Postcolonial environment: influence of age of initial academic exposure to l2 on the perception of L1 accent

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Abstract

This paper examined the influence of bilingual listeners' age of initial academic exposure to L2, on the perception of L1 accent. In addition, the influence of stimulus novelty on the perception of L1 accent was also explored. Twenty-four bilingual listeners perceptually judged the L1 accent of twenty bilingual speakers. The bilingual speakers produced four real-words and four novel-words. Bengali was the L1 and English was the L2 for the listeners, as well as for the speakers. Of the twenty-four bilingual listeners, twelve had early and twelve had late age of initial academic L2 exposure. Among the twenty bilingual speakers, ten had early and ten had late age of initial academic L2 exposure. Each listener judged L1 accent based on 320 tokens (8 words, 2 exemplars of each word, across 20 bilingual speakers). Results suggest, all bilingual listeners perceived productions of bilingual speakers with early age of academic L2 exposure as more similar to the native speaker of the target L1. The novelty of the stimuli influenced listeners' perception of L1 accent; novel words were perceived as less accented than the real words. The interplay of sociolinguistic variables is discussed to suggest that only crosslinguistic transfer of linguistic constructs might not capture bilingual speakers' perception of accent.

Keywords: transfer, Bengali, bilingualism, accent, perception, postcolonialism

1. Introduction

This paper presents two issues. First, influence of bilingual listeners' age of initial academic second language (L2) exposure on their perception of first language(L1) accent has been examined. Specifically, two groups of bilingual listeners, with varying age of initial academic L2 exposure, were compared based on their perception of L1 accent of two groups of bilingual speakers; the bilingual speakers also varied in their age of initial academic L2 exposure. As a second issue, influence of stimulus novelty on bilingual listeners' perception of L1 accent was explored. That is, bilingual speakers produced real words and novel words. Participants listened to those real and novel words to perceptually judge speakers L1 accent.

1.1.   Perception of Accent

Accent is usually interpreted as a distinctive pronunciation or articulatory register of any language, especially the register that is associated with a specific geographical-belt, social tier, economic or ethnic group (The New Oxford American Dictionary, 2005). History of L2 exposure, frequently

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indexed by age of initial L2 learning, is known to influence bilingual speakers' L2 production, which is perceived by listeners as L2 accent (Best and Tyler, 2007). History of L2 exposure is also known to influence bilingual listeners' perception of L2 accent (e.g., Best and Tyler, 2007). To understand the perception of accent, the studies related to bilingualism or second language learning have offered considerable attention to variables that are inherent to speakers. Some of those speaker-specific variables are, age of learning L2, length of residence in an L2-speaking environment, the L1 of the speaker and the amount of L1 usage (e.g., Piske Mackay, & Flege, 2001). Additional variables that are not specific to speakers are also reported to influence perception of non-native or foreign accent. For example, methodological factors, which have been systematically manipulated by the researchers, are, rating scales (e.g., Southwood & Flege, 1999), elicitation techniques (e.g., Thompson, 1991), speaking rate (e.g., Munro & Derwing, 2001), lexical frequency (e.g., Levi, Winters & Pisoni, 2007) and listening context (e.g., Levi, et al., 2007). Moreover, variables related to listeners are also known to influence perceived degree of accent. Native versus nonnative listeners (e.g., Flege, 1995), and experienced (ESL instructors or Linguists) versus inexperienced raters (e.g., Thompson, 1991) have been known to influence perceived degree of accent. Since, these widely documented aforementioned variables are known to influence bilingual speakers in their L2 production and L2 perception, and bidirectional linguistic transfer is also commonly observed in bilingual speakers, those aforementioned variables are also expected to influence the same bilingual speakers in their perception of L1 accent.

The fields of social science, education and bilingualism do acknowledge bidirectional transfer and hence consider that as L1 can influence L2, L2 can also influence LI. Predominantly, L1 influence on L2 has received more focus, but L2 influence on L1 is less examined (e.g., Appel & Muysken, 1987; Cook, 1991, 2003; Laufer, 2003; Romaine, 1995; Pavlenko, 2004; Wang, 2006). Researchers have mostly explored influence of L2 on L1 in the area of child language acquisition and in simultaneous bilingualism (Appel & Muysken, 1987; Romaine, 1995). A comprehensive multicompetence framework proposed by Cook (1991, 2003) probably highlights the mechanism to address this longstanding need of exploring L2 influence on L1. Several years back, Laufer (2003) had also highlighted the critical importance of relevant research in this area. Some works based on English-Chinese interactions have caught attention where L2 influence on L1 has been the focus (see Wang, 2006). Clearly, compared with the research done to understand influence of L1 transfer on L2, relatively fewer studies have explored influence of L2 transfer on L1. The current study focused on the influence of L2 on L1.

Historically, linguistic transfer and language attrition have been used to explain accent production and perception (Jarvis & Pavlenko, 2008, Pavlenko, 2004). Specifically, forward transfer (i.e., influence of L1 on L2), reverse transfer (i.e., influence of L2 on L1) and language attrition mechanisms have been used to explain accent (Jarvis & Pavlenko, 2008, Pavlenko, 2004). Since, linguistic transfer could operate at all linguistic constructs, including phonology, morphology, syntax, semantics,

pragmatics, orthography, lexicon and in discursivity, variable influence of different linguistic features in speakers' production and perception behaviors could be possible. When linguistic transfer refers to retention of linguistic features across the languages, language 'attrition' is conceptualized as, "loss of some L1 elements, seen in the inability to produce, perceive, or recognize particular rules, lexical items, concepts, or categorical distinctions due to L2 influence" (Pavlenko, 2004). Overall, it is widely accepted that early age of L2 exposure minimizes L1 influence on L2 accent and simultaneously induces L2 influence on L1 accent (Jarvis & Pavlenko, 2008). In summary, linguistic transfer, and attrition are potential aspects of any sociocultural scenario where more than one language is operational. Hence sociocultural environment of the bilingual speakers heavily influences their production and perception of both L1 and L2. In this study, influence of age of initial academic L2 exposure on listeners' perception of L1 accent was examined. Participants were chosen from a postcolonial country to understand how sociocultural influence on language interferes with participants linguistic behaviors.

1.2.   *Sociocultural influence on language*

The sociolinguistic texture of any country is an important consideration to understand the relationship between the nature of L2 exposure and bilinguals' production and perceptual behaviors (Chakraborty, 2012; D'Souza, 2001). Speakers from post-colonial country offer an interesting test-platform because, English is the L2 in most post-colonial countries, with the vernacular language(s) being their L1, with diaglossia existing in all the post-colonial countries. This issue becomes especially critical in any post-colonial linguistic environment where diglossia intersects bilingualism (D'Souza, 2001; Fishman, 1967). For instance, in Southeast Asia, after several hundred years of colonial rules (from 1858 to 1947) and independence in 1947, the Indian subcontinent (e.g., India, Pakistan, Srilanka, Bangladesh, Nepal, Bhutan) continued the use of English as the predominant language in their higher education system, judiciary, commercial sectors, communication media, and in bureaucracy (e.g., Mehrotra 1998, Chakraborty, 2012). Socio-politically, in India and in the entire subcontinent, English is generally considered an L2 and a post-colonial linguistic residue.

However, socially, for upward mobility in the intellectual or privileged class, knowledge of English language is still considered a critical index (Rana, Bhowmick, Chand, Kumari, Sinha, 2016; Krishnaswami & Burde, 1998). Usually, postcolonial countries, with reference to the status of English language, has moved from a case of diglossia without bilingualism (Fishman, 1967), where exclusively social elites had an access to English language, to a case of diglossia with bilingualism, where English as a language is widely used across various commercial, social, judicial, occupational, academic and entertainment sectors (D'Souza, 2001). Higher proficiency in English with minimal vernacular influence is perceived as an essential requirement for sociocultural and economic advancement. Thus, postcolonial countries are usually flooded with schools offering education in either vernacular language

or in English language, as their primary medium of instruction. Education using the vernacular language is for those who are usually from the lower economic class and English (as a medium of instruction) for the financially affluent class. Hence, experimentally, academic exposure to an L2 becomes an index of age of initial exposure to an L2 in a post-colonial country (Chakraborty, Goffman & Smith 2008; 2011; 2012). Considering the social history and values associated with English language in a country, such as India, speech-language issues related to intentionality, cognition and the degree of overt exhibition of preference for English accent could be critical factors to understand bilingualism in a postcolonial environment. Hence, bilinguals from the Indian subcontinent offer an interesting testbed to explore how age of L2 exposure influence perception of L2 accent.

In summary, the current study simultaneously offered several less-explored facets. Historically, influence of age of initial arrival in a native L2 speaking country has been used as L2 as a marker of age of L2 exposure (for review, see Piske et al., 2001). In the current study, influence of age of initial academic L2 exposure has been used as a marker of age of L2 exposure. In speech perception literature, influence of age of L2 exposure on L2 perception accuracy has been the dominant focus (Jarvis & Pavlenko, 2008). In addition, only linguistic interactions incorporating phonology, morphology, syntax, semantics, pragmatics, orthography, lexicon and discursivity might not always capture all the nuances of bilinguals' psycholinguistic behaviors. Cross linguistic interaction (CLI) might transcend beyond the linguistic domain and include social and/or conceptual prestige, visual and/or aural forms, intentional or unintentional nature, nonverbal, overt or covert manifestations with positive or negative social consequences (Jarvis & Pavlenko, 2008). In the current study, sociolinguistic texture and prestige associated with specific languages have been used as windows to understand the potential influence of age of initial exposure to L2 on bilingual listeners' perception of L1.

1.3. *Novelty of the semantic referents*

A second focus of this study was to examine how the novelty of the stimuli influenced listeners' perception of L1 accent. As the name implies, novel words or non-words are not expected to be present in a target language. This issue becomes relevant for listeners' perception, as lexical frequency is known to influence language processing (Coetzee 2006; Luce & Pisoni, 1998) and specifically, perception of accent in second language (Levi, et al., 2007). Hence, lexical frequency is also expected to influence bilingual listeners' perception of L1 accent. Based on the predictions of the exemplars model of memory (MINERVA2 model of Hintzman, 1988) with further application for speech perception (Goldinger, 1996), Levi, et al., (2007) reported that L2 words with low frequency were rated as more accented compared to words with high frequency. Extending these findings further, novel words with novel referents are likely to be of lower lexical frequency in the L1 context. Hence bilingual listeners are expected to perceive these novel words as more accented compared to the real words.

Taken together, the current study examined the influence of listeners' age of initial academic exposure to an L2 on their perceived degree of L1 accent of two groups of bilingual speakers, who differed in their age of initial exposure to L2. The hypotheses are:

1- Considering the sociolinguistic context of India and the predominant research findings in transfer literature, it was predicted that the two groups of listeners would differ in their L1-accent ratings. Bilingual listeners with late age of initial academic L2 exposure would perceive productions of bilingual speakers with late age of initial academic L2 exposure as closer to native L1. Bilingual listeners with early age of initial academic L2 exposure were expected not to perceive any difference in L1 accent of the two groups of bilingual speakers.

2- Since novel words are of low frequency, consistent with the predictions based on exemplars model (MINERVA2 model) and findings of Levi et al., (2007), novel words were expected to be perceived as more L1-accented than the real words. In addition, regardless of their age of initial academic L2 experience, the novel words were equally unfamiliar to all of the listeners and speakers. Hence, the logical extension of unfamiliarity of the stimuli would suggest that listeners would offer equivalent ratings for the two groups of bilingual speakers.

2. Methodology
2.1.   Participants
Twenty-four bilingual participants, with Bengali as their L1 and English as their L2, volunteered in this study. Of these twenty-four participants, twelve listeners had early age of initial academic exposure to English (i.e., from the kindergarten level) and had high English proficiency scores (16-25, M=20.6, SD=3.75) on Test of Adolescent and Adult Language (TOAL-3; Hammill, Brown, Larsen, & Wiederholt, 1994). Henceforth, this group will be labelled as early/high listeners. The remaining twelve listeners were academically exposed to English late (i.e., the content language was Bengali until grade twelve and became English only from their undergraduate level) and had low L2 proficiency scores (3-9, M=7, SD=2.75) on TOAL-3. This second group of listeners, henceforth, would be labelled as late/low listeners. The two groups of listeners were comparable in their academic qualifications (i.e., all were college graduates) and L1 experience.

2.2.   Speech Stimuli
Twenty normal Bengali-English bilingual speakers (aged 20 to 45 years) recorded the stimuli using a SHURE microphone (BETA 58A) and Marantz CD recorder (CDR300). Of 20 speakers, 10 bilingual speakers had a history of early age of initial academic exposure to English and high L2 proficiency scores (15-26, M=21.4, SD=3.75) on Test of Adolescent and Adult Language (TOAL-3; Hammill, Brown, Larsen, & Wiederholt, 1994); henceforth early/high speakers. The remaining 10 speakers had late age of initial academic exposure to English and had low L2 proficiency scores (3-10, M=7,

SD=2.75) on TOAL-3. They would be labelled as, henceforth, late/low speakers.

For both, listeners and speakers, Bengali was the L1 and English was the L2. All the phonemes and syllable structures in the stimuli are permissible in both languages (i.e., English and Bengali). These phonemes and syllables, developmentally, appear very early in their acquisition stage. However, it should be noted that Bengali only permits strong-weak trochaic stress pattern. But English permits both trochaic and weak-strong iambic patterns. Both of the listeners and speakers reported a history of normal speech, language, hearing and neurological development. In addition, all of the participants passed hearing screening at 20 dB at .5 kHz, 1 kHz, 2 kHz, 4 kHz and 6 kHz using pure tone audiometry.

The stimuli were four real words and four novel words, with two different lexical stress patterns. In each category (i.e., real and novel), 2 words had strong-weak, trochaic stress pattern ("marble" and "bible") and 2 words had weak-strong iambic stress ("buffet" and "baboon"). Even though etymologically, these are borrowed words in Bengali, there exist no Bengali equivalents of these words. Hence, regardless of the social class, these words are now considered Bengali words. Similarly, in the novel word category, the trochaic novel words were [ˈpʌpəp] and [ˈbʌməp], and the iambic novel words were [pəˈpʌp] and [bəˈmʌp]. Each novel word had a corresponding novel semantic referent. The target stimuli were initially produced in a Bengali carrier phrase, "ami _____ bolechi" (which means, "I have said_____"). Then, using PRAAT acoustic software (Boersma & Weenink, 2009), two samples of each target word were extracted from the Bengali sentence frame. Eight tokens (4 target words X 2 samples of each target word) were selected from each speaker, in each condition (i.e., real and novel). These tokens were randomized across all 20 bilingual speakers.

2.3. Procedure

To obtain listeners' natural responses first and also to minimize the possibility of giving any cues to the listeners that the stimuli have been systematically manipulated lexical stress, the order of presentation was fixed; the real words were presented first and then the novel words. Productions were played through two Bose loudspeakers. Each listener marked perceived degree of L1 accent on a 9-point scale (Southwood & Flege, 1999), printed next to every token. On the scale, '9' represented 'very native' and '1' represented 'very non-native' Bengali accent. Before starting data collection, the listeners received a short training, where a native Bengali speaker (an experimenter) oriented participant with the scaling procedure. No reference points for '9' or '1' were provided. Since, perception of accent is a global phenomenon, where listeners use multiple acoustic cues to a varying degree, selective attention to any specific cue (lexical stress) was not recommended. The listeners were instructed to judge the degree of nativeness of each token.

2.4.   Statistical analyses

A repeated measures ANOVA was performed. The within group variables were novelty of the stimuli (real and novel), speakers (early and late), stress pattern (trochaic and iambic) and words (e.g., bible & [b∂'mΛp]). The between group factors were listeners' groups (early/high and late/low listeners). The statistical significance level was set at .05.

3. Findings

The degree of L1 accent ratings by the two groups of listeners were compared. A significant group effect was observed, *F* (1, 22) = 5.89, *p* = .02, η_p^2 = .21. The early/high listeners assigned higher numerical ratings compared to the late/low listeners. No interaction between listener and speaker was observed, *F* (1, 22) = .001, p =.97, η_p^2 < .0005, suggesting that the relationship between the two groups of listeners did not vary along with the speakers' type. All listeners perceived Bengali (L1) productions of the early/high group of speakers as more native-Bengali compared to the productions of the late/low group of speakers.
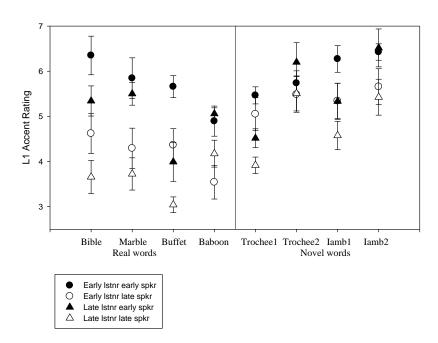

Figure 1. Perceived degree of foreign-accent

Figure Caption: Perceived degree of foreign-accent ratings by 24 bilingual listeners based on 20 bilingual speakers' production of real (left panel) and novel words (right panel). Accent ratings are based on a nine-point metathetic scale. In the scale, 9 = very native-like and 1 = very non-native-like production. Error bars represent standard errors. Filled circle – early L2 exposed listener rating early L2 exposed speakers. Filled triangle – late L2 exposed listener rating early L2 exposed speakers. Unfilled circle – early L2 exposed listener rating late L2 exposed speakers. Unfilled triangle – late L2 exposed listener rating late L2 exposed speakers.

Novel words were perceived as less accented than the real words, F (1, 22) = 17.90, p < .005, η_p^2 = .45. Similar to the real words, all listeners assigned higher native accent ratings to the early/high speakers, F (1, 22) = 17.28, p < .005, η_p^2 = .44. However, an interaction between stimulus novelty and speaker was observed, F (1, 22) = 9.4, p = .005, η_p^2 = .3. Post-hoc testing (Tukey HSD) revealed that in the real word, as well as in the novel word conditions, the early/high speakers received higher ratings than the late/low speakers. A significant stimulus novelty by speaker by stress interaction was observed, F (1, 22) = 4.39, p = .04, η_p^2 = .17. Post-hoc testing (Tukey HSD) revealed that in the real word condition, only early/high speakers' production of trochees received higher ratings than their production of iambs. The late/low speakers' productions of trochees and iambs received comparable rating. In the novel word condition, regardless of the speakers age of initial academic L2 exposure, ratings of trochees did not differ from iambs.

4. Discussion

The primary focus of this study was to examine influence of listeners' age of initial academic exposure to L2 on their perception of L1 accent. Overall, even though the two groups of listeners assigned significantly different values to their ratings on a 10-point metathetic scale, they were comparable in their nature of accent ratings; all listeners perceived Bengali (L1) productions of the early/high group of speakers as more native-Bengali compared to the productions of the late/low group of speakers. Thus, at the level of single word, for perception of real and novel words, age of academic L2 exposure did not have a discernable influence on the nature of perceived degree of L1 accent produced by these two groups of bilinguals, who varied in their L2 experience.

A secondary focus of this study was to examine how the novelty of the semantic referents influenced listeners' perception of L1 accent. Results suggest that novelty of the stimuli influenced listeners' perception of L1 accent; novel words were rated less accented than the real words. Results of listeners' accent perception for novel words, in this study, is suggesting against overgeneralization of some previous findings based on exemplars model (MINERVA2 model) and findings of Levi et al., (2007). An active interplay of the sociolinguistic scenario of India and the nature of bilingualism of the participants are the two critical variables, which have influenced this outcome.

4.1.   *The sociolinguistic scenario and the nature of bilingualism*

In post-colonial India, similar to other post-colonial countries in the south Asian subcontinent, speakers more proficient in English are respected in every walk of life and citizens aspire to attain English proficiency (Krishnaswamy & Burde, 1998). So, speakers with English (L2) influence in their L1 accent do not experience detrimental consequences; but they enjoy invisible privileges (Mehrotra, 1998). On the contrary, speakers with vernacular or L1 influence in their L2 accent do not experience such privileges, which clearly endorses presence of a diaglossic environment.

From a global perspective, it has also been empirically reported that an accent's influence on a listener's cognition might vary based on how the listener esteems language-specific accents in differing sociolinguistic scenarios. For example, Vornik (2003) reported that listeners associate certain accents with variables, such as, sociolinguistic power and attractiveness. And if listeners rate an accent as attractive or powerful, then these ratings strongly correlate with levels of perceived credibility of speakers' propositional content. That is, some accents receive preference over others, and this is certainly related to the listener's perception of different sociolinguistic variables. Vornik's (2003) line of findings have also been endorsed by several other studies (Fuertes, Gottdiener, Martin, Gilbert, & Giles, 2012; Hosoda & Stone-Romero, 2010).

In the current study, the bilingual listeners from India allowed their perception of power and social attractiveness play roles when they rated the two groups of bilingual speakers. That is, since socially, in the Indian subcontinent, speakers fluent in English (L2) are widely respected and considered more powerful, educated, enlightened, credible and honest (Lev-Ari & Keysar, 2010), listeners assigned higher ratings for the early/high speakers, for both real and novel conditions. Indians esteem proficient speakers of English and speakers with minimum influence of L1 or vernacular on their English (L2) accent. Beyond the Indian sociolinguistic scenario, there exist numerous examples worldwide endorsing such accent biases. Researchers have extensively discussed different consequences or nature of accent biases (see, Ovalle & Chakraborty, 2013); for example, in Nicaragua versus Costa Rica (US DOS, 2012; UN CERD, 2001, p. 42), Haiti versus The Dominican Republic (MRGI, 2008a; 2008b;), Bangladesh versus Pakistan (Library of Congress, 2010; Ali, 2002), experiences of African women immigrated to Canada (Creese & Kambere, 2003). Some earlier studies also observed similar results (Chakraborty, 2012, 2011).

4.2.   Novelty of the semantic referents

Real words are more comprehensible compared to novel words (Ikeno & Hensen, 2007). Comprehensible words are generally perceived as less accented, when less comprehensible words are perceived as more accented (Ikeno & Hensen, 2007). Moreover, an extension of exemplars model of memory (MINERVA2 model of Hintzman, 1988) and speech perception research (Goldinger, 1996; Levi, et al. 2007), suggest that novel words with novel referents are of lower lexical frequency; and words with lower frequency are perceived as more accented. Hence, we had hypothesized that real words would be perceived as less accented because of their higher comprehensibility and higher frequency. However, results of the current study suggested that the novel words were perceived as less accented than the real words in Bengali, L1.

An absence of any perceptual template of the novel stimuli might have influenced the outcome. In this study, all listeners had a prolonged exposure to the real words and hence had already developed an acoustic template of the target real words to compare the stimuli to. On the contrary, the novel words were not represented in their perceptual domain and did not have any

expected acoustic reference. Since there was no reference in listeners' perception about the expected accent, the novel words were judged as less accented. But the listeners compared the real words against their preexisting acoustic representation of those target real words. Consequently, novel words were judged much closer to native L1, compared to the real words.

4.3.   Trochaic versus iambic stress pattern
In Bengali, regardless of the syllable length or lexical class, it is imperative to stress the first syllable (Hayes & Lahiri, 1991). Perceptually, strong-weak trochaic stress pattern is more salient than the weak-strong, iambic stress pattern. Results of the current study suggested that all listeners perceived trochaic words as more native Bengali, when early/high speakers produced them. On the contrary, English language, permits both trochaic and iambic stress patterns. In English, the lexical class of a word is sensitive to speakers' stress pattern. For example, the word, 'produce' is a noun, if the first syllable is stressed; but it becomes a verb when the stress shifts to the second syllable. So, shifting stress from first syllable to the second syllable changes the lexical class of a word in English language; and semantics change too. In the current study, due to an early age of initial academic L2 exposure, the early/high group probably marked these stress patterns differentially and appropriately. As a result, listeners perceived their production of trochaic words as more native Bengali, compared to their production of words with iambic stress pattern. However, the late/low speakers, due to their late age of initial exposure to L2, probably did not mark the two stress patterns differently and overgeneralized their L1 trochaic pattern. Hence, the listeners assigned trochees and iambs comparable rating when the late/low speakers produced them. This result has been consistent with some previous studies (Chakraborty, 2011, 2012,). However, in the novel word condition, regardless of the speakers' age of initial L2 exposure, ratings of trochees did not differ from iambs. Unlike ratings for the real word trochees and iambs, absence of difference in ratings for trochees and iambs in the novel word condition, potentially reflect difference in real and novel word processing in listeners. Absence of different ratings in novel trochees and novel iambs also reiterates that lexical stress assignment is arbitrary in nature and not acoustically inherent to any syllable structure.

5. Conclusion
This paper offered preliminary evidence that, at the single word level listeners' age of initial academic exposure to an L2 did not influence their perception of L1 accent; but stimulus novelty did. The neoWhorfian view (Pavlenko, 2004) of bilingualism and thought, sees the interaction between 2 languages as a complex phenomenon where linguistic and conceptual enrichment and transformation may be present side by side with potential attrition of L1. Voluntary and selective attrition of L1 and subconscious leaning towards L2-influenced-L1 to approximate power-status in a post-colonial environment needs further exploration. Finally, to understand the contribution of semantic referents in accent perception, listeners' familiarity with the target word versus unfamiliarity with the target, needs to include

listeners from linguistic groups unfamiliar with the real words of the target L1. The findings of this paper should be interpreted specific to the experimental groups and the conditions of this study. Clearly, further study with other linguistic community is needed to understand such multivariable interactions operating on accent perception, where relatively larger linguistic chunks (i.e., phrases or sentences) could be used as stimuli with fine grained acoustic analyses. We also need to acknowledge that qualitative and quantitative variables could be considered simultaneously to understand sociolinguistic behaviors of the bilingual population.

Acknowledgements

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