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Advanced Research in Experimental & Applied Linguistics

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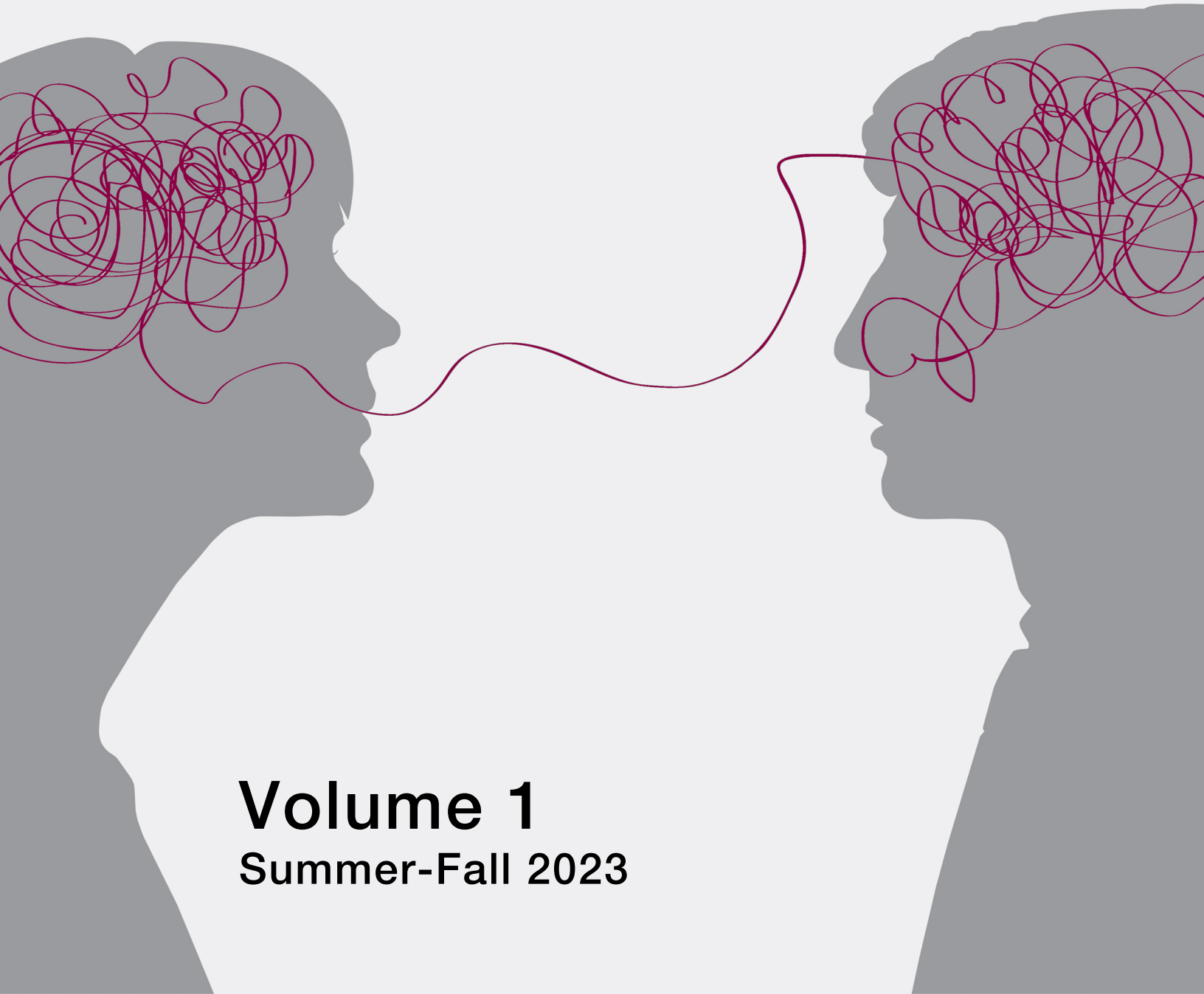
ARiEAL Research Magazine



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EDITOR'S NOTE

In this Summer-Fall's 2023 inaugural issue of *The ARiEAL Research Magazine* we provide a voice to the wealth and mosaic of student trainees' research experience as a medium to disseminate high-quality and original research alongside spotlighting relevant portfolios. As a research center, ARiEAL brings together a community of researchers ranging from undergraduate and graduate trainees to established scholars and enables them to excel in problem-driven scientific research in fundamental, experimental, and applied linguistics. The breadth of our community and research reflects the interdisciplinarity of our center — we have created a supportive environment for researchers to cross traditional boundaries and produce socially impactful projects that straddles the worlds of Health Sciences, Sciences, Engineering, Social Sciences, and Humanities. This is one of our strengths and the pieces that were selected for this inaugural issue bear witness to our commitments to interdisciplinary and socially impactful research.

We write about the history of the modern museum in southern Ontario, the challenges, and proposed solutions for under documented communities regarding their linguistic capacities and the cognitive science of language as it relates to musical aptitude and word learning.

We take you inside the comprehensive portfolio of linguistic programmer and recent graduate Renee Boney, and back in time as Aleem Mohammed in the Anthropology department uncovers the unsatisfactory ways the modern museum represents non-dominant cultures in Ontario. We journey through the under-reported dialect of Meixian Hakka via Baraneza Pirabagaran in the Phonetics department and the speech production–perception of Polish children and heritage Polish listeners via Dakyung (Rachel) Lim— an ARiEAL graduate student. Adrienne Yau in the Psychology, Neuroscience and Behaviour department, and her team, investigate the connection between patterns of sound and word learning.

This edition is composed of high-quality, innovative, interleaved research. The themes presented—closely related to experimental linguistics, focuses on, and celebrates ARiEAL trainees' accomplishments and research aspirations for cultivating a brighter world. The interdisciplinary exchange of research topics generates a sense of awe. We sincerely hope the awe-inspiring research transmits through our audience as you also experience the bringing together of ARiEAL's brightest minds— a spark that makes a brighter world possible.

Sincerely from your 2023 Editorial Team,

Spencer Jarvis-Frain
Monika Krizic
Bre-Anna Owusu

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Perception of child-produced Polish sibilants: a comparison of native English speakers and Polish Heritage speakers

DAKYUNG RACHEL LIM, B.A

Abstract

The Polish language has a complex sibilant structure when compared to languages like English. Of particular interest here are the alveolo-palatal and retroflex sibilants.

This paper builds on the findings of a production-perception study of Polish sibilants in typical children (Zygis et al., in print) and expands the results by examining English and Heritage Polish population perceptions of Polish children's productions. The Zygis et al. study examined Polish children's perception of their own production and adults' productions. Their study acquired recordings of 80 Polish children aged 35–106 months producing words with /s, ʂ, ɕ/. They then had to choose between three images (corresponding to Polish words, e.g.: *kasa* for cash register) to indicate the stimuli they heard. Their study found that there were a number of acoustic parameters that children used to identify sibilants.

For the present study, we want to explore the perception of these sibilants for different phonetic environments and for non-native listener populations. The three phonetic conditions included: the whole word as in the original study, the isolated sibilant, and the (isolated) sibilant together with the preceding vowel. Edited audio was played to native English and Polish Heritage listeners to determine the perception of the three-way Polish sibilant distinction. A total of 37 English and 10 Heritage listeners participated in the study. It was hypothesized that the English native listeners would categorize all Polish alveolars as (English) alveolars, but it was not clear how retroflex and alveolo-palatal contrasts from the children's complex productions would be resolved by the English listeners. It was further assumed that the perception of stimuli with vowel transitions (e.g., /kasa/ and /as/ in contrast to isolated /s/) would significantly differ when comparing English listeners and Polish Heritage listeners. In our results, English participants increasingly categorized all manipulations of /s/ as /s/ and /ɕ/ as the /ʃ/ sibilant especially with the older children. Phonetic information in the form of formants (on top of the spectral noise) did not significantly improve sibilant distinction for the English participants. The Polish Heritage speakers showed difficulty in correctly identifying /ʂ/ variations especially in the older children. Phonetic environment and age had varying effects depending on the sibilant.

1. Introduction

1.1. Sibilant acquisition for typical children

Defining what is considered typical in children's development clarifies the expectations for progress and acquisition at specific age ranges. McLeod et al.'s (2007) meta-analysis observed that typical acquisition of sibilants starts at 3 years of age but is accompanied by phonological

processes, mistakes, and a sibilant lisp[1]. It is to be expected that these phonemes will be fully acquired later on in life as speech acquisition continually develops throughout one's life. Studies that target child speech (such as Li & Munson, 2016; Hardcastle & Gibbon, 2018, and others mentioned by Miodonska et al., 2022) face the issue of inter-speaker variability. Comparative analyses have focused on intra-speaker variation, and even in inter-speaker circumstances, the population has been homogenous. One of the aims of the study presented in this thesis is to analyze the variance among the Polish children's participants as well as the perception of the English participants. Minczakiewicz (2017) found that, similar to the English children, 30% of Polish children had sigmatism (lisps) during their early school years. This is interesting to note as the stimuli used for our study consisted of early school age Polish children. The fact of sibilant lisps and difficulty in acquisition will have an influence on the perception results of the children's sibilant productions.

1.2. Analyzing the Stimuli of Sibilant Perception Tasks

Previous studies into sibilant perception have focused on sibilants in isolation, CV(Consonant-Vowel) pairs, or sibilants embedded within a word, but rarely inclusive of all three conditions. Li and Munson's (2016) study found that there was no significant effect of the vowels (and therefore formants) in perception accuracy. By manipulating the stimuli to have VC pairs instead of the typical CV order, we can observe effects of the preceding transitioning vowel formants on the proceeding sibilant's perception. It will be noteworthy to compare the results from our own study to see if there are any significant differences in the vowels for the same VC phonetic conditions.

1.3. Non- Native (English) Speakers' Perception and Categorical decision-making

From birth, humans can discern all possible speech sounds, but this ability narrows according to the parameters of the individual's native language and immediate environment by the first year (Santrock et al., 2021). However, when it comes to production, according to McLeod et al. (2007), children are not fully intelligible to strangers until at least 6 years of age. This is also when their sibilant lisps (for the English children cohort at least) disappear. Taking these facts into consideration, it is of interest to observe how children's speech sounds are perceived by non-natives. One phenomenon to keep in mind is categorical perception, which states that internal categories of the listener will influence their sensory perception (Goldstone and Hendrickson, 2009). Categorical perception accounts for our human need to categorize what we perceive through perceptual adaptations. These adaptations may warp our senses into accentuating or deemphasizing the actual stimuli. Another notion to consider is the difference in "fragile" vs "robust" contrasts, in which the former is stated to

[1] A sibilant lisp is the inability to correctly pronounce sibilants (for instance /s/ and /z/), where the airstream that should normally be directed in the middle of the oral cavity is spilled to the sides (of the tongue) (Speechlanguage-resources).

show "perceptual decline [when] phonetic or phonemic exposure is lacking and are less amendable to training in adulthood" (Polka, 1991), while the latter is easier to modify especially in non-native speakers. Taking all these notions into account, it will be interesting to note the perceptual results of non-native contrasts produced by children.

1.4. Summary and Hypothesis

In summary, the goals of this study are to assess the Polish Heritage speakers' perceptual accuracy of the sibilants in different phonetic environments. We can also observe the perception of native English speakers of this three-way contrast, which does not exist in the English IPA. Altogether, this study will ultimately contribute to the knowledge of Polish sibilant perception for both Heritage speakers and non-native populations.

Based on previous work and literature, we hypothesize that the English native speakers will categorize the /s/ manipulations as /s/ and the other foreign Polish sibilant phonemes as /ʃ/. These results should change in accordance with the age of the informants. As for the participants with Polish fluency (Heritage speakers), we expect better than chance identifications for informants aged 5 years and 6 months to 6 years and 3 months and beyond due to the consideration that children have successfully acquired all phonemes in their native language and the absence of the sibilant lisp (Mcleod, 2007). It remains to be seen if a variation in phonetic environment will affect the perceptual results.

2. Methods

2.1. Experimental design

There were two versions of the experiment with each version consisting of two parts. The first part in each experiment involved the completion of forms which included a questionnaire for the participants. The second part of the experiments involved the speech perception portion. Audio for the speech perception was edited using Praat. The original audio files came from Zygis et al's (2021) experiment of 81 child participants' recordings of three Polish words: [kasa], [kaṣa], and [kaɕa]. The original audio was cut so that there were three versions for each child's recording of each Polish word. Each version had the whole word (unedited from Zygis et al,. in print), the sibilant on its own, and the preceding vowel with the sibilant (VC pair). The program used to design and run the experiment was Gorilla (Cauldron Science, 2016). The first version of the experiment, which we referred to as the English version, started with a practice run, a countdown, then the actual experiment where participants would hear one stimulus and be shown a forced-choice two button option, i.e., the participants had to choose on of the two buttons to proceed. The buttons were labelled: "kasa ls | as" and "kasha | sh | ash" (refer to Figure 1 in Appendix). There was no time limit and the stimuli played automatically within each task screen, with no option for replay. The second version of the experiment, referred to as the Polish version, was similar except for the set-up of the buttons. The set-up was replicated from Zygis et al. (in print) to

ensure consistency. This version of the experiment had the buttons set up with images, no labels, of a cash register, a bowl of groats, and a doll. The set-up took place in a sound treated room (treated with acoustic absorption foam) in the Phonetics Lab in McMaster's ARiEAL C entre. The only exception to this standard set-up was that for some of the paid Polish Heritage participants the location/room where the experiment was conducted was at a restaurant (before and during operating hours, to ensure a quiet environment) but the equipment was the same. This was done due to accessibility issues for these Heritage Polish participants.

2.2. Participants

Participants were recruited using the SONA credit system at McMaster University with the approval of the McMaster Research Ethics Board (MREB) and with additional ARiEAL approval for the paid participants. The criteria for involvement in the English version required participants to be native speakers of English. In total, there were 37 English speaking participants whose data was analyzed. For the Polish version, the criteria included the requirement of some fluency of Polish. The Polish participants were compensated $15 for one hour of the study because they did not qualify for SONA credit bonuses. There were 10 Heritage Polish speakers and three Learners of Polish. Due to the small sample size of our Learners, their data was not included for discussion or analysis.

3. Results

3.1. English Perceptual Proportion Results

Figure 4 exhibits the perception results from the English participants for the response for each fricative (in the order /kaɕa/, /kasa/, and /kaʂa/) in the x-position. The responses, as stated in the methods section for the English group, are divided into /s/ in red (at the bottom) or /ʃ/ in blue (stacked on top). The y-axis shows proportions out of the total responses for each fricative. The correlating response counts are displayed for each response bar. Each plot is labe led with the stimulus condition in this exact order: Sibilants, VC pair, and word. We observe that across all stimulus conditions, as expected, that the Polish /kasa/ fricative had the highest number of English /s/ response proportion. The /s/ responses were all above 75% of the total responses for each stimulus condition. The /kaɕa/ fricativ showed the lowest proportion for /s/ perception (less than 25% of the total), follo ed by the /kaʂa/ fricative with approximately 50% /s/ responses across conditions. The results do not appear to differ significantly between stimulus conditions (i.e., isolated fricative on the left, VC condition in the middle, complete minimal pair word on the right) for the same fricative. Within each fricative, there seems to be a small effect that the sibilant condition seems to render more /s/ responses for /kaɕa/ (Figure 4 far-left plot). The VC pair for /kaɕa/ follows (middle plot) with the word condition being the last (far-right plot). There seems to be a tie for /s/ proportions for the /kasa/ fricative in all conditions. Lastly, for /kaʂa/, the sibilants again, like for /kaɕa/, have the highest /s/ response,

followed by the word stimuli, and then the VC pair being the lowest.

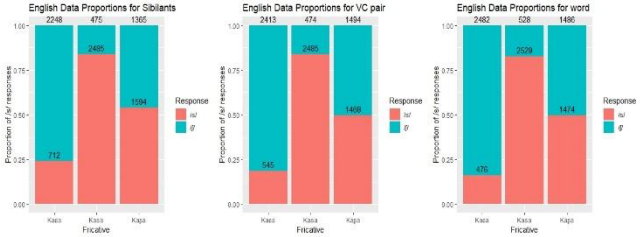

Figure 4: English Perceptual Results.

3.2. English Results with Children's Age Factor

Figures 5 to 7 are similar to Figure 4 but have the additional consideration of the children's ages (of the spoken stimuli presented). The children's ages are sorted according to the groups used in Zygis and colleagues' (in print) paper (refer to Table 1 in Appendix). The stimulus conditions had to be separated due to the ages, and thus each condition had its own array of plots for the three fricatives of interest. The order of the stimulus conditions remains consistent with previous plots, where it is sibilant, VC pair, and word order. In Figure 5, the sibilant conditions for the English participants are displayed, and overall, we can see that /kasa/ elicits the most /s/ responses across all ages. There is a progressive trend as the older children's stimuli are increasingly categorized as /s/ (and less as /ʃ/). In the final age group, Group 5, there are only about 3% /ʃ/ perception responses out of the total stimuli for this age group. On the other hand, the majority of responses for /kaɕa/ resulted in /ʃ/ across all age groups. The proportion for /s/ perception of /kaɕa/, excluding the total, appears to have a general downward trend with increasing age. The age group that has the highest percentage /ʃ/ is as follows: Group 4 (86%), Group 5 (82%), Group 3 (81%), Group 2 (70%), then Group 1 (67%). The results of the English participants' perception show that the /kaɕa/ sibilant stimuli generally sounded more like /ʃ/ in an increasing manner for the voices of older children. For the / kaʂa / fricative, when looking exclusively at the /s/ perceptions, increased age leads to a decrease in /s/ proportion. Thus, conversely, we can see that with increasing age, there is an increase in the /ʃ/ proportions. It appears that before Group 3, the participants perceived the / kaʂa / sibilant stimuli as /s/ representing 69% and 67% of the total in Group 1 and 2, respectively. However, past that age, the results flip to favor the /ʃ/ perception (/s/ of the total for Group 3, 4, 5 = 48%, 40%, 23% respectively).

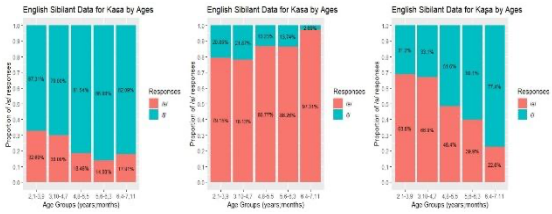

Figure 5: English isolated sibilant Perceptual Responses as a Function of Age Results.

For the VC pair stimulus condition in Figure 6, there is almost no difference for the last two (VC pair and word condition) plots compared to the first plot (isolated sibilant). Thus, the conditions do not seem to have any effect.

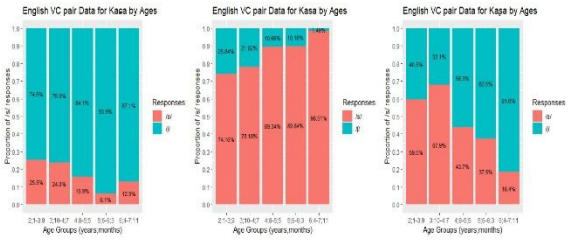

Figure 6: English VC Pair Perceptual Proportions as a Function of Age Results.

In our final word stimuli condition, Figure 7 exhibits the exact same patterns as the previous conditions.

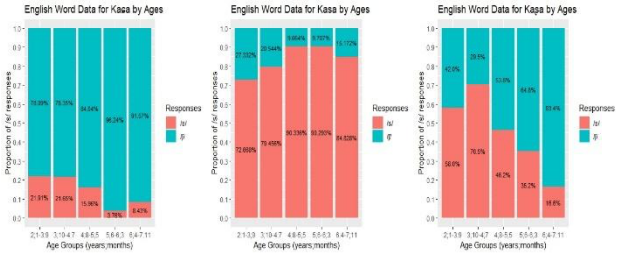

Figure 7: English Word Perceptual Proportions as a Function of Age Results.

3.3. Polish Heritage Speakers Accuracy Results

In this section, we will discuss the results of the Heritage Polish speakers. The plots for the Polish participants depict the proportion of correct responses (accuracy) instead of proportion of responses, unlike in the English plots. The correct responses are on the bottom (teal-colored bar) and incorrect responses are stacked on the top (fuchsia-colored bar).

Figure 8 shows the accuracy of the Polish Heritage speakers for the three fricatives in each stimulus condition. Across all three plots, we can see that the /kasa/ fricative has the highest accuracy, with all values above 60% correct. Within the /kasa/ fricative, the sibilant condition yields the lowest accuracy. The /kasa/ word condition has the highest accuracy, with 75% accuracy. The /kaʂa/ fricative, across all stimuli conditions, shows the highest rate of incorrect responses (below 20% correct responses), indicating the lowest accuracy. The remaining fricative /kaɕa/ exhibits the opposite effect: the sibilant condition had the highest accuracy, while the word condition had the lowest. Therefore, for the fricatives /kasa/ and /kaʂa/ (to a much lesser extent), the more phonetic information does seem to lead to changes in accuracy. However, for /kaɕa/, the presence of additional information actually, surprisingly, results in less accurate responses.

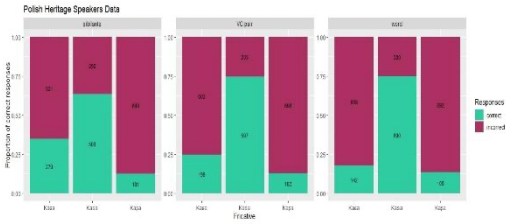

Figure 8: Polish Heritage Speakers Accuracy Results.

3.4. Polish Heritage Speakers with Children's Age Factor

Adding children's ages into consideration, Figures 9 to 11 illustrate the accuracy according to the children's ages for the Polish Heritage speakers. Figure 9 specifically focuses on sibilants for the three fricatives of interest. In the sibilant condition, we observe that the /s/ fricative yields the highest number of correct responses across all age groups, while /kaʂa/ has the lowest accuracy results. When considering proportions, the accuracy appears to rise with age for the /kasa/ sibilants (middle plot). The

accuracy starts at 59% for Group 1 and reaches 76% in Group 5. In contrast, the /kaʂa/ sibilants (right plot) show a reverse pattern where accuracy decreases with increasing age. The correct percentage for the /kaʂa/ sibilant starts at 14% in Group 1 and falls to 10% in the final group. It seems that for this fricative, the older the group the lower the categorization accuracy. There does not appear to be a general pattern for the /kaɕa/ sibilant as the accuracy rates range from 32% to 38% in a seemingly random order. It is worth noting that Group 3 had the most accurate results (38%), while Group 2 and 5 had the lowest (31.67%). However, the difference in accuracy ratings does not appear significant enough to conclusively set apart specific groups. It is noteworthy that this pattern was observed in Figure 8 and 9, where the /kasa/ sibilant had the highest accuracy among the fricatives. Additionally, the fact that the /kaɕa/ fricative in the sibilant condition had average results and the /kaʂa/ fricative had the lowest accuracy remains consistent in all the figures (8 and 9) so far.

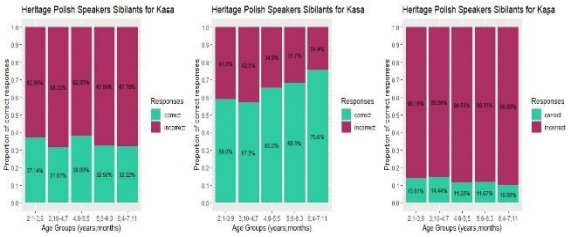

Figure 9: Polish Heritage isolated sibilant Accuracy as a Function of Age Results.

In Figure 10, the VC condition, the overall pattern remains, with /kasa/ exhibiting the highest accuracy and /kaʂa/ the lowest. There is a deviation in the /kasa/ accuracy for Group 3 (84%), but the accuracy generally increases with Group 5 peaking at 94% accuracy.

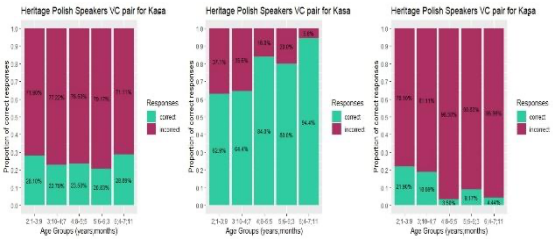

Figure 10: Polish Heritage VC Pair Accuracy as a Function of Age Results.

In Figure 11 word condition, we can observe similar results to the other stimuli conditions. The /kasa/ fricative has the highest accuracy among all the age groups in the word condition. The lowest accuracy in Figure 11 is for the /ʂ/ fricative. Previously, the pattern for /kaʂa/ showed a clear decrease with increased age groups. Figure 11 seems to be an exception as there is a decline from Group 1 (26%) to Group 3 (5%), followed by a small uptake from Group 4 (6%) to Group 5 (7%). The /ʂ/ fricative for the word condition, although the lowest between the fricatives, yielded the highest results among the stimulus conditions. Lastly, the /ɕ/ fricative appears to finally have a noticeable trend. There was no clear pattern in other figures, but for Figure 11's word condition, a discerni ble trend emerges. With the exception of Group 4 (13% accuracy), the increase in age groups resulted in a decrease in accuracy for the /kaɕa/ word condition.

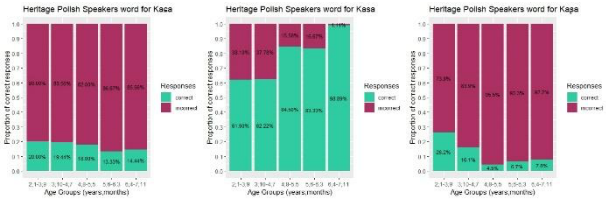

Figure 11: Polish Heritage Word Accuracy as a Function of Age Results.

4. Discussion

4.1. Heritage Speakers and Children's Ages

Across all stimulus conditions (isolated sibilant, VC pair, word), /kaʂa/ exhibited the lowest accuracy with less than 25% correct responses. This aligns with the child stimulus results from Zygis et al (in print), where /kaʂa/ also had the lowest overall accurateness (Figure 12 from Zygis et al., in print) with percentages ranging between 50-75%. However, our results showed improvement with the addition of phonetic information. From the isolated sibilant to the whole word (see Figure 8), there was a very small increase in accuracy for /kaʂa/. The sibilant variations of /kasa/ in our study showed an increase in accuracy, while /kaɕa/ showed a decrease with increased phonetic information. Therefore, the claim by Bukmaier and Harrington (2016) regarding the difficulty in /ʂ/ identification being connected to the weak articulatory and acoustic information is not evident from our results. Furthermore, contrary to previous studies which concluded that the addition of phonetic information, such as preceding vowel formants, did not lead to improved perception, our results demonstrated an improvement (with the exception of /ɕ/). It is interesting to note that the /ɕ/ sibilant, which was acquired first, did not have the highest accuracy in our study (Figure 8 accuracy ranged from 18-35%). Our results (Figure 8) showed that /kasa/ had the highest accuracy, with all responses well above 33.3% chance accuracy. This difference in accuracy may be a result of the interaction between English and Polish phonology for our Polish Heritage participants. Since the English language lacks the other two sibilants (/ʂ/ and /ɕ/), the increased exposure to the common /s/ phoneme in both languages results in greater familiarity and confidence for all the /s/ conditions. This supports Polka's (1991) "fragile" contrast. The Polish children in Zygis et al.'s study (in print) had less exposure to /s/ compared to the /ɕ/ sibilant and to those with English fluency. This is attributed to their social and linguistic environments in Poland, where obviously English is not as common as it is in Canada. Native Polish child participants heavily relied on spectral properties, particularly centre of gravity (COG), for distinguishing /s/ and /ʂ/ (Zygis et al., in print). However, it was for the /ɕ/ sibilant that the formants, specifically the "F2 of preceding and following vowels," provided the most crucial cues for perception (Zygis et al., in print). In our own study, we observed the opposite effect, where there was a greater reliance on formants for /s/ and /ʂ/, and an increased confidence in spectral cues for /ɕ/. The native Polish children in Zygis et al. (in print) performed well with spectral properties for /s/ and /ʂ/, while relying more on formants for /ɕ/. On the other hand, the Polish (adult) Heritage speakers in our study exhibited lower accuracy with spectral properties for /s/ and /ʂ/ and less confidence in utilizing formants for /ɕ/.

McLeod (2007) found that by the age of 6, children's intelligibility improves with the outgrowing of the sibilant lisp. The increase in intelligibility corresponds with our findings for /kasa/, as we observed that the youngest children's productions in Group 1 and 2 (under 4 years 8 months)

were the most difficult to distinguish; had the lowest accuracy. Group 3 and older children's productions exhibited significant improvements in precision especially with more phonetic information. We observed the opposite trend for /kaʂa/, where older children's productions resulted in less accurate distinctions (refer to figures in results). This can be explained by the limited exposure our Polish Heritage speakers had to /ʂ/ and even less exposure to the specific word "kaʂa" (meaning "groats", which is not common in the Canadian English vocabulary)[2]. Based on Polka's (1991) concept of fragile contrast, since our Heritage speakers spent more time using English due to their sociolinguistic environment, their contrasts are "less amendable to training in adulthood". Additionally, younger children tend to speak more slowly, often drawing out each phoneme, due to their underdeveloped articulators compared to the older children (McLeod, 2007). This is especially true for phonemes that pose difficulties, such as the last acquired /ʂ/ sibilant contrast. The slight difference in stimulus exposure (for the participants) can explain the higher accuracy observed in the younger children's productions. This relates to Polka's (1991) concept of exposure in fragile contrasts. Even if it is a matter of seconds between stimuli, the additional time and exposure may have contributed to an improvement in perception. No clear age pattern emerges for /kaɕa/ (see figures in results). Once again, this aligns with how spectral properties provide the most reliable cues for Heritage speakers, similar to how English native speakers perceive the contrast between the two English sibilants, which is purely based on spectral information and not at all based on formant transitions. The lack of age patterns within each /kaɕa/ stimuli condition can be attributed to the lack of exposure in fragile contrasts, as described by Polka (1991,) or the process of child speech acquisition, as discussed by McLeod (2007). Therefore, considering that /ɕ/ is the first sibilant contrast to be acquired in Polish, native Polish children would not be struggling to articulate this phoneme compared to /ʂ/. However, since our Polish Heritage speakers would have acquired /ɕ/ first, having more familiarity and exposure to it, their perceptions resulted in average accuracies for /kaɕa/ in our study. We can confirm that our hypothesis holds true for the /kasa/ manipulations. The other two sibilants did not support our hypothesis, as their accuracies remained below 33.3% chance despite increasing ages.

4.2. English Speakers and a Comparison

The analysis of the English participants is based solely on choice proportions and not accuracy. Across stimuli conditions (refer to Figure 4), it appears that the addition of phonetic information (e.g., formants added to the spectra noise) did not significantly influence the categorization of the sibilants. This confirms part of our hypothesis that /s/ variations would be categorized as /s/ and the other two Polish sibilants as /ʃ/. It is interesting to note that /kaɕa/ word variations had the highest proportion of

[2] Terms like "kaʂa" for groats is most likely used by Polish speakers that practice Polish cuisine as many dishes can be translated into "kaʂa" (ex: buckwheat, cornmeal, etc.). They may be familiar with this word if this is the case (Stroinska, 2023).

/ʃ/ perceptions, despite /ʂ/ (retroflex) being closer in place of articulation to the post-alveolar English fricative /ʃ/. Perhaps this can be attributed to the fact that the alveolo-palatal fricative /ɕ/ is further back in articulation, making /ɕ/ perceptions more favored towards /ʃ/ rather than /s/. Contrary to our hypothesis, the retroflex /kaʂa/ produced mixed results, with approximately equal proportions of /s/ and /ʃ/ perceptions, hovering around 50%. Further addition of (following or preceding vowel) formants to spectral noise did not significantly affect the distinctions, as the average /s/ proportions remained steady. The proximity of the place of articulation to the two phoneme options (/s/ and /ʃ/) to the retroflex fricative could explain why the results were split around 50%. It could be that the retroflex, in comparison, was perceived to be centered around the alveolar-postalveolar region of the mouth. The English participants' categorical perception appears to be established for /kasa/ and /kaɕa/, but variable for /kaʂa/. It may be that despite having the established /s/ vs /ʃ/ categories, English participants recognize that /kaʂa/ needs another category (or at least that it cannot be placed into just one of these already established ones). Our results show that the English participants did well in distinguishing that the alveolo-palatal /ɕ/ was different from /s/. However, they struggled with the retroflex /ʂ/, which may indicate a need for another category in the experimental design (which, of course, is methodologically difficult). Spectral noise and formant transitions, which were stated to be vital for Padgett and Zygis (2010), were decisive factors for the categorizations of /kasa/ and /kaɕa/ in our study, but not as much for /kaʂa/. Additional phonetic information, beyond the preceding formant, evidently influences mainly the /kaɕa/ perceptions. Altogether, the preceding vowel formant in addition to the spectral noise is evidently not a vital cue for the English participants' perception. The effect of additional phonetic information to perception is very minimal.

Factoring in the children's ages showed increasing confidence in /s/ categorizations for /kasa/. The highest /s/ categorization is at the VC pair level, which again indicates more cues from preceding vowel formants rather than the following vowel formants and spectral noise. However, at the word level, /kasa/ saw a small drop in its average, where /s/ accounted for 86% of the total at the VC pair level and 83% at the whole word. The lowest /s/ categorization (thus highest /ʃ/ selection) is observed in /kaɕa/ and decreases with the older age groups. The same pattern is seen in /kaʂa/ with the older age groups. As the younger children exhibit a sibilant lisp along with lengthened articulations, the sibilants may sound more like /s/ to some extent. Nonetheless, it is evident that in Group 3 (beyond 5 years), with the disappearance of the lisp and more adult-like articulations, perceptions overwhelmingly lean toward /ʃ/. In section 3.2 (Figures 5 to 7), we can see a high /s/ distinction (more than 50% chance) for Groups 1 and 2 for /kaʂa/. However, there is a clear shift in Group 3, as /s/ selections drop below chance (50%) across /kaʂa/ stimuli conditions. Thus, the more matured

articulatory development of the children appears to increase sibilant perception.

5. Conclusion

Our data showed that more phonetic information (formants in addition to spectral noise) did not significantly influence English participants' perception. The English participants had an established perception of /kasa/ and /kaɕa/ but was uncertain for /kaʂa/. However, increasing the age of the children in the stimuli, around the 5-year mark with the sibilant lisp disappearance, greatly shifted the perception (from /s/ to /ʃ/). A change in stimulus conditions and increasing ages seem to have varied effects on selective sibilants for Polish participants. The addition of formants (to existing spectral noise) increased accuracy for the /s/ sibilant but decreased for /ɕ/ (and minimal effects for /ʂ/). Increasing the age for the Polish Heritage speakers showed significant improvement in accuracy (for /s/), or its decline (for /ʂ/), or no trend (for /ɕ/). Our perceptual results suggest that more formants and spectral noise do not aid Polish-sibilant distinction in English listeners however increasing age does lead to improvements. Adult Heritage Polish listeners rely on different phonetic environments dependent on the sibilant with age also shifting their perception. These results may indicate a broader phonetic process in foreign phoneme perception.

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Appendix

Table 1
Children's age groupings used in the graphs.

	Age (year; month)	Number of children	Number of observations in perception blocks
Group 1	2;11–3;9	21 (9 female, 12 male)	903
Group 2	3;10–4;7	17 (9 female, 8 male)	785
Group 3	4;8–5;5	19 (8 female, 11 male)	884
Group 4	5;6–6;3	12 (7 female, 5 male)	534
Group 5	6;4–7;11	7 (4 female, 3 male)	318

Table 1. From Zygis et al (in print) of Children's Age Groupings respective to their experiment

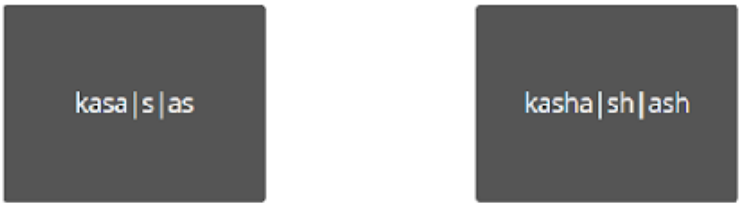

Figure 1: Picture illustrating the two-way forced selection buttons and the labels for the English only participants.

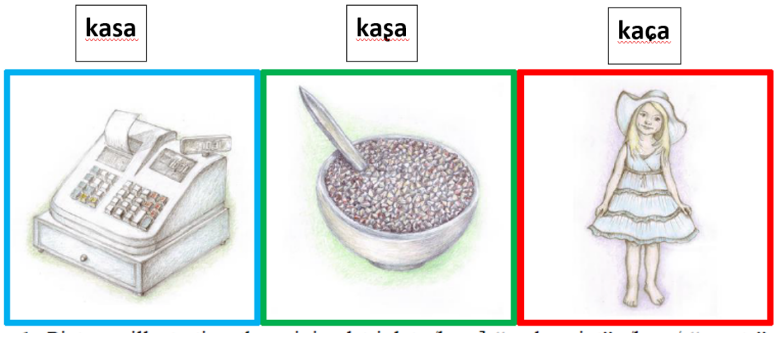

Figure 2: Replica picture, from Zygis et al., (in print), illustrating the minimal triplet: /kasa/ "cash point, /kaʂa/ "groats", and /kaʧa/ "Cathe, prop.name".

Figure 3: Picture of the Testing Setup for all participants

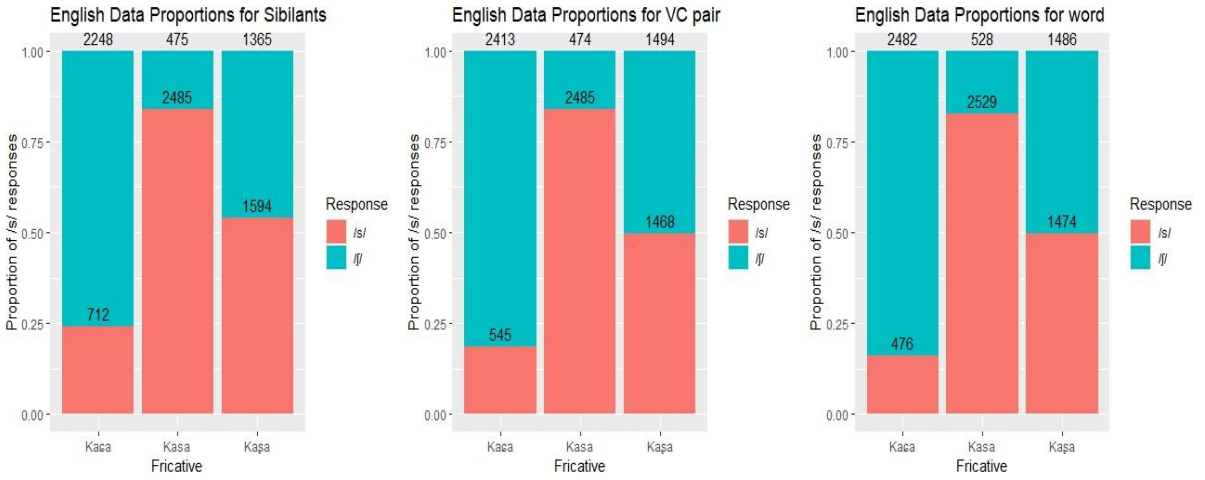

Figure 4: English Perceptual Results. X-axis with the different fricatives (/kaca/, /kasa/, and /kaşa/) and y-axis with the proportion of /s/ responses with the count labels. Response is color coded for each fricative as /s/ or /ʃ/.

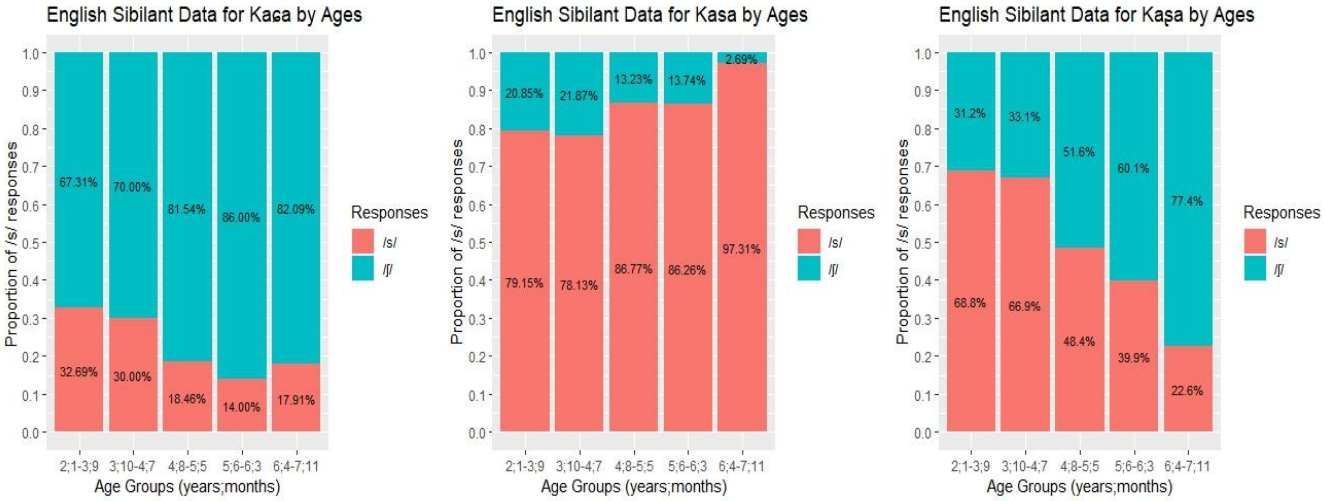

Figure 5: English Sibilant Perceptual Responses as a Function of Age Results. X-axis with the different age Groups and y-axis with the response proportions. Response is color coded for each fricative as /s/ or /ʃ/. Each plot shows sibilant perceptions for respective fricatives (/kaca/, /kasa/, and /kaşa/).

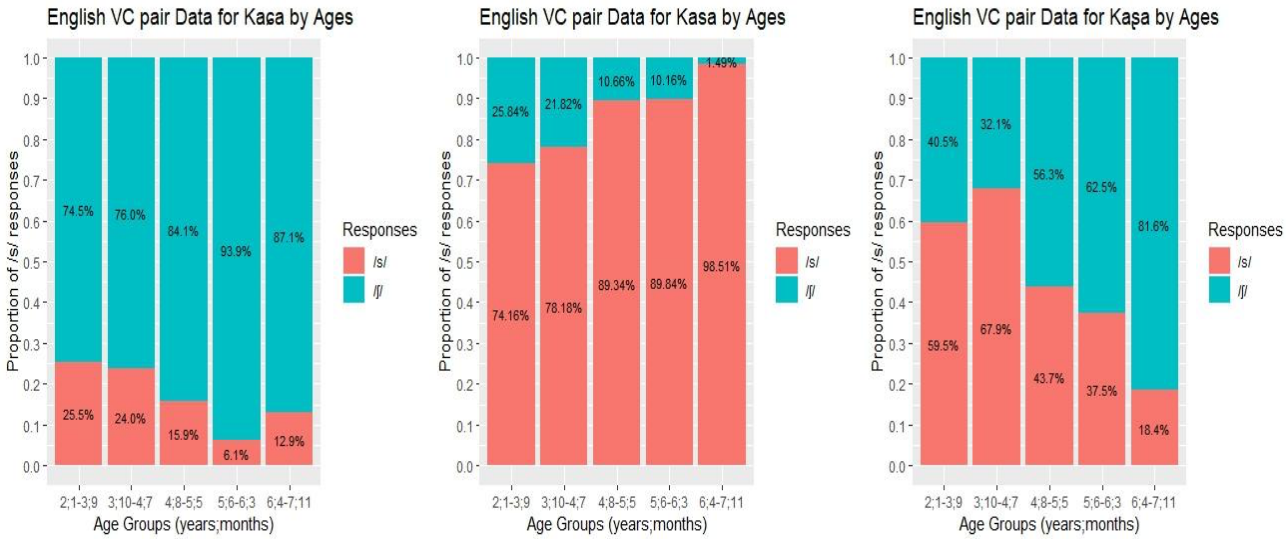

Figure 6: English VC pair Perceptual Proportions as a Function of Age Results. X-axis with the different age Groups and y-axis with the response proportions. Response is color coded for each fricative as /s/ or /ʃ/. Each plot shows VC pair perceptions for respective fricatives (/kaɕa/, /kasa/, and /kaʂa/)

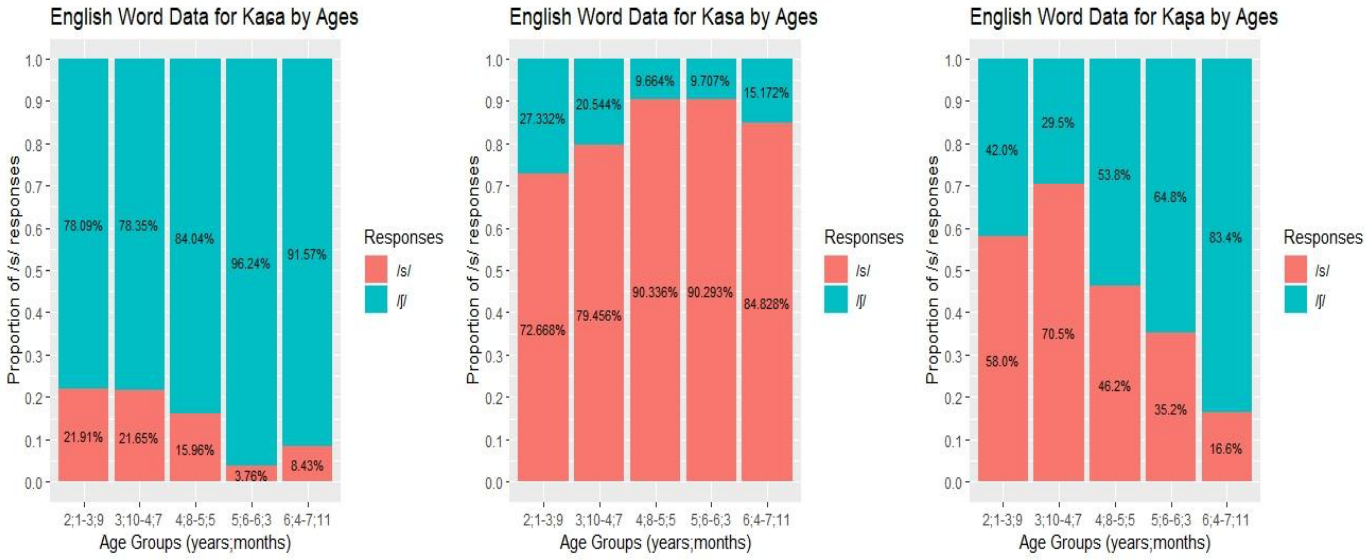

Figure 7: English Word Perceptual Proportions as a Function of Age Results. X-axis with the different age Groups and y-axis with the response proportions. Response is color coded for each fricative as /s/ or /ʃ/. Each plot shows word perceptions for respective fricatives (/kaɕa/, /kasa/, and /kaʂa/)

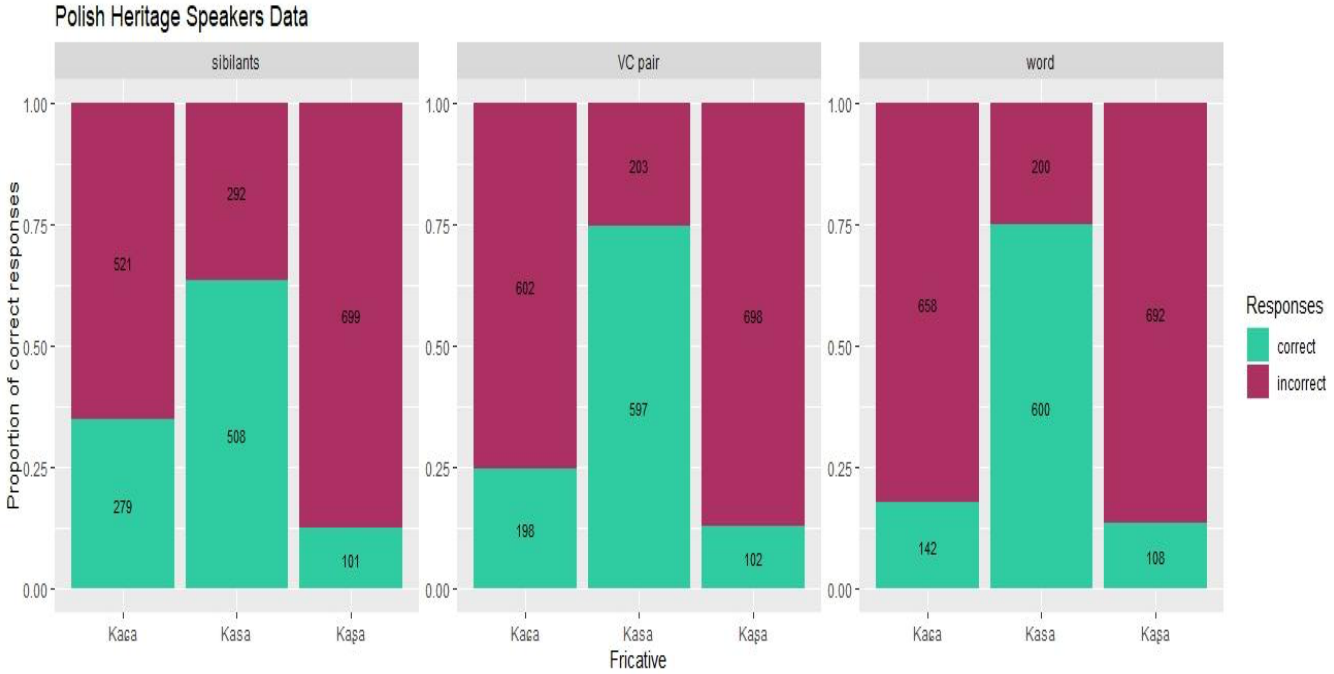

Figure 8: Polish Heritage Speakers Accuracy Results. X-axis with the different fricatives (/kaɕa/, /kasa/, and /kaʂa/) and y-axis with the accuracy in percentage scales. Response is color coded for each fricative as correct (bottom teal bar) or incorrect (top

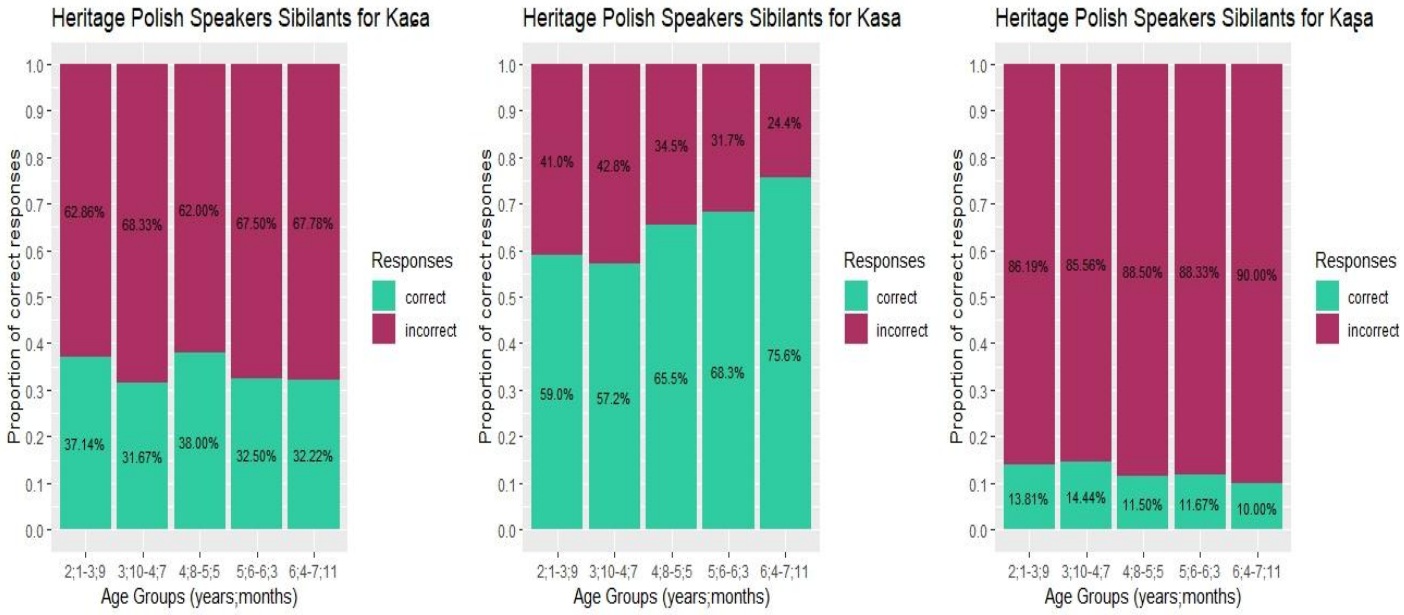

Figure 9: Polish Heritage Sibilant Accuracy as a Function of Age Results. X-axis with the different age groups and y-axis with the accuracy response percentages. Response is color coded for each fricative as correct (bottom teal bar) or incorrect (top fuchsia bar). Each plot shows sibilant perceptions for respective fricatives (/kaɕa/, /kasa/, and /kaṣa/)

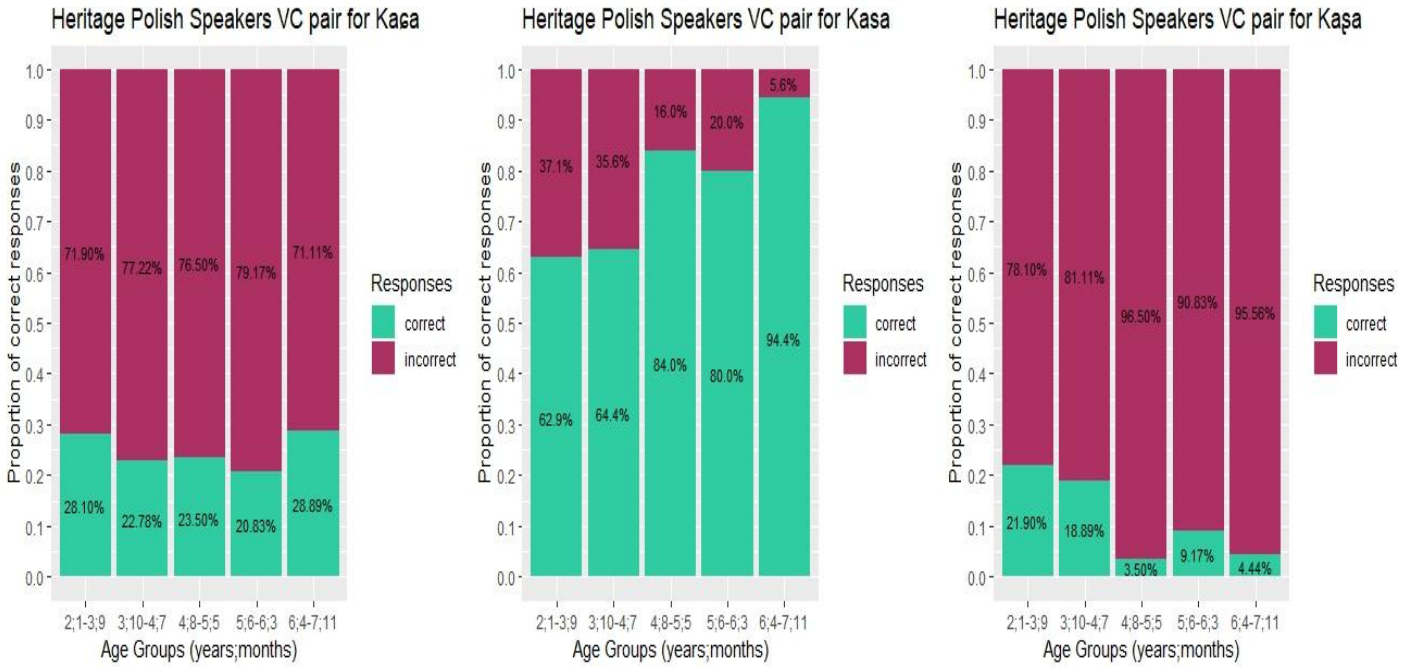

Figure 10: Polish Heritage VC Pair Accuracy as a Function of Age Results. X-axis with the different age groups and y-axis with the accuracy response percentages. Response is color coded for each fricative as correct (bottom teal bar) or incorrect (top fuchsia bar). Each plot shows VC pair perceptions for respective fricatives (/kaɕa/, /kasa/, and /kaṣa/)

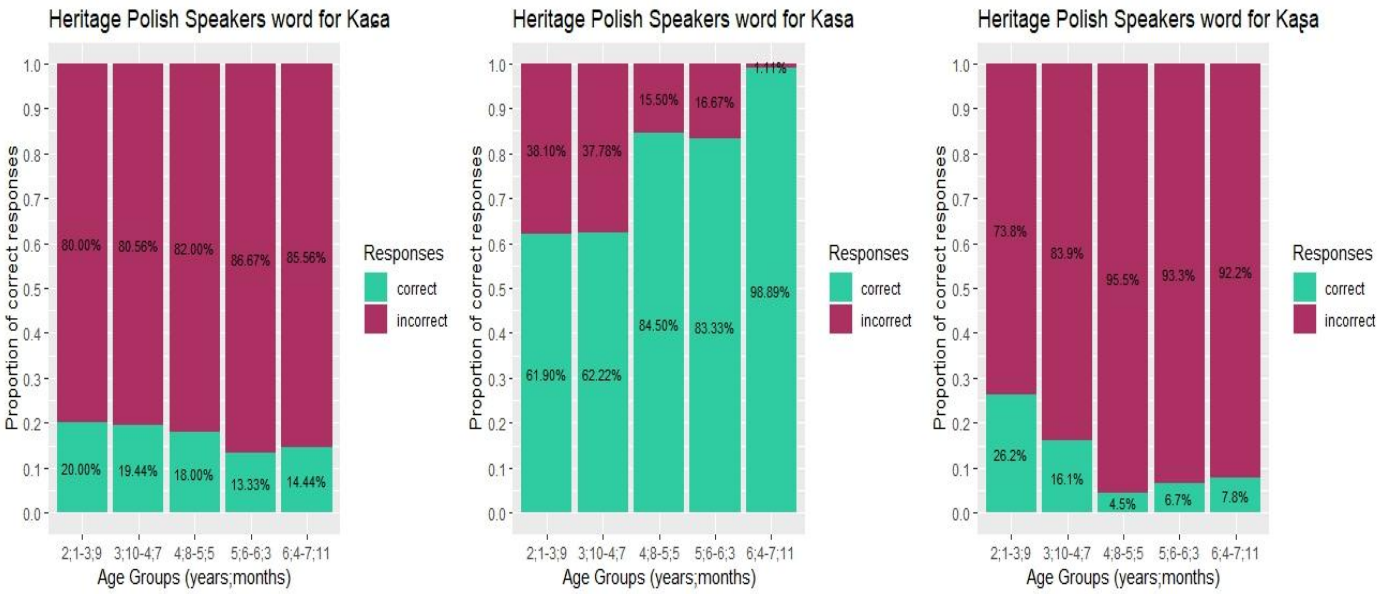

Figure 11: Polish Heritage Word Accuracy as a Function of Age Results. X-axis with the different age groups and y-axis with the accuracy response percentages. Response is color coded for each fricative as correct (bottom teal bar) or incorrect (top fuchsia bar). Each plot shows word perceptions for respective fricatives (/kaɕa/, /kasa/, and /kaʂa/)

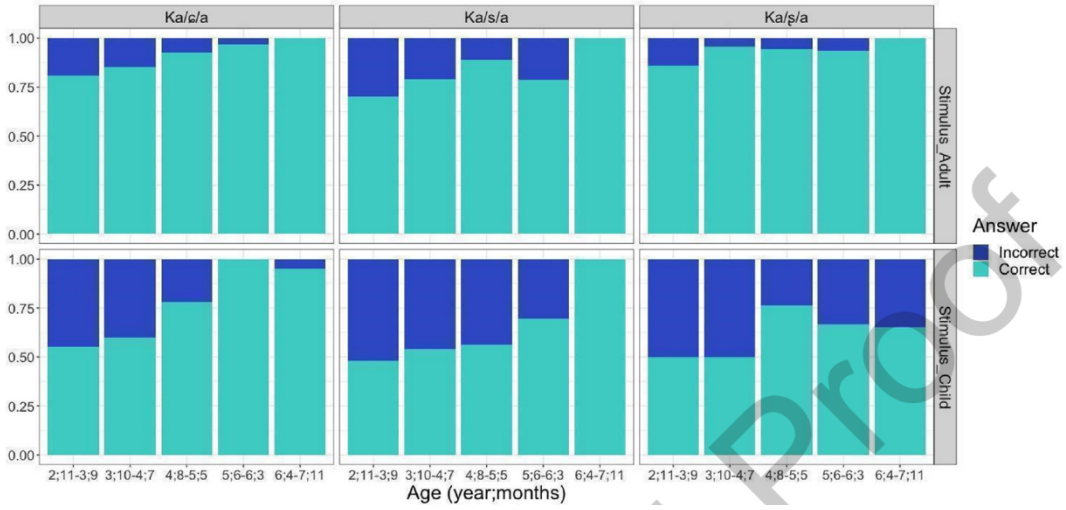

Figure 12: (From Zygis et al., in print) Proportion of correct/incorrect answers as a function of the STIMULUS TYPE (Adult, child) and AGE for the word-medial contrast

Developing New Methods of Museum Storytelling: A Linguistic Critique of Modern Museums

ALEEM MOHAMMED

Abstract

While the narrative of museums is predicated upon notions of preservation and education, the history of the modern museum rather reflects a want for spectacle, isolating material culture from intangible histories. As Western culture has begun to problematize the colonial history embedded within societal structures, so too should museums and other tourist spaces do the same. Within southern Ontario, the politico-economic situation which surrounds museum curation has hindered progress in presenting accurate cultural representations. As a survival mechanism, modern museums still capitalize upon the notion of spectacle and employ language which decontextualizes history and heritage. Through the ethnographic field method of polymorphous engagement as well as sociolinguistic methods of discourse and text analysis, I examine various museum spaces around southern Ontario on their effectiveness in representing marginalized cultures and histories compared to representing settler-colonial culture and history. I intend to challenge the premise of the modern museum and highlight the various ways in which the 'post' museum could manifest despite neoliberal pressures, arguing for a more concerted effort to integrate alternative museum styles into the modern museum model.

The Modern Museum

The modern museum is a place of memory and story. Modern museums are physical or digital collections of cultural artefacts in which tourists can experience times and places they otherwise cannot. While seemingly economically invaluable, museums are best described as places which encapsulate the beauty in culture for the world to see; they preserve materials and demystify history and heritage to tourists and locals alike. Modern museums are truly impressive sites which embolden the human experience and reinforce the value of ancient and modern peoples near and far.

That is, this is what they are perceived to be anyway. Despite the historical and cultural grandeur imposed upon the modern museum, the museum institution does a less-than-stellar job living up to this image. Though there have been efforts to correct wrongs, modern museums in the West have been known to falter in their representations of foreign, particularly non-white, cultures. The use of outdated language, the mistreatment of artefacts, and the robbery of said artefacts from their home cultures all obstruct museums from achieving accurate and meaningful representation. What confounds the situation is that many of the largest museums are for-profit organizations. Government funding and public donations support modern museums, larger museums also generate revenue through ticket sales and merchandise (Tegomoh 2007). Because of this, capitalist economic

pressures play a direct role in modern museum curation (Hein and Alexander 1998; Tegomoh 2007); the museum must appeal to their audiences in order to justify their existence. Neoliberal ideologies of capital and economic value have forced museums into a position wherein culture becomes spectacle. Criticisms of these issues are nothing new, from as early as the 1980s (Associated Press 1996; Hong 2016) to as recent as March 2023 (Cheam-Shapiro 2023), both scholars and locals have argued against the methodologies and priorities of the modern museum.

Much of the cultural issues found within modern museums come as a result of the neoliberal ideologies which inform what museums can display and how to be granted funding and patronage. Because of these processes, modern museums must be "productive, relevant, measurable, and useful" for the sake of funding (Kundu and Kalin, 2015). This study aims to combat the neoliberal politics which exploits the modern museum and seeks ways in which accurate cultural representations can exist regardless of politico-economic pressures. Continuing the work of Chris Healy, Graham Dann, John Urry, and many of my contemporaries, my thesis intends to provide a synthesized sociolinguistic and anthropological examination of the modern museum and alternative museums to further improve their role as places of social memory, cultural representation, and cultural preservation in hopes of creating a new 'post museum.'

A Historical Overview of the Modern Museum

The modern museum follows a style of memory collection which stems from the English-born 'Cabinets of Curiosity' of the eighteenth century (Bennett 1995). Also called 'Wonder Rooms' (Goodrich 1822), these spaces were based upon colonialist ideologies of ownership of materialism. Much like the modern museum, the Cabinet of Curiosity acted as a representation of the world. They held physical mementoes of European international travels into Africa, Asia, and the Americas (Goodrich 1822; Cohen 2022). Wealthy European colonialists, or tourists, would steal objects from other cultures and collect them in a room for other elite members of society to enjoy.

What is important to note here is that the Cabinets of Curiosity, while considered educational, were not really places of memory or storytelling, at least not in the same sense that modern-day museums are. Artefacts gathered by colonialists were not categorized by culture or region, nor were they given descriptions or linked with stories of where they came from. Rather, items would be grouped by senses (Alexander 2017). Markedly, items in a collection would be grouped based on what they looked like; if it looked like a mask, it would go with other masks, even if they were not masks at all. This ocular-centrism, the prioritization of sight, was emblematic of the Cabinets of Curiosity, which carries on into the modern museums we visit today (Alexander 2017). While interest in foreign artefacts would naturally lead to a want to learn more and preserve them, the priority was to be able to see and

hold these items. Regardless of the context which surrounded cultural artefacts, the precedence was centred around seeing the object, everything else comes after (Alexander 2017). Born from this tradition is the modern museum (Hein and Alexander 1998).

I do want to mention that ancient museum traditions, such as those in ancient Greece, Egypt, and Babylon, have had influences on the modern museum institution, as they did with Cabinets of Curiosity. The word museum itself is etymologically related to 'muse' and comes from a temple dedicated to the nine muses of Hellenistic mythology (Young and Braziel 2007; Oxford University Press 2023a). However, aspects of modern museums, such as the prioritization of white European epistemologies, ocular-centrism, and the specific goal to cultivate collections of foreign objects do not stem from ancient museums; Ennigaldi-Nanna may have been the progenitor of the museum (Cohen 2022), however, she was not the progenitor of the modern museum.

I would also be remised not to mention that there are active attempts to better link the objects on display with the place of origin and intangible history as well as use accurate, emotional, and representative language. Axiological and epistemological changes in academic anthropology, archaeology, and history have greatly transformed how museums conduct processes; internationalized efforts of women (Gerson 2023), persons of colour (Young and Braziel 2007), queer folks (Catlin 2022), and disabled peoples (Bouton 2023) have forever changed museology and the modern museum for the better. However, while the distance between the visual aspect and the educational and preservative aspects has considerably shrunk, there is still a lot more work that can be done.

Sociolinguistic and Anthropological Theory-crafting

To contextualize the research I conducted for my thesis, I first need to define terms within the anthropological and sociolinguistic framework in which I will be using them. Some of these terms stem from long-standing anthropological theory, and others are my own proposal to help further the field of museology and the anthropology of tourism.

Neutralization

Neutralization is the process of choosing words and grammar which would convey as little emotion as possible. While the theory is yet to be clearly defined in the literature, neutralization is used across many different fields. Those in forensics (Kieffer and Sloan 2009) as well as corporate and marketing linguists (CivicPlus n.d.) describe neutralization as a method of appealing to as many people as possible by making situations seem more neutral than they are. This style of language is used in propaganda as well; the very term 'neutralize (targets)' is often used in place of 'kill (people)' to subdue emotional reactions. As I will explore further in this paper, modern museums tend to prioritize this neutral linguistic style over adding emotionality; natural history and human

history displays use the same language style. This is done to reinforce the type of storytelling modern museums want to convey, one rooted in the objectivist, scientific tradition.

Amnesia and (Imperial) Nostalgia

Nostalgia is generally defined as, "sentimental longing for or regretful memory of a period of the past, especially one in an individual's own lifetime; (also) sentimental imagining or evocation of a period of the past." (Oxford University Press 2023b). In simpler terms, nostalgia is a melancholic fondness for the past; it is the wanting to go back to past times, often with the assumption that those times were, in some way, better than the current reality. To problematize this definition, oftentimes the use of this word is predicated upon a certain level of delusion a person must have to feel nostalgia. (Boym 2001; Mitchell 2021). This delusion stems from a form of amnesia. In this context, Amnesia is the lack of memory. More intense than nostalgia, amnesia is forgetting, partially or entirely, a series of events and the emotions felt as a result.

Whether brought about by ignorance or arrogance, modern museums leave out certain information about a culture when curating the stories they want to tell. Because of this, certain ideologies and histories are heavily detailed with others being completely forgotten (Mozaffari 2007; Watson 2007; Young and Braziel 2007). Nostalgia and amnesia go hand-in-hand with neutralization when creating spaces of cultural memory and identity. To create nostalgia, there must be a misconstruction, or outright forgetting, of the past (Boym 2001; Young and Braziel 2007; Mitchell 2021). As well, language with negative connotations takes away from evoking nostalgia. It is not just a misconstruction of the past, there seems to be a building of imaginary pasts as well (Young and Braziel 2007). The fundamental way museums represent culture and history or how individual items curated play off of not just a want to evoke a nostalgic past, but to build a new past. One that is not *mis*construction but, rather, *re*construction.

Anemoia

Anemoia is a concept I have been exploring as a potential new term which can better illustrate the nuances of neocolonialism, cultural imperialism, and imperialist nostalgia within museum and tourism studies. Anemoia originates as an internet term found first in the *Dictionary of Obscure Sorrows*, a collection of words meant to describe hyper-specific feelings and emotions otherwise not represented by the English lexicon. The entry for Anemoia reads,

> N[oun]. Nostalgia for a time you've never known. Imagine stepping through the frame into a sepia-tinted haze, where you could sit on the side of the road and watch the locals passing by. Who lived and died before any of us arrived here, who sleep in some of the same houses we do, who look up at the same moon, who breathe the same air, feel the same blood in their veins—and live

> in a completely different world (Koenig 2013).

The definition of anemoia is one that eloquently differentiates between fondly remembering a time a person has lived themself, and fondly reminiscing on times that a person has never actually experienced before.

In discussing what a 'post museum' would look like. I intend to explore alternative ways of memory and heritage including heritage sites and living museums. These spaces do not necessarily try to evoke nostalgia for tourists to experience; that is to say, it is not bringing the tourist into a world they are already a part of. They do not meld history into a succinct and conformed timeline of events, nor do they homogenize cultures by creating simplified displays lacking emotionality. Rather, through anemoia, these spaces offer tourists a chance to experience culture and heritage contextualized to their own time and place as best they can. Places which employ anemoia do not try to make places and times relatable or simplistic, they prioritize the emotionality and context of the people being represented for the tourist to the experience.

Methodologies

As is the tradition of sociolinguistics and anthropology, this study relied heavily on corpus analysis and participant observations. This study applies the methodology of polymorphous engagement (Gusterson 1997). Polymorphous engagement is to interact with informants in multiple settings across varying levels of formality and proximity. This includes not only participant observation and interviews, but also written material, pop-cultural analysis, and digital anthropology. This is done to preserve "pragmatic amateurism" (Gusterson 1997).

While in this study I was not able to formally interview any participants, casual conversations, off-hand comments, and question-answer periods in tours were all treated with the same respect. For the tourist, this included comments on displays, questions about the exhibits, and their reactions and emotions thereafter. For the employees, this language analysis included the words they used in describing the culture being presented, if any information was glossed over or left out, and if they had any comments on the way the modern museum or heritage space portrayed culture. Primary sources such as pamphlets, written tour guides, information panels, or any other written promotional and educational material were analyzed for the presence of emotionality as well as nostalgic and anemoic terms. As well, each piece was researched to account for amnesia.

In total, I was able to visit in person the Royal Ontario Museum, the Bata Shoe Museum, the Dundas Museum and Archives, the Bradley House, and the Benares House. These sites focused on both Indigenous and white Canadian histories. In addition to this, I analyzed digital exhibitions from around the world including the Fashion History Museum in Cambridge, Ontario.

Analyzing the Modern Museum

The modern museum I want to discuss in-depth in this paper is the Royal Ontario Museum (ROM) as it perfectly contextualizes the issues present in modern museums. Established in 1912, the ROM stands as Canada's largest museum, encompassing over two hundred thousand square feet with a collection exceeding "13 million artworks, cultural objects and natural history specimens, featured in 40 gallery and exhibition spaces" (*About the Museum* n.d.). Sufficed to say, the ROM is an impressively large institution. This is reflected in the number of visitors as well. On average, the ROM sees hundreds of thousands of visitors every year, with some of its highest numbers coming pre-COVID-19 pandemic reaching up to 1.35 million annual visitors (*ROM Announces* 2017). It is important to note this figure only includes patrons who have visited the physical ROM, as such it does not include any digital attendance figures for digital exhibitions or online tours.

To say that this museum is influential is an understatement. For many in southern Ontario, the ROM is the first, and perhaps only, museum they may visit. Many out-of-province and international tourists will prioritize the ROM as well. Consequently, this leads to the ROM being one of the only sources of museum experiences many people may have. This poses a unique issue for the ROM as compared to other museum spaces in Canada as the museum wants to accommodate as many people as possible. Because of this, designing signage and descriptions in simple or easy English and curating exhibitions which allow for a continuous flow of tourists are prioritized. This would also include choosing exhibitions which appeal to the highest number of people or are currently relevant to the socio-political state of Canada.

The ROM wants to accommodate as many tourists as possible in their exhibitions at the expense of linguistic accuracy, detail, and emotion. A good example of this is the ROM's free Indigenous cultural history exhibit which features art, artefacts, and photographs of Indigenous peoples in Canada with a particular focus on the Anishinaabek and Haudenosaunee peoples of Ontario and Manitoba. This exhibition is meant to be an overview of the cultures and traditions of the people of Turtle Island dating from pre-colonial times to modern-day history. Much of the stories featured in the exhibit centred around the clothing and cultural artefacts of the nation with masks, boats, toys, and maps all on display. As well, many different photographs of white Canadians and Indigenous peoples throughout history were featured.

What was not featured was modern-day Indigenous peoples. Seemingly, the ROM exhibit had chosen to stop the history around the 1900s with one very egregious display. In lieu of any modern-day representations of continuing political struggles, language revitalization efforts, reconciliation efforts, or modern traditions, the ROM chose to centre the display as illustrated in Appendix 1. This display depicts a trio of "Mohawk people using modern-day technology" (Royal Ontario

Museum 2022). Needless to say, this display was not *meant* to be in any way indicative of actual modern-day Mohawk people, however, the ROM did not convey this intention well. The plaque for this display reads,

> Contrary to popular stereotypes, Indigenous cultures are not relics of the past. They have been influenced by over five centuries of contact with European cultures, but they have also retained core values, beliefs, and practices. The challenge for museums is to represent the ongoing interplay of tradition and change that is very much part of living culture (Royal Ontario Museum 2022).

The plaque continues with,

> This life group was installed at the ROM in 1917. The plaster figures were created by Ulrich Dunbar, a sculptor from Washington, D.C. who worked under the direction of W. H. Holmes of the Smithsonian Institution. The ears of corn and clothing for the mannequins were obtained from Haudenosaunee sources in the United States. The figures show domestic activities but omit spiritual or intellectual life. Such static displays give a misleading picture of Indigenous cultures as unchanging, trapped in the past, and out of contact with other groups or historical events. These wrong impressions came to be the image that stayed with visitors beyond the museum doors (Royal Ontario Museum 2022).

During my visit to the museum in October of 2022, the plaque for this particular display was placed on the side of the exhibit lower than eye level for the average person.

Phrases like "…been influenced by… European cultures" and "obtained" (Royal Ontario Museum 2022) are frequently used as euphemisms for 'colonized' and 'stolen.' The use of neutral terms is done to diminish the historical tension of Indigenous people in Canada which stems from a want to promote a specific image of Canada (Dann 2000; Urry and Larsen 2011). Museums will tend to use neutral terms like "contact," "influence," and "obtained" (Royal Ontario Museum 2022) as they do not carry the same emotional weight as words like 'colonize' and 'stole' do.

This example of neutralization also invokes the use of amnesia as a linguistic tool to appeal to the tourist. The exhibition itself had little-to-no mention of the wars between European colonialists and Indigenous peoples, rather, it favoured featuring inter-Indigenous fighting and Indigenous positions within inter-colonial fighting. By doing this, the exhibit suggests to the tourist that Indigenous-colonial fighting was negligible if occurring at all. The use of neutralized language reinforces this narrative as it further suggests that the relationship between the two parties was neutral, not overtly negative, but not overtly positive either. This style of language combines with imperialist nostalgia as it creates an image of a peaceful and mutually

beneficial colonial timeline. This communicates to the tourist that the museum is impartial to the matter and that history is not seen through an 'emotional' lens, but rather a 'practical' or 'objective' lens.

Analyzing Alternative Museums

In contrast to this, I want to highlight the Bradley House and Benares House as alternatives to modern museums: the heritage site. The Bradley House was built in 1830 and was the home to the Bradley family until the death of the patriarch, Lewis Bradley, in 1846. From there it was sold to various families before being given to the Mississauga Heritage Foundation in 1961, with the house being opened for public viewing in 1967 (*Bradley House* n.d.). In comparison, the Benares Historic House was built in 1857 and was home to the Harris and Sayers family up until its donation to the Mississauga Heritage Foundation. The heritage site opened to the public in 1995 (*Benares Historic House* n.d.). These two houses were owned by white colonial families who had high status in the region of modern-day Mississauga. As such, their homes are filled with many opulent and of-the-time items and materials, most of which are still featured in the houses to this day.

The Bradley House was the first site I visited. While there, I was given a tour and had the chance to walk around the grounds, viewing the plaques and art exhibition on display. What surprised me was the amount of Indigenous and black history representation that was featured in their exhibits section. These exhibits detailed the otherwise neglected histories of black migrants during the time of the underground railroad in North America. As well, they detailed the relationship between the colonialists and the Indigenous peoples they bought land from. For the Bradley House to highlight this is a step in the right direction in terms of dismantling amnesia. I want to focus on their Indigenous display as, not only were the signs in English, but had concepts and phrases in a Haudenosaunee language as well. None of the modern museums I visited featured any significant amount of language use outside of English and French. At most, modern museums had the original name for the item on display and any traditions associated with it. In contrast, the Bradley House featured pronunciation and translation guides to accompany their displays.

Though, there were some neutralizing terms I encountered with the tour and the English written material. The term "settler" was still being used and the tour details on the land purchases, while much more in-depth than the records at the ROM, lacked a lot of the cultural context surrounding them. By this I mean, the land purchases were mentioned to happen, but not how or why they happened. As well, though they recognize the Indigenous lands on which the house sits, there is little-to-no mention of the relationship between the families of the Bradley house and the surrounding neighbourhood and the Indigenous peoples.

The Benares House was very similar to this, the house and tour itself were pleasant to

go through as the items were all in contextually accurate spots and the tour guide was very informed on both the history of the Harris and Sayers families as well as the black Canadian family and the other white Canadian families which neighboured the house. As an aside, the Benares House also continues to use "settler," "aboriginal," and "exotic" in their tours and written works.

I think the strengths of the heritage house outweigh the weaknesses in terms of representation and potential cultural education and preservation. Heritage houses offer something modern museums invariably fail to incorporate into their exhibitions: intangible history. Intangible history is all the non-physical aspects of human culture including but not limited to folklore, memories, and conversations, as well as ideas, values, and morals. It is difficult to encapsulate these aspects of human culture in modern museums as their style of display is very isolating. In contrast, heritage houses have all of the items on display in context with every other item, this creates a physical narrative which tells a story on its own (Risnicoff de Gorgas 2001; Lambrum 2007). The presence of a modern toilet and the presence of a chamber pot in the Benares House tells the story of transitioning from old to new technology, and the refusal of some to do so. Or the presence of hand-drawn maps and journal notes on a desk shows how worldly, yet incredibly messy, Lewis Bradley's son was. As well, smell and touch, and even taste, were all incorporated into the tours; the tour guide made fresh bannock for me at the Bradley House and I had the chance to play the piano at the Benares Historic House. This incorporation evokes emotion unlike any other. To be transported to a different world with the use of intangible history embedded within the tangible material makes the experience all the more immersive and the learning experience all the more edifying.

While on these tours, the guides and the written materials around the site used language with reminded tourists that the artefacts on display, as well the stories being told, are of a different time. Careful attention was placed on dating objects and events as well as where they came from. As well, the tour guides were careful to mention the less idyllic truths of each family. This includes the Benares House mentioning Canadian slavery and 'servants,' as well as the Bradley House continuing to share Indigenous and black stories as they relate to their narratives. This careful creation of the past, as well as linking it to the present, is the employment of anemoia. Every aspect of existence is being featured such that the tourists can feel the life on display, rather than just see the life on display.

The Post Museum

There is a certain amount of disconnect between museums and culture. Museums hold the title of educational and preservative spaces, yet modern museums have continued to fail in cultural representation and serving the communities from which they profit. This is because modern museums prioritize the narrative over the represented. Politically,

there is a certain amount of want to create a space which tells a very specific story, funding from the nation-state creates the pressure to please the bureaucratic councils which fund the non-profit modern museum. This manifests as language that plays with amnesia and nostalgia to forge new historical imaginaries; ones which tend to present a world which better conforms to their version of history.

To further problematize the issue, there is a fundamental miscommunication between the Western modern museum and the tourist, one which pervades museum institutions even in this globalized society which promotes equity. Modern museums must operate on a fundamentally flawed notion of culture in which the intangible history is not fully appreciated nor conveyed in favour of the spectacle. To forego this is to forego the wants and needs of the neoliberal politicians and governing bodies which control their funding. As such, they sacrifice anemoic experiences. As we see with the ROM, there are missing pieces in their language and exhibition spaces which create falsified versions of history.

Alternatives to the modern museum do exist. Heritage sites offer their own interpretations as to how to represent culture, past and present, in ways which are both satisfying and edifying to the tourist. Yet, I would argue they, too, are not adequate replacements for the modern museum. Heritage sites, though incredible at incorporating emotionality, intangible history, and placemaking, are limited by the fact that they cannot represent what is not already preserved nor can they accommodate all facets of history; their influence is small. As well, these alternative museums are also severely underfunded as they often do not gain as much donations or grants from the government or non-government organisations to expand and update their expenditures.

The answer is, of course, not black and white. Modern museums have an arduous battle to face if they want to become better places of representation and education. However, I do not see a future in which modern museums survive. Rather, I see a future in which the 'post' museum, a place born from both the modern museum and alternative museums, exists in tandem with other forms of representation, preservation, and education. The 'post' museum, not ruled by the whims of bureaucracy or neoliberalism, would be a place where everyone can be represented. To be honest, this idea of the 'post' museum seems to be a pipe dream. Canada has continued to trend towards forgetting the arts and humanities as important aspects of our culture; more and more can we see heritage sites and museums, both modern and alternative, lose funding based on patronage and perceived importance (Hunt 2023; Global News 2023). Yet, as I have learned more about the efforts of activists and academics in recreating archives and museum spaces, I am hopeful the idea of a 'post' museum can one day become a reality.

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Appendix

Figure 1 – Living Cultures

Linguistics Coding Tools

RENEE BONEY

In the Advanced Programming for Linguistics course, I developed three innovative tools using the R Programming Language to assist linguists and professionals in linguistic-related fields.[1]

Among the tools, one was designed for speech pathologists, and other linguistic-related professionals, while the remaining two catered to the needs of linguistic researchers. These original tools were designed to highlight my skills and build a comprehensive portfolio

Check Your Patient's Progress

The first tool, named "Check Your Patient's Progress," is an interactive ShinyApp intended to aid professionals with monitoring the development of their patients.

For instance, this tool can be especially beneficial for those who are working in the healthcare field. Some professions that could use this tool may be Applied Behaviour Analysis (ABA) therapists, audiologists or speech-language pathologists.

Speech-language pathologists treat speech, communication and swallowing disorders. If a speech-language pathologist has a patient with a stuttering disorder, they can record the frequency of their stuttering onto a CSV file and upload it to the ShinyApp. This CSV file will be organized in a table and graphed.

Here's a code snippet that would allow users to upload their CSV file:

```
tabPanel("Upload File",
                              titlePanel("Uploading Files"),
                              sidebarLayout(
                                  sidebarPanel(
                                      fileInput('file1', 'Choose CSV File',
                                                accept=c('text/csv',
                                                         'text/comma-separated
-values,text/plain',
                                                         '.csv')),

                                      tags$br(),
                                      checkboxInput('header', 'Header', TRUE),
```

[1] If you would like to see my coding portfolio, follow this link: https://illustrious-froyo-5df57d.netlify.app/

```
                                    radioButtons('sep', 'Separator',
                                                 c(Comma=',',


                                                   Tab='\t'),
                                                 ','),


                                    h1("'Header' uses the same subtitles fro
m your CSV Files for each column. If you do not want to see the titles, do no
t select header."),


                                ),
```

My code uses an interface to upload data from CSV files. The app will read the uploaded files and will update the inputs. This also shows how the data will be organized in the table for the user. The user can choose how they would like the data to appear in the table.

Preposition Counter

The second tool, "Preposition Counter," is an R function designed to assist linguists in managing vast datasets by counting the number of prepositions in a sentence. This tool is particularly valuable when dealing with extensive linguistic data.

For instance, if a speech-language pathologist is working with a patient who has a disorder that impacts their preposition use, and the speech-language pathologist would like to know the number of prepositions the patient is using, they can record it and run it through the function prepositions_counter() and learn the exact number of prepositions in a matter of seconds.

The code to create the function is:

```
prepositions_counter <- function(sentence) {

  prepositions <- c("about", "above", "across", "after", "against", "along",
"among", "around", "at", "before", "behind", "below", "beneath", "beside", "b
etween", "beyond", "but", "by", "concerning", "considering", "despite", "down
", "during", "except", "for", "from", "in", "inside", "into", "like", "near",
"of", "off", "on", "onto", "out", "outside", "over", "past", "regarding", "ro
und", "since", "through", "throughout", "to", "toward", "under", "underneath"
, "until", "up", "upon", "with", "within", "without")

  words <- unlist(strsplit(sentence, " "))

  prep_num <- sum(words %in% prepositions)

  return(prep_num)
```

```
}
```

Users can create a sentence and run it in the function preposition_counter(). After running the function, it will return the number of prepositions in the code, for instance:

```
y <- "Today he went out and about He went above and beyond"


prepositions_counter(y) #It will return 4, since there are 4 prepositions in
the string
## [1] 4
```

Stringr Swirl Lesson

Lastly, I created an interactive Swirl Lesson that guides users on utilizing the Stringr Package in R. The Stringr Package enables researchers to efficiently perform pattern-matching tasks on texts or corpora. Researchers can swiftly locate phrases, words, and other elements within large datasets.

The Stringr lessons consists of many different questions, some that are exact answers or multiple choice.

Here's an example of a multiple-choice question in my code:

```
- Class: mult_question

  Output: What does str_subset() return?

  AnswerChoices: word containing the pattern;the pattern;logical vector;numbe
r of instances of the pattern in each word

  CorrectAnswer: word containing the pattern

  AnswerTests: omnitest(correctVal= 'word containing the pattern')

  Hint: Think about patterns!
```

Users can choose between the answers that they believe to be correct. If they do not guess correctly, a hint will be presented. The multiple-choice questions appear in a numbered list and users can enter the number to the corresponding answer. This is what the user will see in the R console:

```
| What does str_subset() return?


1: word containing the pattern
```

```
2: the pattern
3: logical vector
4: number of instances of the pattern in each word
```

Individual differences in rhythmical abilities and short-term memory for language material

Adrienne Yau [1,3], Chelsea Whitwell [2,3], Fiza Ahmad [2,3], Eniola Bode-Akinboye [1,3], Nnenna Utomi [1,3], Elisabet Service [2,3]

1 Department of Psychology, Neuroscience & Behaviour, 2 Department of Linguistics, 3 ARiEAL

Centre for Advanced Research in Experimental & Applied Linguistics

McMaster University

Background

- Individuals vary greatly in their rhythmic abilities despite rhythm being a huge part of daily life.[1]
- Previous studies have suggested a role for domain-general auditory temporal patterns in phonological short-term memory (STM).[2]
- Both speech and music are diverse in their rhythmic patterns. Rhythm in speech can be classified by timed stress, syllable, and mora.[3] While rhythm in music seems to be classified by patterns of tempo and grouping.[4]
- There is no agreed theory about what connects nonverbal auditory patterns to word learning.
- Here, we assess the effect of pitch and temporal grouping on participant performance in a sequence repetition task with short and long beeps (temporal tapping).

Research Questions

1. Does added pitch information (long beeps = lower pitch) or temporal grouping (long and short pauses) affect accuracy of temporal tapping from STM?
2. Does verbal short-term memory for nonsense sentences depend on a person's short-term memory for specific temporal sequences?
3. How does musicality affect accuracy?

Methods

1.

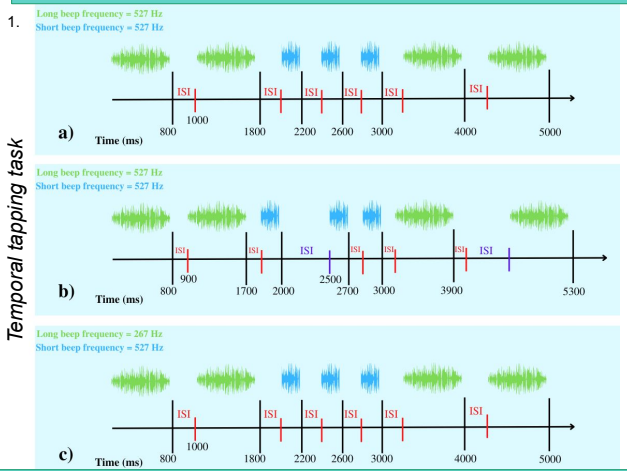


Table 1. English Pseudowords

STM for Language				
ROO	MUTH IN	FANED	IMM	GRASH NIT
KADE	SMOR KETS	NOOLED	OH	GUZ DIN
ROO	NOLK	WINTED	ROO	PRILES

Hypotheses

How well you tap the rhythms should affect how well you repeat the nonsense sentences.

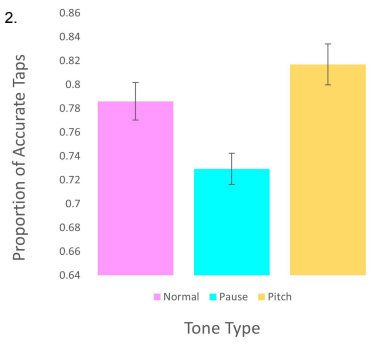
If pauses support verbal short-term memory, there will be a positive correlation between the temporal tapping task and nonsense sentence task.

If pitch patterns support verbal short-term memory, there will be an enhanced positive correlation between the temporal tapping task with added pitch and the nonsense sentence repetition task.

Results

Overall proportion of correct taps (n=38).

2.



Repeated Measures ANOVA Within Subjects

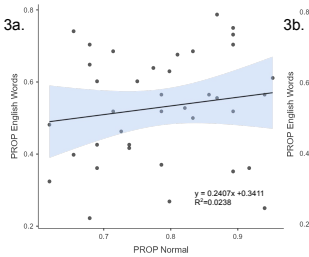
$F(2, 74) = 27.3$, $p < 0.001$, $\eta^2p = 0.425$

Table 2. Post Hoc Test, Bonferroni Correction

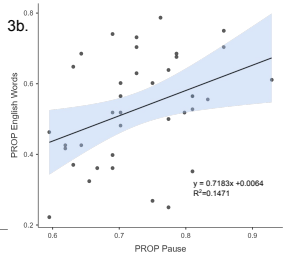
	Pause	Pitch
Normal	*$p_{bonferroni}$ <0.001	$p_{bonferroni}$ =0.063
Pitch	*$p_{bonferroni}$ <0.001	

Correlation between the proportion of correct English pseudowords and short and long taps (n=38).

3a.



3b.



3c.

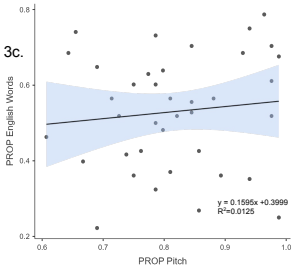
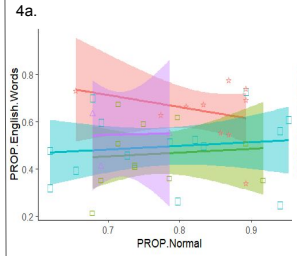


Table 3. Correlations

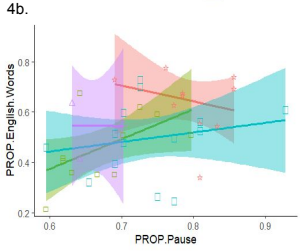
		PROP English Words
Normal	Pearson's r	0.155
	p-value	0.354
	CI 95%	-0.174, 0.452
Pause	Pearson's r	0.383
	p-value	*0.018
	CI 95%	0.072, 0.626
Pitch	Pearson's r	0.112
	p-value	0.504
	CI 95%	-0.216, 0.417

Musicality as a factor (n=38).

4a.



4b.



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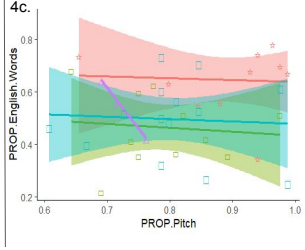

Pitch Block, Factorial Anova

Main effect Musicality $F(3,30)=3.094$, $^*p=0.0417$, $\eta^2p = 0.24$

Main effect PROP Pitch $F(1,30)=0.512$, $p=0.4800$, $\eta^2p = 0.017$

Main effect interaction $F(3,30)=0.382$, $p=0.7665$, $\eta^2p = 0.04$

Table 4. Pairwise comparisons, Fisher's LSD Test

	Beginner	Intermediate	Advanced
No Training	**t(38)=2.478, *p=0.01907**	t(38)=1.525, p=0.1376	**t(38)=-3.007, *p=0.0053)**
Beginner		t(38)=-0.9525, p=0.3485	**t(38)=-5.485, *p=5.931e-06**
Intermediate			**t(38)=-4.532, *p=8.7e-05**

Discussion

1. Temporal grouping affected participant accuracy in the tone task. Grouping tones together decreased accuracy.
2. There was a significant correlation between the accuracy for temporally grouped tones and the proportion of accurately repeated English pseudowords. None of the other tone conditions significantly predicted nonsense sentence recall.
3. Musicality as a main effect was only significant when there was added pitch information. This main effect occurred in 4 group comparisons (no training & beginner), (no training & advanced), (beginner & advanced), (intermediate & advanced).

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Contact us!

Supervisor: eservic@mcmaster.ca

Principal Student Investigator: yaua4@mcmaster.ca or adrienne.yau.19@gmail.com

Graduate Student Help: whitwelc@mcmaster.ca, sheikf12@mcmaster.ca

Volunteers + English Scorers: bodeakie@mcmaster.ca, utomin@mcmaster.ca

Exploring Deontic Modals of Meixian Hakka

Baraneza Pirabagaran
McMaster University

McMaster University
Linguistics & Languages

GOALS

- The **goal of this project** is to examine the expression of modal verbs in Meixian Hakka from a comparative perspective.

- **Meixian Hakka is a variety of Hakka** originating from Meizhou, Guangdong.
- It is underdocumented in its syntax, morphology, & semantics.

METHODS

- There is **no previous literature** in English academia on Meixian Hakka modality
- This project gathered data via **grammaticality judgement tasks** conducted with a native speaker consultant
- Consultant is a **Meixian heritage speaker**, which is their primary home language

BACKGROUND

- Modal verbs are a class of auxiliary verbs that express deontic contexts, including possibility (epistemic/dynamic 'can' – to be able to act) and obligation (deontic 'can' – permission given to act)

- A variety of Hakka that is better studied is **Taiwanese Sixian Hakka** (see Chung 2012)

Modal (English)	Modal (Sixian)	Modal (Meixian)
Can (Deontic)	*(VERB)-tet	koiy-*(VERB)
Can (Abilitative)	voi-*(VERB)	tet (VERB)
Must (Epistemic)	(NO DATA)	yit ting
Must (Deontic)	oi	yit ting oi
Should (Epistemic)	(NO DATA)	ying goi
Should (Deontic)	ingoi	ying goi oi

- Previous studies (Chung 2012) on other varieties analyse modal **OI** uniformly as obligation across Hakka

- However, as shown in the table, I discovered that abilitative and deontic forms map to opposing functions in the two varieties.

QUESTION

Meixian Hakka looks like counter-evidence to Chung's (2012) generalization that "oi" is the sole deontic modal in Hakka. How is deontic obligation expressed in Meixian?

ANALYSIS

1. In other varieties such as Sixian, **OI** is the sole deontic modal for obligation (as described by Chung 2012).

Modal (English)	Modal (Sixian)	Example[1]
Must (Deontic)	oi	Amin oi hi hog-gau. Amin need go school "Amin must go to school."

2. To contrast, I propose that in Meixian, **OI** is a necessary but insufficient component of deontic obligation.

Modal (English)	Modal (Meixian)	Example
Want	oi	Ngai oi set. 1SG want eat "I want to eat."

b. Deontic obligation is expressed periphrastically, by the combination of the epistemic modal AND **OI** in Meixian.

Modal (English)	Modal (Meixian)	Example
Must (Epistemic)	yit ting	Ge'then yit ting shi set fan. 3SG must go eat rice "They must be going to eat."
Must (Deontic)	yit ting oi	N'ziga yit ting oi set. 2SG must eat "You must eat."
Should (Deontic)	ying goi oi	N'ziga ying goi oi set. 2SG should eat "You should eat."

CONCLUSIONS

1. In Meixian, the morpheme **OI** by itself can only express deontic permission.
2. However, the morpheme **OI** is required in all deontic contexts.

LIMITATIONS & FUTURE RESEARCH

1. Unexpectedly, **OI** is ungrammatical in the deontic permissive and obligatory negative in Meixian.

	Modal (English)	Modal (Meixian)	Example
1	Must Not (Deontic)	yit ting m'*(oi)	*N'ziga yit ting m'oi set. 2SG must not-want eat "You must not eat."
2	Should Not (Deontic)	ying goi m'*(oi)	*N'ziga ying goi m'oi set. 2SG should not-want eat "You should not eat."
3	Not Want (Dynamic)	m'oi	N'ziga yit ting m'oi set ma? 2SG must not-want eat WH "Do you absolutely not want to eat?"
4	Not Want (Deontic)	m'*(oi)	*N'ziga m'oi set 2SG not-want eat "You do not want to eat."

2. Instead of **OI**, a modality-sensitive form of negation occurs.

	Modal (English)	Modal (Meixian)	Example
1	Must Not (Epistemic)	yit ting m'	Ge'then yit ting m'shi set fan. 3SG must not-go eat rice "They must not be going to eat."
2	Must Not (Deontic)	yit ting m'zun	Ngai yit ting m'zun set. 1SG must not-ZUN eat "I am absolutely not allowed to eat."
3	Should Not (Deontic)	ying goi m'si	N'ziga ying goi m'si set. 2SG should not-SI eat "You should not eat."

REFERENCES & ACKNOWLEDGEMENTS

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About our Contributors

FIZA AHMAD is a second-year MSc student in Applied Linguistics at McMaster University and is a trainee in Dr. Elisabet Service's Language, Memory, and Brains Lab.

ENIOLA BODE-AKINBOYE is a fourth-year BSc student in Psychology, Neuroscience, and Behaviour at McMaster University and a trainee at ARiEAL in Dr. Lyn Turkstra's Lab.

RENEE BONEY is a recent graduate (BA Honours) in Communication Studies and Cognitive Science of Language and a current project support assistant in the Department of Biology at McMaster University.

DAKYUNG RACHEL LIM is a recent graduate (MSc, Cognitive Science) at McMaster University and a trainee at ARiEAL in Dr. Daniel Pape's Phonetics Lab.

ALEEM MOHAMMED is a recent graduate (BA Honours) of Linguistics and Cultural Anthropology at McMaster University and the editor of the Journal of Ethnography.

BARANEZA PIRABAGARAN is a fourth-year undergraduate student in the Department of Linguistics and Languages, specifically majoring in Cognitive Science of Language.

DR. ELISABET SERVICE is a Professor and Chair in the Department of Linguistics and Languages at McMaster University and the co-director of the Language, Memory & Brain Lab.

NNENNA UTOMI is a fourth year BASc student in Applied Psychology in Human Behaviour at McMaster University and a is a trainee in Dr. Elisabet Service's Language, Memory, and Brains Lab.

CHELSEA WHITWELL is a doctoral candidate in Cognitive Science of Language and Linguistics at McMaster University and is a trainee in Dr. Elisabet Service's Language, Memory, and Brains Lab.

ADRIENNE YAU is a recent graduate (BSc Honours) of Psychology, Neuroscience, and Behaviour at McMaster University and a trainee at ARiEAL in Dr. Elisabet Service's Language, Memory, and Brains Lab.