. N., & Clark, J. G. (2009). *Introduction to audiology*. Boston, MA: Allyn and Bacon.

Summary: This chapter provides information on the methodology and importance of conducting speech audiometry. A description of audiometers and the test environment is included. The authors cover the patient's and clinician's role in speech audiometry. Definitions of key components of speech audiometry are included. The methodology of obtaining the speech recognition threshold is detailed out, as well as the use of masking in speech audiometry. The authors then discuss the instructions for word recognition testing.
Relevance to the Current Work: This chapter provides information on the necessity and methodology of obtaining speech audiometry.

McFarland, C. D. (2004). The Philippine language situation. *World Englishes, 23*(1), 59-75.

Summary: This article summarizes similarities and differences of major Philippine languages: Tagalog, Cebuano, Hiligaynon, Bikol, Kapampangan, Pangasinan, and Ilokano. Similar to Tagalog, Bikol, and Hiligayon, Cebuano has three case-marking particals and a plural partical. However, unlike Tagalog, Cebuano's *sa* expresses definitiveness. As the primary Bisayan language, Cebuano possesses more similarities to Tausug than other Bisayan languages, which bear more similarities to Bikol and Tagalog. Cebuano is typically found in the central Philippines, which has encouraged it to borrow from the other languages nearby. This has created an appearance of similiarity between Cebuano and other Philippine languages, that does not, in fact, exist. However, the Philippine languages do not currently have an overarching study of comparison. However, it can be said that all Philippine languages, other than Chavacano, belong to the Austronesian family, although they are not currently considered an official subgroup of the Austronesian family. Three Philippine groups exist: northern Philippine, meso-Philippine, and southern Philippine. Cebuano belongs to the Central Philippine subgroup, in the South Bisayan languages with Tausug. Over time, Philippino languages have been affected by geography, settlers, and expansion. Many of these languages have acquired aspects of Spanish and are now accumulating English, although these acquisitions may not sound enough like the original word to be identified by a native speaker of those languages.
Relevance to the current work: This article discusses the characteristics of the Cebuano language including it's language family, influences on Cebuano, and it's characteristics.

Nissen, S. L., Harris, R. W., Channell, R. W., Conklin, B., Kim, M., & Wong, L. (2011). The development of psychometrically equivalent Cantonese speech audiometry materials. *International Journal of Audiology, 50*(3), 191-201. doi:10.3109/14992027.2010.542491

Objective: The purpose of this study was to develop psychometrically equivalent word recognition (WR) and speech recognition testing (SRT) materials for native Cantonese speakers.
Design: Familiar Cantonese words were selected and recorded by a native Cantonese speaker. A total of 250 Cantonese bisyllabic words were chosen as stimuli for the WR materials and divided into 10 lists of 25 words each. 90 trisyllabic words were selected

for the SRT materials. Listeners were presented with each WR list at a different intensity level ranging from -5 to 40 dB HL in 5-dB increments. For SRT evaluation, the stimuli were randomized and delivered to each participant beginning at 6 dB below his or her pure tone average, decreasing in increments of 2 dB until no correct responses were given. Thereafter, the presentation level was raised to 2 dB above the initial presentation level and increased in increments of 2 dB until the participant verbally repeated all stimulus items correctly. Native Cantonese judges rated each response as correct or incorrect. Based on listener response, WR lists were arranged into four lists and eight half-lists that were relatively homogeneous in audibility. Logistic regression was used in digitally adjusting the intensity of each trisyllabic SRT word to match the listeners' mean pure tone average.
Study Sample: Native male and female speakers of Cantonese were used to record the test stimuli. 20 normal-hearing native Cantonese speakers between the ages of 19 and 29 were utilized.
Results: The mean psychometric function slopes for the WR materials were 7.5%/dB for the male talker and 7.6%/dB for the female talker. No statistically significant difference was found between the lists or half-lists. For the SRT materials, the mean psychometric slopes of the male and female talker recordings at 50% were 14.5%/dB and 14.9%/dB, respectively.
Conclusions: The digital recordings of the Cantonese speech audiometry materials were produced for availability on compact disc.
Relevance to Current Work: This study was similar in scope and design to the current work and was therefore useful as a reference.

Nissen, S. L., Harris, R. W., Jennings, L. J., Eggett, D. L., & Buck, H. (2005). Psychometrically equivalent trisyllabic words for speech reception threshold testing in Mandarin. *International Journal of Audiology, 44*(7), 391-399. doi:10.1080/14992020500147672

Objective: The purpose of this study was to develop psychometrically equivalent trisyllabic Mandarin words for testing the speech recognition threshold.
Design: 90 common Mandarin trisyllabic words were selected and recorded by male and female native Mandarin speakers. These materials were presented to native Mandarin listeners for evaluation from -10 to 14 dB HL in 2 dB increments.
Study Sample: Twenty normal hearing subjects were selected for this study. All were native Mandarin speakers, and they ranged in age from 19 to 35 years.
Results: 24 trisyllabic words were found to have acceptable steep psychometric function slopes. These words were digitally adjusted so that their intensities would match the mean pure tone average for the listeners. The mean slopes for the selected trisyllabic words were 11.3%/dB for the male talker and 12.1%/dB for the female talker.
Conclusions: After digital adjustment, the trisyllabic words were found to be homogeneous with respect to audibility and psychometric function slope, which were then committed a compact disc for future clinical use.
Relevance to Current Work: This study provides insight into the development of trisyllabic speech audiometry materials for non-native English speakers.

Ramkissoon, I. (2001). Speech Recognition Thresholds for Multilingual Populations. *Communication Disorders Quarterly, 22*(3), 158-162.

Summary: This article discusses the history of speech audiometry in the United States and its current importance in audiometry testing, focusing on speech recognition testing for multi-lingual speech populations. To illustrate the importance of speech recognition testing with multi-lingual populations, the author addressed the sociolinguistic aspects of speech and language and potential impact on test results. English digits are presented as an alternative means of testing speech recognition in non-native English populations, with an emphasis on the familiarity of the subject with the digits. This article does not contain original research, but does list previous examples of the affectiveness of digit testing, as they possess a steep intelligibility slope that is important in selecting words for speech recognition tests.
Relevance to the Current Work: This article provides information regarding the significance of speech recognition testing in multi-lingual populations. Additionally, it provides validity to alternative testing means when presentation materials are not available in the individual's native language.

Ramkissoon, I., Proctor, A., Lansing, C. R., & Bilger, R. C. (2002). Digit speech recognition thresholds (SRT) for non-native speakers of English. *American Journal of Audiology, 11*(1), 23-28. doi:10.1044/1059-0889(2002/005)

Objective: The purpose of this study was to create speech recognition testing materials for non-native English speakers using digit pairs.
Design: 56 digit pairs and 36 CID W-1 test items were used for stimuli, which were recorded by an American-English speaking female. Pure tone audiometry was conducted to obtain pure tone averages that were later compared to speech recognition scores. At 1000 Hz, stimulus was presented at 20 dB above the pure tone average. The subject repeated the word back; if the subject incorrectly identified the initial word, the presentation level was increased. After a correct response, presentation level was decreased by 2 dB, and decreased by 2 dB after an incorrect response. Eight thresholds were obtained, and the first two were discarded. With the remaining six, the threshold level for the subject was estimated.
Study Sample: The study used 12 non-native English speakers and 12 native English speakers. The subjects were between 22 and 69 years of age and possessed normal hearing in both ears. The majority of the non-native speakers of English had resided in the United States for less than one year and spoke English less than one hour per day. Each subject had completed high school and had normal auditory discrimination based on the Adult-Language Assessment Scales subtest.
Results: A correlation was found between the digit-SRT and the CID materials, and a near match of mean thresholds between the digit stimuli and the listener's pure tone average. The average threshold for non-native English listerners was significantly higher than native English listeners, which indicated that the non-native English listeners demonstrated larger differences in SRT when using the CID W-1 materials than their native English counterparts.

Conclusions: Results indicated a strong reslation between the listener's pure tone average and their CID-SRT. The authors concluded that digit pairs present a viable method of measuring speech hearing threshold, particularly in cases where English is not the listener's native language.
Relevance to the Current Work: This article provides information regarding an alternative method of establishing the SRT of non-native English speakers.

Rimikis, S., Smiljanic, R., & Calandruccio, L. (2013). Nonnative English speaker performance on the Basic English Lexicon (BEL) sentences. *Journal of Speech, Language, and Hearing Research, 56*(3), 792-804. doi:10.1044/1092-4388

Objective: This study examined speech-in-noise performance using the Basic English Lexison (BEL) for nonnative English speakers and to assess whther the BEL lists were equal in difficulty to be used in testing for the population of nonnative English speakers.
Design: Subjects provided demographic information via a questionnaire and completed the Versant English Test of English language proficiency. Five hundred BEL sentences, that had been used previously to familiarize the subjects, were then presented to these individuals with noise added.
Study Sample: The sample size consisted of 102 nonnative English speakers of 24 languages, with ages ranging between 18 to 50 years of age.
Results: Testing revealed that there were significant differences in individual sentences, but they could be grouped into three lists of statistically equal performance. Individuals with higher levels of English proficiency, regardless of the native language, performed equally to native English speakers on a significant portion of the BEL sentences.
Conclusions: The researchers concluded that the BEL sentences were appropraite to use in speech perception testing for nonnative English speaker, and that the BEL sentences were not biased to a specific language of origin, and therefore, could be used for a variety of language testing.
Relevance to the current work: This study establishes the viability of using English speech audiometry materials for nonnative speakers of English, particularly if clinicians must use interpreters or omit speech audiometry testing.

Rodriguez, R. F. (2014). Lexicography in the Philippines (1600-1800). *Historiographia Linguistica, 41*(1), 1-32. doi:10.1075/hl.41.1.01rod

Summary: This study discussed the impact of missionaries on the lexicography of Philippine languages, which belong to the Austronesian family and agglutinative. Missionaries learned multiple languages and wrote the native languages down for future settlers to learn the language. However, many of these early works remain unavailable due to limited accessibility, regardless of their importance.
Relevance to the current work: While the vocabularies discussed where created centuries prior to the current study, the article identifies multiple Filipino languages and the Spanish influence on them, which are seen to this day. In addition, this work compares and contrasts characteristics of Spanish and Filipino languages.

Rudmin, F. (1987). Speech reception thresholds for digits. *Journal of Auditory Research, 27*(1), 15-21.

Objective: The purpose of this study was to determine if speech recognition testing using digit testing were a predictor of pure tone hearing testing.
Design: Tests used digits 1, 2, 4, 5, and 9 for their longer vowel duration and homogenous audibility. Subjects were required to provide two correct responses at each level, to reduce the effects of randomly guessing a correct response thereby reducing a false level pass.
Study Sample: 130 subjects referred for audiology assessment were used in the study. Data from seven individuals was discarded, and of the remaining 123 subjects (74 males, 49 females), 43 were native English, 40 native French, and 40 spoke other native languages.
Results: The pure tone average was seen to correspond to the speech recognition score obtained using digits.
Conclusions: English digits provide a reliable method for establishing an individual's SRT, no matter their language of origin.
Relevance to the Current Work: This study evaluated a reliability of using English digits to conduct speech recognition testing, opposed to the individual's language of origin.

Shyrock, A. (1993). A metrical analysis of stress in Cebuano. *Liguana, 91*(2-3), 103-148.

Summary: This article discusses word stress of the dialect of Cebuano spoken in the Cebu district. Cebuano uses a quantity-sensitive stress system: the more phonemes present, the more stress given to that syllable. Primary stress is determined by the weight of the second to last syllable, although in the absence of a heavy penult, or second to last syllable, the final syllable is awarded primary stress. Secondary stress is established on alternating syllables to the left of the primary stress syllable. Therefore, stress is assigned in a right to left pattern. Additionally, the article states that in Cebuano, content words must have two syllables or a long vowel. The morphological system seem is Cebuano allows for prefixes, infixes, suffixes and reduplication, with inflectional suffixes causing a rightward shift of primary stress.
Relevance to the current work: This article provided information used to understand the Cebuano language, specifically its structure and how it affects Cebuano's stress patterns.

Scannell, Kevin P. (2007). The Crubadan Project: Corpus building for under-resourced languages. *Cahiers du Central, 5*(1).

Summary: The article described a corpus-building project of lexical information for languages that are limited in resources. When a corpus is compiled, it may be used in the creation of language technologies. By compiling a language corpus based on a web crawler that collects text in a given language from the Internet, once an appropriate amount of data has been gathered and information on the new language, a list of the gathered words is compiled into a lexicon. Additional processing may take place once the web crawler has been trained to a new language. Stopwords (words which occur frequently in the selected language but infrequently in other languages) allow for higher precision in retrieving documents that are written in the target language. Native speakers

check the lexicon for errors. A variety of uses for this information exist including spelling and grammar technologies as well as updating dictionaries and constructing thesauruses.
Relevance to Current Work: This project was useful in selecting appropriate Cebuano words to include as stimuli for the current project.

Tanangkingsing, M. (2013a). A study of second-position enclitics in Cebuano. *Oceanic Linguistics, 52*(1), 222-248.

Summary: This article looks at the affects of clitics – or unstressed morphemes that typically occur combined with other words, such as contractions – within the Cebuano language. While in the majority of Philippine languages, (en)clitics are considered empty utterances, in Cebuano, enclitics possess semantic content as well as required structures. However, while they do possess attitude or slant to the utterances, enclitics are disposable syntactically.
Relevance to the current work: This article provided information about one specific aspect of the Cebuano language, and how the use of second-position enclitics in Cebuano differ from other Philippine languages.

Tanangkingsing, M. (2013b). A study on the behavior of Cebuano pronouns in discourse. *Concentric: Studies in Linguistics, 39*(1), 59-89.

Summary: This article dicusses the characteristics and special features of pronouns in Cebuano. Gender distinction in pronouns does not exist in Cebuano, as well as most other Philippine languages. The use of third-person pronouns has to be distinct or else the referent may be difficult to identify by the listener. English is rigid in referential expressions, requiring subjects in sentences. In Cebuano, subjects are not always required, and the pronoun is often dropped in these instances. In Philippine languages, clauses with that initiate with the predicate are the norm while Indonesian languages, are subject-verb-object based. This led the author to hypothesize that the pre-posing of pronominal forms in Cebuano indicate a development from Philippine languages to Indoasian languages, as the Cebuano floating pronoun in front of the verb is atypical in other Filipino languages. The pre-posing of pronouns is seen in cases of definiteiveness, verb type, and structure of the verb. This article dealt with the variety of function and form that pronouns exhibit in conversation.
Relevance to the current work: This article provided more information regarding the Cebuano language, specifically its pronouns and how it compares with other types of Philippine languages in pronoun usage. Pronouns are throughout narrative and conversational language, and understanding their use in specific languages is important when learning more about the language's characteristics.

Tanangkingsing, M., & Shuanfan, H. (2007). Cebuano Passives Revisited. *Oceanic Linguistics, 46*(2), 554-584.

Summary: Establishing the syntactic and sematic construction of passive sentences in Cebuano was the focus of this study. The authors postulate that *na-* clauses serve a passive function, or nonpurposeful action of the noun whereas *gi-* represents purposeful

actions. *Na*-construction contains a form of distinct word order required to establish passive tense.
Relevance to the current work: This study provided information on the syntax of the Cebuano language and its organization.

Taylor, B. (2012). *Development of Psychometrically Equivalent Speech Audiometry Materials for Measuring Speech Recognition Thresholds in Native Tagalog Speakers* (Unpublished master's thesis). Brigham Young University, Provo, UT.

Objective: The purpose of this study was to develop psychometrically equivalent trisyllabic words for testing the speech recognition threshold of Tagalog.
Design: 90 common Tagalog syllabic words were selected and recorded by male and female native Cebuano speakers. These materials were presented to native Tagalog listeners for evaluation in 2 dB increments.
Study Sample: Twenty normal hearing subjects were selected for this study. All were native Tagalog speakers, and they ranged in age from 19 to 51 years.
Results: 34 bisyllabic words were found to have acceptable steep psychometric function slopes. These words were digitally adjusted so that their intensities would match the mean pure tone average for the listeners. The mean slopes for the selected trisyllabic words were 5.4%/dB HL to 15.1%/dB HL.
Conclusions: After digital adjustment, the trisyllabic words were found to be homogeneous with respect to audibility and psychometric function slope, which were then committed a compact disc for future clinical use.
Relevance to Current Work: This study provides insight into the development of trisyllabic speech audiometry materials for non-native English speakers.

Thibodeau, L. M. (2007). Speech audiometry. In R. J. Roeser, M. Valente, & H. Hosford-Dunn (Eds.), *Audiology diagnosis* (2nd ed., pp. 288-313). New York: Thieme.

Summary: This chapter provides an overview of speech audiometry: terminology, rationale, components, and methods. Speech audiometry may be used to differentiate between individuals who will benefit from from hearing aids and who will not. Indeed, speech audiometry should be used in calibrating hearing aids. The chapter then discusses the relative effects of reduced absolute and differential sensitivity. The process for conducting speech audiometric tests is included as well.
Relevance to the Current Work: This chapter helps to understand the importance of speech audiometric testing. It also covers the methods of conducting speech audiometric testing, including speech recognition testing.

Thompson, I. (2013, July 11, 2013). Cebuano. Retrieved from http://aboutworldlanguages.com/cebuano

Summary: This site provides statistics and characteristics of the Cebuano language. The article continues to describe the alphabet used in Cebuano, and a list of phonemes commonly used in Cebuano is included. Stress and grammar are also discussed, with a basic summary of key components: pronouns, subjects, verbs.

Relevance to the Current Work: This article provided initial information regarding the characteristics of the Cebuano language.

Wilson, R. H., & Strouse, A. (1999). Psychometrically equivalent spondaic words spoken by a female speaker. *Journal of Speech, Language, and Hearing Research, 42*(6), 1336-1346.

Objective: The purpose of this study was to equate spondaic word thresholds psychometrically for the CID W-1 test in an effort to reduce threshold variability of spondaic words.
Design: The study followed two experiments. The first experiment established psychometric functions for 36 spondaic words using listener responses for a male and female talker. The female talker recordings were then adjusted digitally to produce equal thresholds. The second experiment determined the psychometric functions of the 36 adjusted spondaic words.
Study Sample: The study used two groups of 20 normal hearing listeners. Listeners ranged in age from 22 to 30 years for Experiment 1 and 19-29 for Experiment 2.
Results: While the mean thresholds for the experiments were the same, the standard deviation for Experiment 2 was significantly smaller than Experiment 1.
Conclusions: The authors concluded that the materials were psychometrically equivalent, due to the reduction of standard deviation between experiments. A compact disc was then compiled with the versions of spondaic words by the female talker.
Relevance to the Current Work: The study discusses creating homogenous speech audiometry materials, similar to the current work.

Wolff, J. U. (1966). *Beginning Cebuano, Part 1* (Vol. Yale Linguistics). New Haven, CT: Yale University.

Summary: This book provides information on the Cebuano langauge. It is an instructional textbook in how to speak Cebuano. It starts by providing information related to the nature of the language: the background and regions where Cebuano is spoken. Wolff then discusses the characteristics of the language.
Relevance to the Current Work: This work provides background information on the Cebuano language and its nature.

APPENDIX B

Informed Consent

Introduction

This research study is being conducted by Richard Harris, PhD at Brigham Young University; Sarah Ralph, BS Communication Disorders, Communication Disorders graduate student at BYU; and Melissa Anderson, BS Communication, Communication Disorders graduate student at BYU to evaluate a word list recorded using improved digital techniques. You were invited to participate because you are a native Cebuano speaker.

Procedures

If you agree to participate in this research study, the following will occur:

- You will receive a 15-minute hearing screening where you will hear beeps and indicate whether or not you heard them.
    - Should you do not meet the hearing requirements, you will be provided with $10, a hard copy of your test results, and a referral to a physician.
- You will listen to Cebuano words and repeat the words you hear.
- The total time commitment for the Cebuano word portion of the exam will be approximately 60 minutes.
- This will take place in a laboratory in the Taylor Building also known as the Comprehensive Clinic. The laboratory is located in room 110 of the Taylor Building on the BYU Campus.

Risks/Discomforts

There are no known risks associated with this study. The researchers will be present at all times to make sure that you are not experiencing any problems during any portion of the study. If you indicate in any way that you do not want to participate, we will stop immediately.

Benefits

The primary benefit to you is finding out whether you have normal hearing or not throughout the course of the study. There may be benefits to society in general in that this study may result in more effective treatment methods for Cebuano-speaking individuals participating in hearing evaluations.

Confidentiality

Your participation will be confidential. The data will be stored in file cabinets within locked laboratories or offices in the Taylor building on the campus of Brigham Young University. Only the researchers will have access to the data. All names will be removed from research materials. Your name will never be used in association with this research. Information will be kept for three years after the study is completed. The files will remain in a locked laboratory only accessible by the researchers. Internet data will be saved as a Microsoft Excel document with no subject identifiers. Subjects will be identified only by number with no names or any other identifying referents.

Compensation
You will receive $10 for participating in the hearing screening. If you meet the requirements for additional testing, an additional $20 will be provided for your participation; compensation will not be prorated. You will receive a free hearing exam and you will be provided a printed copy of your hearing evaluation.

Participation
Participation in this research study is completely voluntary. You are free to decline to participate in this research study. In addition, you may withdraw your participation at any point without loss of compensation.

Questions about the Research
Please direct any further questions about the study to Richard Harris at (801) 422-6460 or richard_harris@byu.edu. You may also contact Sarah Ralph at (253) 632-3030 or Melissa Anderson at (940) 231-2343, or through email at sarahralph32@gmail.com or mdanderson.89@gmail.com.

Questions about Your Rights as Research Subjects
Should you have any questions regarding your rights as a research participant contact IRB Administrator at (801) 422-3841; A-285 ASB, Brigham Young University, Provo, UT 84602; irb@byu.edu.

Statement of Consent
I have read, understood, and received a printed copy of this entire consent document. I desire of my own free will to participate in this study.

Your Name (Printed): _________________ Signature: ____________________ Date: ______

APPENDIX C

Evaluation Sheet for Cebuano Talkers

Please rate the following talkers on the following attributes.
Circle the number that best applies 1-Worse to 5-Excellent.
Then rank order the male talkers from your favorite to least favorite assigning them a number from 1-2 (use each number only once).

Male Talker 1	**Worse**		**Fair**		**Excellent**	**Rank**
Pleasantness of Voice	**1**	**2**	**3**	**4**	**5**	
Intelligibility	**1**	**2**	**3**	**4**	**5**	______
Accent	**1**	**2**	**3**	**4**	**5**	

Male Talker 2	**Worse**		**Fair**		**Excellent**	**Rank**
Pleasantness of Voice	**1**	**2**	**3**	**4**	**5**	
Intelligibility	**1**	**2**	**3**	**4**	**5**	______
Accent	**1**	**2**	**3**	**4**	**5**	

APPENDIX D

Selected Cebuano Trisyllabic Word Definitions

#	Word	Part of Speech	Definition
1	amahan	noun	father
2	balaod	noun	law
3	barangay	noun	village
4	daotan	adjective	bad; depraved; harmful
5	gabii	noun	evening; night
6	gisulat	verb	wrote
7	gitawag	past participle	called
8	ibabaw	adverb	above; upper
9	kaaway	noun	adversary; antagonist; enemy; foe; opponent
10	kalayo	adverb	far away
11	kauban	noun	associate; chaperon; companion; escort; fellow; mate
12	lalaki	noun	boy; lad; male; man
13	maayo	adjective	fair; good; well
14	pagbuhat	noun	working; devise; do; manufacture; perform
15	paglaom	noun	hope; prospect
16	pagpatay	noun	execution; killing; slaying
17	pagsimba	noun	worship
18	pagsulod	noun	access; entering; entry
19	pagtuo	noun	belief; conviction; creed; faith; notion; supposition
20	pagtuon	noun	education; learning; studies; review
21	tibuok	adjective	entire; intact; whole

APPENDIX E

Description for BYU Cebuano Speech Audiometry Materials CD

Track 1 1 kHz calibration tone.

Track 2 Trisyllabic words for use in measuring the SRT in alphabetical order for familiarization purposes.

Track 3 Trisyllabic words for use in measuring the SRT in random order, repeated in blocks for a total duration of 5 minutes.

Track 4 Speech Discrimination List 1 – 50 monosyllabic words in random order.

Track 5 Speech Discrimination List 2 – 50 monosyllabic words in random order.

Track 6 Speech Discrimination List 3 – 50 monosyllabic words in random order.

Track 7 Speech Discrimination List 4 – 50 monosyllabic words in random order.

Track 8 Speech Discrimination List 1A – 25 monosyllabic words in random order.

Track 9 Speech Discrimination List 1B – 25 monosyllabic words in random order.

Track 10 Speech Discrimination List 2A – 25 monosyllabic words in random order.

Track 11 Speech Discrimination List 2A – 25 monosyllabic words in random order.

Track 12 Speech Discrimination List 3A – 25 monosyllabic words in random order.

Track 13 Speech Discrimination List 3B – 25 monosyllabic words in random order.

Track 14 Speech Discrimination List 4A – 25 monosyllabic words in random order.

Track 15 Speech Discrimination List 4B – 25 monosyllabic words in random order.

Track 16 **Ikaw makadungog og sinumpay-sumpay nga mga pulong nga nagkalain-laing ang kalanogon. Palihog isulti og balik ang mga pulong kong imo na kining madungog. Kung dili ka sigurado sa pulong, puwede kang mutag-na.**

Instructions for speech reception threshold—verbal response: **You are going to hear a series of words that may vary in volume. Please repeat each word as soon as you hear it. If you are not sure of the word that you heard, you may guess.**

Track 17 **Ikaw makadungog og sinumpay-sumpay nga mga pulong nga permamnente ang bolyum. Palihog isulti og balik ang mga pulong kong imo na kining madungog. Kung dili ka sigurado sa pulong, puwede kang mutag-na.**

Instructions for speech discrimination—verbal response: **You are going to hear a series of words that will be given at a constant volume. Please repeat each word as soon as you hear it. If you are not sure of the word that you heard, you may guess.**

Track 18 **Kining bahin sa test ikaw makadungog og saba sa pikas nga dunggan og mga pulong sa pikas. Ibaliwala ang saba og usba og sulti ang matagpulong kong imo na kining madungog.**

Instructions for speech audiometry, masking in nontest ear—verbal response: **During this part of the test you will hear a noise in one ear and words in the other. Ignore the noise and repeat each word when you hear it.**

Track 19 **Ikaw makadungog og sinumpay-sumpay nga mga pulong nga permanente ang bolyum. Palihog og suwat sa mga pulong kong imo na kining madungog. Kung dili ka sigurado sa pulong, puwede kang mutag-na.**

Instructions for speech audiometry—written response: **You are going to hear a series of words that will be given at a constant volume. Please write each word as soon as you hear it. If you are not sure of the word you heard, you may guess.**

Track 20 **Kining bahin sa test ikaw makadungog og saba sa pikas nga dunggan og mga pulong sa pikas. Ibaliwala ang saba og isuwat ang matagpulong kong imo na kining madungog.**

Instructions for speech audiometry, masking in nontest ear—written response: **During this part of the test you will hear noise in one ear and words in the other. Ignore the noise and write each word when you hear it.**

Track 21 **Ikaw makadungog og sinumpay-sumpay nga mga tuno nga may nagkalain-laing ang gitas-on nga tingog. Kung madungog nimo ang tuno, ipata-as dayon ang imong kamot. Ibutang ang imong kamot kon muobos na ang tuno. Ipata-as ang imong kamot kung sa imong pagtu-o nadungog nimo ang tuno, bisan og dili ka sigurado.**

Instructions for pure tone audiometry—hand raising: **You are going to hear a series of tones that will vary in pitch. When you hear the tone, immediately raise your hand. Put your hand down as soon as the tone goes off. Raise your hand if you think you hear the tone, even if you are not sure.**

Track 22 **Kining bahin sa test ikaw makadungog og saba sa pikas nga dunggan og mga tuno sa pikas. Ibaliwala ang saba og ipata-as ang kamot kong imong madungog ang tuno.**

Instructions for pure tone audiometry, masking in nontest ear—hand raising: **During this part of the test you will hear noise in one ear and tones in the other. Ignore the noise and raise your hand when you hear a tone.**

Track 23 **Ikaw makadungog og sinumpay-sumpay nga mga tuno nga may nagkalain-laing ang gitas-on sa tingog. Kung madungog nimo ang tuno, tulpoka dayon ang buton. Undang sa pagtulpok kon muhunong na ang tuno. Tulpoka ang buton kung sa imong pagtu-o nadungog nimo ang tuno, bisan og dili ka sigurado.**

Instructions for pure tone audiometry—button pressing: **You are going to hear a series of tones that will vary in pitch. When you hear a tone, immediately press the button. Stop pushing the button when the tone goes off. Push the button if you think you hear the tone, even if you are not sure.**

Track 24 **Kining bahin sa test ikaw makadungog og saba sa pikas nga dunggan og tuno sa pikas. Ibaliwala ang saba og tulpoka ang buton kong imong madungog ang tuno.**

Instructions for pure tone audiometry-masking in nontest ear—button pressing: **During this part of the test you will hear noise in one ear and tones in the other. Ignore the noise and press the button when you hear a tone.**