

## Research Report

### PROSODIC PATTERNS IN SYLHETI-ENGLISH BILINGUALS

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#### Abstract

The primary aim of this study was to investigate prosodic prominence across three groups of Sylheti-English bilinguals: first-generation who arrived as adults, first-generation who arrived as children, and second-generation, i.e., born in the United Kingdom to parents who grew up in Bangladesh. To measure prominence,  $f_0$ , duration, and intensity were measured across disyllabic words in Sylheti and English. The results showed significant differences in the  $f_0$  analysis. Regarding monolinguals, Sylheti prominence displayed a rising contour, in contrast to the English falling contour. In Sylheti, the bilinguals born in the United Kingdom were the only group significantly different from the Sylheti monolinguals, displaying an English-like falling pattern in their Sylheti prominence. In English, the late arrival bilinguals displayed a Sylheti-like prominence realization, but the early arrivals and those born in the United Kingdom approximated the monolingual English prominence realization. Overall, language use patterns were the most significant factor related to the bilinguals' prominence realization.

#### INTRODUCTION

The current study investigates the production of prominence realization by Sylheti-English bilinguals. More specifically, this study focuses on speakers from the East London Bangladeshi community, one of the United Kingdom's largest and most established ethnic communities. The dense urban nature of this community allows for the exploration of intergenerational differences in production patterns, in both the heritage (L1, Sylheti) and majority (L2, English) language because numerous generations live

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close together. To date, research on the speech patterns in ethnic minority communities has primarily focused on segmental aspects of speech, with much less known about the prosodic patterns in such communities (but see, e.g., de Leeuw et al., 2012; Mennen, 2004). The current study adds to the growing body of research on prosodic patterns in ethnic minority communities. Moreover, Sylheti-English bilinguals are an under-researched community, and to our knowledge, there is no previous description of the prosodic patterns in this group. We, therefore, provide one of the first descriptions of prosodic patterns in Sylheti-English bilinguals.

In this study, we define prominence in accordance with Ladd (2008) as “perceptible gradual modifications of the phonetic prominence of the individual words [...] by gradual changes in various acoustic parameters, adding a slight nuance of emphasis” (p. 8), and thus we do not specify whether this prominence arises due to stress patterns specifically, as there is disagreement (see below) as to whether Sylheti is a stress bearing language, based on what we know about Standard Bengali. Noteworthy is, however, that previous researchers have *perceived* stress on the penultimate syllable for words in focus position in both English and Standard Bengali (see below, Khan, 2010; Shattuck-Hufnagel, 1988).<sup>1</sup> Additionally, we use the term bilingual to describe people who use two or more languages in their everyday lives (Grosjean, 1998, 2010), as “bilinguals do not necessarily need to have perfect knowledge of all the languages they know to be considered as such” (Fabbro, 2001, p. 201). In line with this, we use the term monolingual to describe people who did not use two or more languages in their everyday lives, although functional monolinguals may have had some knowledge of other languages.

The study had three objectives. First, as there is limited research on Sylheti prosody, the initial objective was to explore and compare prominence in Sylheti and English monolinguals, and, if the prosodic patterns were found to differ, whether Sylheti follows the Standard Bengali pattern, i.e., a lower relative  $f_0$  in the prominent syllable.

The second objective was to explore the L1 and L2 prominence patterns of Sylheti-English bilinguals, and, more specifically, intergenerational differences between bilingual speakers in the London Bangladeshi community.

Finally, the third objective was to explore the influence of factors (language use, length of residence, and age of arrival) that might contribute to any potential variation between our bilinguals.

### **PREVIOUS RESEARCH ON SPEECH IN HERITAGE LANGUAGE COMMUNITIES**

There is a growing body of research on intergenerational differences in the production of speech segments. Much of the variability found in L1 and L2 speech production patterns of heritage language speakers can be accounted for by language use patterns and age of arrival (see, e.g., Major, 1992; Nagy & Kocketov, 2013). In large diaspora communities in the United Kingdom (UK), for example, one general pattern observed is that bilinguals who arrived in the UK as adults are more likely to demonstrate monolingual-like production patterns in the heritage language than subsequent generations, and that the first generation are also more likely to demonstrate foreign-accented speech patterns in English (e.g., Mayr & Siddika, 2016; McCarthy et al., 2013). Moreover, those born in the UK often display non-native production in the heritage language, but acquire production patterns that reflect their monolingual peers in English (Evans et al., 2007; McCarthy

et al., 2014), although, as further discussed below, this is often dependent on language use patterns. For example, McCarthy and colleagues (2013) found that first-generation Sylheti-English bilinguals who had arrived as adults and resided in the UK for over 2 decades mostly produced Sylheti plosives with similar voice onset time (VOT) and had vowel quality patterns like Sylheti monolinguals. The authors suggested that the maintenance of native-like monolingual heritage language production patterns was largely driven by the dense nature of the community and ongoing use of the heritage language. In contrast, in other ethnic minority communities, which are potentially not as dense as the London Bangladeshi community, attrition of first language voicing contrasts has been found within first generations, e.g., in English speakers residing in Brazil (Major, 1992) and France (Flege, 1987), Russian speakers in the United States (Dmitrieva et al., 2010), as well as phonetic drift in English native speakers acquiring Korean (Chang, 2012).

In comparison, those who arrive as children or second-generation bilinguals typically display incremental changes toward the majority language production patterns in their native language (Evans et al., 2007; Mayr & Siddika, 2016; McCarthy et al., 2013, 2011; Nagy & Kockotov, 2013; Sharma & Sankaran, 2011; but see Kirkham & McCarthy, 2020). For example, Nagy and Kockotov (2013) showed an intergenerational trend toward the English VOT pattern in Russian and Ukrainian heritage language speakers in Toronto, and Mayr and Siddika (2016) found incremental changes in VOT patterns across generations of Sylheti heritage language speakers in Wales, UK.

Heritage language markers may also be retained to fulfil socio-indexical functions on the part of the heritage language speakers (Alam & Stuart-Smith, 2011; Heselwood & Mcchrysal, 1999, 2000; Kirkham, 2011; Sharma & Sankaran, 2011). Moreover, even in first-generation bilinguals, there is preliminary evidence suggesting that not only general attrition processes (i.e., the L2 influencing the L1) affect the native language, but also that socio-indexical factors contribute to changes in both the L1 and L2 (de Leeuw, 2019; Passoni et al., 2018).

What we therefore see is general processes affecting generational groups, but also nuanced variation within generations that may be driven by factors such as language use patterns. It is this variation that is explored in the current research through an investigation of the prosodic patterns in Sylheti-English bilinguals.

### **PREVIOUS RESEARCH ON PROSODIC VARIATION IN BILINGUAL SPEECH**

A small body of research has examined prosody in bilingual L1 and L2 speech. In general, the findings indicate that L1 prosody is susceptible to change upon acquisition of an L2, regardless of the age at which the L2 was acquired. For example, Mennen (2004) found that adult Dutch speakers of L2 Greek living in the Netherlands assimilated toward Greek tonal alignment patterns in their native Dutch, and that they were also unable to realize Greek tonal alignment according to monolingual norms. Furthermore, in a longitudinal study of Stefanie Graf over four decades, maximum pitch peaks in her German became higher and more English-like over time from adolescence to mid-adulthood after her move to the United States (de Leeuw, 2019). Additionally, in de Leeuw et al. (2012), some late sequential German-English bilinguals in Vancouver, Canada, performed within English monolingual norms in their German tonal alignment production, whereas others displayed native German monolingual production patterns. Further investigation of this

same community suggested that the social and political environment of “being German” in Vancouver may have influenced pitch realization of the German-English males, with a wider pitch span and higher pitch level in both their German and English indexing friendliness and helpfulness to dissociate themselves from the stereotypical image of Germans in Canada as being aggressive (de Leeuw, 2020; Lieb, 2008). Moreover, in a small group of Turkish-German simultaneous bilingual children (age 10-12 years), it was found that there was bidirectional prosodic interaction with the children producing Turkish prosodic patterns in German, and German prosodic patterns in Turkish (Queen, 2001).

Prosodic influence is also possible between bilinguals in contact settings, which promote larger changes within a community. For example, it has been argued that changes in the prosodic patterns of L1 Argentinian Spanish coincided with a large wave of Italian immigration, and with Argentinian Spanish converging with Italian due to direct and indirect prosodic transfer (Colantoni & Gurlekian, 2004). Similarly, Spanish-Quechua bilinguals in Peru have been reported to produce Spanish intonation patterns in their Quechua (O'Rourke, 2005), and Simonet (2011) reports finding intonational convergence in a language contact situation in Mallorca.

In brief, it has been found that bidirectional prosodic interaction is prevalent in both bilingual speakers (children and adults), as well as larger communities in which convergence can occur.

### **PROMINENCE REALIZATION IN SYLHETI AND ENGLISH**

As no previous research has been conducted on Sylheti prosody, this section focuses on a discussion of Standard Bengali compared with English. The aim of this comparison is not to enter into a discussion regarding a theoretical typology of Bengali and Sylheti, but rather to provide a baseline for the Sylheti and English data to explore the production patterns of the bilinguals.

In English, in the nuclear tone tradition (see e.g., Cruttenden, 1997), a prominent word would generally be realized through a high-fall nuclear pitch accent on the stressed syllable and a higher  $f_0$  is often considered to be the strongest cue for lexical stress identification in English (Lieberman, 1960). Likewise, in the autosegmental metrical framework (Beckman & Pierrehumbert, 1986; Ladd, 2008; Pierrehumbert, 1980), prominence would be encoded with a pitch accent, such as L+H\*, or simply H\*, followed by an L- phrasal tone.

In contrast, in Standard Bangladeshi Bengali, it has been proposed that either a low pitch accent, L\*, or a rising pitch accent, L\*+H, are used to mark focus (Khan, 2008; Maxwell, 2010), but see Hasan (2015). Thus, in Bengali, a word in focus could be described as having a low rising or “scooped” pitch accent on the prominent syllable (Maxwell, 2010, p. 58). Notably, this “scooped” pitch accent is also included in the inventory of pitch accents for English, but it is considered to be contextually specific (Ladd, 2008). It has also been suggested that Bengali stress, if existing at all, is consistently word-initial (Khan, 2010), indicated by means of a decrease in  $f_0$  (see, e.g., Hayes & Lahiri, 1991 in Reetz & Jongman, 2009, p. 211), and that Bengali does not “take advantage of higher  $f_0$  and greater intensity” to indicate syllable initial stress

(Shattuck-Hufnagel, 1988, p. 98). However, notably, Hasan (2015, p. 63) found that focus intonation in Bengali is H\*L1 rather than L\*Hp, as reported in Hayes and Lahiri (1991).

It is relevant to emphasize that an increase in  $f_0$  in the prominent syllable is often considered to be quite regular within the world's languages with Danish listed as an exception (Neppert, 1999) which is considered to be—as in the above discussion—similar to Bengali through marking prominence (or indeed “stress” [Khan, 2010]) through a relatively lowered pitch.

However, Ladd (2008) suggests that “Bengali (and probably most of the languages of India) is an example of a language with non-stress accent and no lexical specification of pitch” (p. 165). He continues, “[t]o my knowledge, all such languages clearly have ‘stress’ in Beckman’s phonetic sense, and at least some of them have the possibility (like English or Bengali, and unlike Japanese) of selecting different pitch accent types to convey different pragmatic meanings”. Stress, in this phonetic sense, is “a phonetic description of one possible concrete realisation of the phonological abstraction” (Ladd, 2008, p. 164), and, according to this definition, “is a cluster of phonetic properties that includes increased intensity and duration as well as various spectral correlates [and] stressed syllables are often accompanied by the major pitch movements we call pitch accent” (Ladd, 2008, p. 164). De Jong et al. (1993) have similarly defined stress as a “set of prosodic categories which involves relationships of relative prominence between syllables” (p. 199), i.e., not solely a single phonetic correlate at the lexical level. Therefore, in our analysis of prominent syllables in Sylheti and English, we obtained  $f_0$  measurements as well as intensity and durational measurements in comparing the prominent penultimate syllable with the final syllable, in disyllabic words.

### **THE CURRENT STUDY: THE LONDON BANGLADESHI COMMUNITY**

This study focuses on Sylheti-English bilinguals from the London Bangladeshi community. The London Bangladeshi community is one of the most established ethnic minority communities in the UK, with the most populous areas being in the London boroughs of Newham, Tower Hamlets, and Camden (Office of National Statistics, 2011). Here, we focus on bilinguals who reside in Tower Hamlets and Camden, where Bangladeshis are the largest ethnic group, 32% and 8%, respectively (Office of National Statistics, 2011; Tower Hamlets, 2018). Continuous migration from the region of Sylhet, Bangladesh, since the 1950s, has resulted in a dense community made up of multiple generations. As such, Sylheti is the dominant heritage language spoken at home and in the community (see, e.g., McCarthy, 2013).

Sylheti prosody has not been documented in detail, and we are not aware of any previous acoustic-phonetic studies. Here, we focus on Sylheti and English prominence realization as produced across disyllabic words. Given the previous research on Bengali and English prosody, we predicted that the disyllabic words, in a carrier phrase, would most likely be realized in English with a *decrease* in  $f_0$  from the (stressed) penultimate to the ultimate syllable; whereas in Sylheti, we considered it possible for the disyllabic words to be realized with an *increase* in  $f_0$  from the penultimate to the ultimate syllable. For the purposes of the current study, it is important to note that other phonetic cues of prominence in English, e.g., high intensity, longer duration, need not be characteristic of stress in South Asian languages

such as Bengali and Sylheti. However, for completeness and to see how such measures behave in Sylheti, we also measured duration and intensity.

## **METHODS**

### ***PARTICIPANTS***

Participants were 34 adults (18–63 years old), grouped according to place of birth and age of arrival in the UK: 1. those who had arrived in the UK as adults (late),  $n = 9$ ; 2. those who had arrived in the UK as children (early),  $n = 8$ ; 3. those who were born in the UK (second-generation),  $n = 6$ ; 4. monolingual English,  $n = 6$ ; 5. monolingual Sylheti,  $n = 5$ . All the bilinguals resided in the London Bangladeshi community, namely Camden and Tower Hamlets. Those born in Bangladesh were from the north-east district of Sylhet (see McCarthy et al., 2013, for more details). All bilinguals had Sylheti as their L1, with no extensive experience or formal education in Standard Bengali. The English monolinguals were all born in the south of England and resided in Hackney or Tower Hamlets at the time of recording. As it was not possible to record Sylheti monolinguals in Bangladesh, we recruited functional Sylheti monolinguals, who were recent arrivals to the United Kingdom (i.e., no more than 3 months), with Sylheti as their L1. Although they reported some English use, they had not attended formal English language classes in Bangladesh and had no more than 1 month of English classes since arrival in the United Kingdom and did not frequently use English in their daily lives.

Information on language use was also collected. Each participant was presented with a list of interlocutors (e.g., when talking to parents, children, etc.), and social situations (e.g., at work, local shops, etc.), and for each situation the speaker stated whether they used English only, Sylheti only, or both English and Sylheti (categorized as “both” in the questionnaire) with the named individuals in the social situations. Based on these responses, a percentage for each language use category was calculated. A series of Tukey adjusted t-tests revealed that late arrivals used significantly more Sylheti and less English than both the early arrivals and second-generation participants (both  $p < .01$ ). The late arrivals reported to use both languages (e.g., code-mixing) in fewer situations than the early arrivals ( $p \leq .01$ ) (see Appendix A for full comparison tables). Additionally, we collected data on age of arrival (AoA) to the United Kingdom and length of residence (LoR) in the United Kingdom. See Table 1 for a summary of the background information.

### ***PRODUCTION TASK***

Each language was recorded separately on the same day with a 30 min to 1 hour break in between. The order of the languages was counterbalanced across participants. The recordings were made in a quiet room in the participants’ home or workplace using an H2 Zoom recorder with a sampling rate of 44.1 kHz, 16-bit-resolution. Using a picture naming task, speakers were recorded producing disyllabic Sylheti and English words in a carrier phrase (English: ‘Say \_\_\_\_ again’; Sylheti: /abar\_\_\_\_ xo/). Therefore, the target words were realized in focus position. A total of 10 words per language was elicited twice in two separate randomized orders (see Table 2 for the full word list). The words were

matched between languages as closely as possible and included mainly, if not only, voiced syllables to ensure a smooth pitch contour, e.g., Sylheti [ˈgada], donkey, *versus* English [ˈgɑːdən], garden.

### ANALYSIS OF PROMINENCE REALIZATION

After an initial impressionistic analysis, for which it is important to note that the authors perceived prominence on the penultimate syllable of the target words in both Sylheti and English, mean *f0*, mean intensity (amplitude), and duration measurements were extracted for the penultimate and ultimate vowel in the target vowels using Praat (Boersma & Weenink, 2016) (see Mennen et al., 2020). An example of the vowel segmentation, which was conducted manually, is shown in Figure 1. For *f0* and intensity, standard Praat settings were used, i.e., 75-500 Hz and 50-100 dB. A total of 1068 tokens were analyzed; 74 tokens were excluded from the analyses due to background noise, unclear speech, or

TABLE 1. Speaker group details: mean and standard deviation in brackets

Group	n	Age of arrival in the UK (years)	Length of residence in the UK (years)	English use (%)	Sylheti use (%)	Both Sylheti and English (%)
Sylheti monolinguals	5	26 (3)	3 months (0.4)	14 (4)	69 (4)	17 (6)
English monolinguals	6	n/a	n/a	100	n/a	n/a
1st generation Sylheti L1 – English L2 late bilinguals, born in Bangladesh	9	20 (4)	24 (6)	23 (10)	57 (15)	20 (12)
1st generation Sylheti L1 – English L2 early bilinguals, born in Bangladesh	8	6 (3)	26 (11)	41 (10)	23 (6)	36 (8)
2nd generation Sylheti L1 – English L2 early bilinguals born in UK	6	n/a	n/a	50 (8)	26 (6)	24 (10)

TABLE 2. Target words for Sylheti and English

Sylheti target word (note: standard Bengali script)	Sylheti		English	
	Phonetic transcription, IPA stress symbol indicates prominence	English gloss	English target word	Phonetic transcription
গাধা	/gada/	donkey	garden	/gɑːdən/
লেবু	/lembu/	lemon	ladder	/ˈlɑdə/
মরিচি	/mɔris/	chilli	money	/mʌni/
পাখি	/faki/	bird	packing	/ˈpɑkɪŋ/
রান্না	/randa/	to cook	rainbow	/ˈreɪnbəʊ/
রাণী	/rani/	queen	reindeer	/ˈreɪndɪə/
তল গাছ	/talgas/	palm tree	rabbit	/ˈræbɪt/
টিয়া	/tia/	parrot	tiger	/ˈtaɪgə/
ভারী	/bari/	heavy	berries	/ˈberɪz/
হরিণ	/horin/	deer	honey	/ˈhʌni/

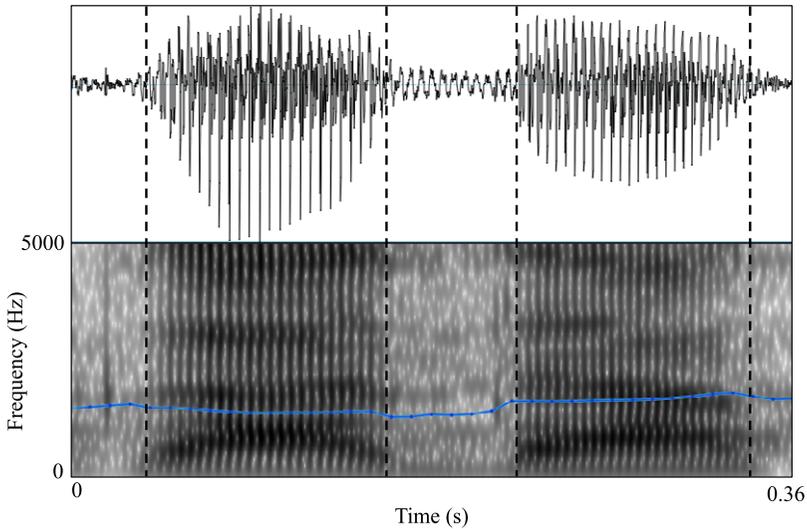


FIGURE 1. Example vowel segmentation in the Sylheti word /gada/. The blue line illustrates the pitch track.

creaky voice. Frequency and intensity measurements were means over the entire vowel in each syllable. For  $f_0$ , measurements were converted to semitones (see Nolan, 2003). Thereafter, all measurements were subsequently converted to a single value by subtracting the ultimate vowel measurement from the penultimate vowel measurement. This resulted in a single value for each measurement:  $f_0$  in semitones (ST), duration in seconds (s), and intensity in decibels (dB), with positive values indicating an increase, negative values indicating a decrease, and 0 indicating no change.

## RESULTS

Statistical analyses were run using R (R Core Team, 2019). For linear mixed-model analyses the lmer function in the lme4 package was used (Bates et al., 2015), with type II analysis-of-variance tables calculated using the package CAR (Fox & Weisberg, 2019). Post-hoc Tukey adjusted group comparisons were conducted using the ‘emmeans’ package (Lenth et al., 2020).

### MONOLINGUALS

As displayed in Figure 2, the Sylheti monolinguals had on average a rising pitch movement ( $\bar{x} = 1.1\text{ST}$ ;  $\sigma = 1.8$ ), from the penultimate to the ultimate syllable, indicated by the positive ST value. In contrast, as expected, the English monolinguals displayed an average negative value ( $\bar{x} = -1.4\text{ST}$ ;  $\sigma = 1.5$ ), indicating a falling pitch movement from the penultimate to the ultimate syllable.

For intensity, the Sylheti monolinguals displayed a negative difference between the penultimate and ultimate syllable ( $\bar{x} = -1.0\text{dB}$ ;  $\sigma = 3.1$ ). The English monolinguals

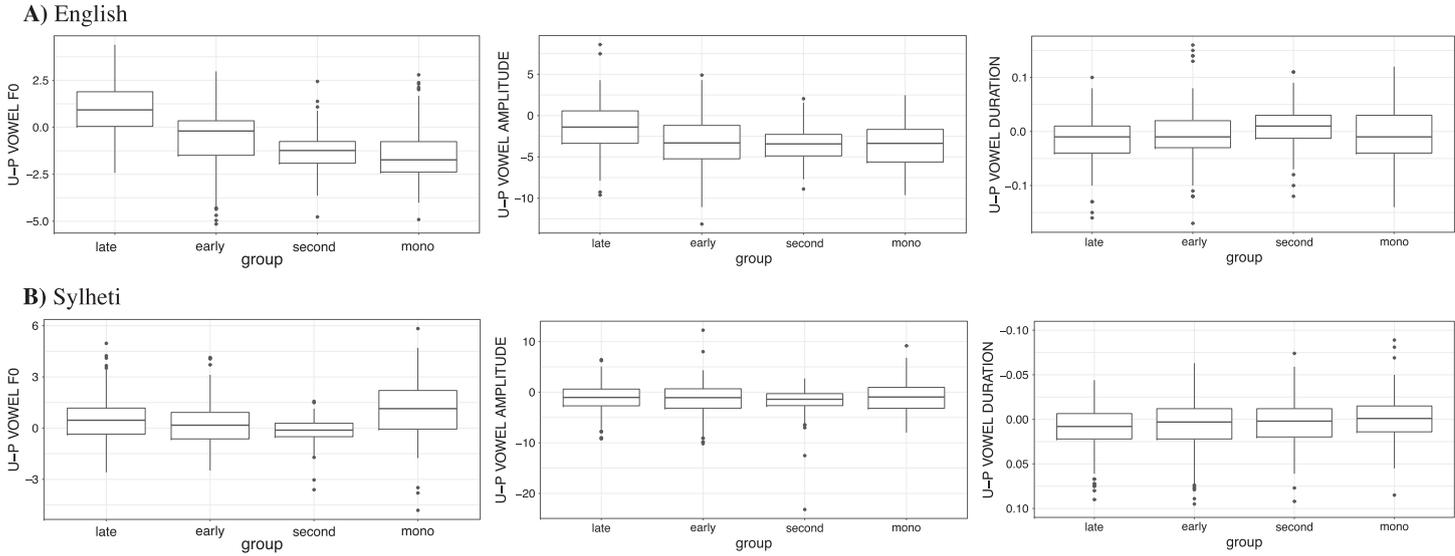


FIGURE 2. Box plots for English (A) and Sylheti (B) accent measures (semitones, amplitude in dB, duration in milliseconds) for the bilingual groups and monolingual speakers.

also displayed a decrease in intensity from the penultimate to ultimate syllable ( $\bar{x} = -3.6\text{dB}$ ;  $\sigma = 2.8$ ).

For duration, the Sylheti monolinguals showed almost no difference between the penultimate and ultimate syllables ( $\bar{x} = -0.01\text{s}$ ;  $\sigma = 0.02$ ). Overall, the English monolinguals also displayed little difference in duration from the penultimate and ultimate syllable ( $\bar{x} = -0.01\text{s}$ ;  $\sigma = 0.05$ ), save open syllables which were longer.

### COMPARISON OF BILINGUALS AND MONOLINGUALS

To investigate the bilingual Sylheti and English prosodic patterns, we ran separate linear mixed effects models for each language and prominence measure (ST, s, dB). In all analyses, the prominence measure was the dependent variable. Each model included group (monolingual, late, early, second-generation) as a fixed factor, and participant and word as random intercepts.

For Sylheti, we found a main effect of group for  $f_0$  ( $\chi^2(3) = 8.43$ ;  $p < .05$ ), but not for intensity ( $\chi^2(3) = 1.21$ ;  $p = .75$ ) nor for duration ( $\chi^2(3) = 3.72$ ;  $p = .29$ ). Similarly, for English, we found a main effect of group for  $f_0$  ( $\chi^2(3) = 21.74$ ;  $p < .01$ ), but not for intensity ( $\chi^2(3) = 7.47$ ;  $p < .06$ ) nor for duration ( $\chi^2(3) = 6.51$ ;  $p = .09$ ).

To further explore the significant main effect of group for  $f_0$ , Tukey HSD adjusted pairwise group comparisons were conducted. In the Sylheti comparisons, a significant difference was found between the second-generation bilinguals ( $\bar{x} = -0.18\text{ST}$ ;  $\sigma = 0.7$ ), who were born in the United Kingdom, and the Sylheti monolinguals ( $p < .05$ ), with second-generation bilinguals displaying a production trend toward English. In contrast, the late ( $\bar{x} = 1.1\text{ST}$ ;  $\sigma = 1.8$ ) and early arrivals, who were born in Bangladesh, ( $\bar{x} = 0.2\text{ST}$ ;  $\sigma = 1.2$ ) were not significantly different from the Sylheti monolinguals ( $p > .05$ ). There were no significant differences between any other groups ( $p > .05$ ).

For English, group comparisons, again with  $f_0$  as the dependent variable, revealed that the late arrivals ( $\bar{x} = 1.0\text{ST}$ ;  $\sigma = 1.3$ ) were significantly different from the English monolinguals, early arrivals ( $\bar{x} = -0.8\text{ST}$ ;  $\sigma = 1.9$ ) and second-generation bilinguals ( $\bar{x} = -1.3\text{ST}$ ;  $\sigma = 1.1$ ), (all  $p < .01$ ). There was no significant difference between any of the other groups ( $p > .05$ ). Specifically, early arrival and second-generation groups used a pitch pattern similar to the English monolinguals, whereas, as a group, the late arrivals used a Sylheti-like pitch pattern. See Appendix B for the full comparison table and effect sizes.

### EXPLORING INTERPERSONAL VARIATION

Observation of Figure 2 shows within-group variation between our participants' production patterns in Sylheti and English. To explore the potential factors underlying this variation, we conducted a series of Pearson product-moment correlation analyses to examine the relationship between the bilinguals' background factors (language use patterns, LoR, AoA) and their Sylheti and English  $f_0$  production patterns, particularly because the late arrival bilinguals used significantly more Sylheti and significantly less English than the other two groups.

TABLE 3. Summary of correlations between the bilinguals' Sylheti pitch pattern (A) English pitch pattern (B), length of residence in the UK (LOR), age of arrival in the UK (AOA), and language use

Group	LOR in the UK (years)	AOA in the UK (years)	Sylheti language use	English language use
A) Sylheti pitch pattern				
Late bilinguals, born in Bangladesh	.75	-.26	.25	-.49
Early bilinguals, born in Bangladesh	-0.04	-0.22	.47	.35
Second-generation early bilinguals, born in the UK	-.37	n/a (born in the UK)	-.54	.52
ALL	.34	.07	.39*	-.34*
B) English pitch pattern				
Late bilinguals, born in Bangladesh	.25	.51	-.15	-.04
Early bilinguals, born in Bangladesh	-.07	.27	-.37	.29
Second-generation early bilinguals, born in the UK	.19	n/a (born in the UK)	0.04	-.42
ALL	.00	.66	.45**	-.46**

\*  $p \leq .05$ , \*\*  $p \leq .001$ .

A summary of the correlations can be found in Table 3. For Sylheti, when all bilinguals were grouped together, we found a significant positive correlation between the speakers'  $f_0$  and Sylheti use,  $r(21) = .39$ ,  $p = .05$ , indicating a more Sylheti-like prominence realization for bilinguals who used more Sylheti in their daily lives. Additionally, again when all bilinguals were grouped together, a negative correlation was revealed between  $f_0$  and English use,  $r(21) = -.34$ ,  $p < .05$ . Bilinguals who used more Sylheti (and, therefore, less English) were more likely to follow a Sylheti-like pitch pattern in their Sylheti, i.e., with a rise from the penultimate syllable to the ultimate syllable.

For English  $f_0$ , when all bilinguals were grouped together, we found a positive correlation between  $f_0$  and Sylheti use,  $r(21) = .45$ ,  $p < .05$ , and a negative correlation between  $f_0$  and English use,  $r(21) = -.46$ ,  $p < .05$ , indicating that those who used more English (and, therefore, less Sylheti) were more likely to follow an English-like prominence pattern in their English.

Of interest, no significant correlations were found between  $f_0$  and the participants' LoR nor AoA, for English or Sylheti (see Table 3), indicating that language use was the most significant determinant of prominence realization in the bilinguals' speech.

## DISCUSSION

Our analysis of the Sylheti monolinguals revealed that, in general, prominent syllables were realized through an increase in  $f_0$  from the penultimate to the ultimate syllable, with the  $f_0$  of the prominent penultimate syllable being lower than the ultimate syllable. This pattern aligns with what some researchers have found in Standard Bengali (Khan, 2008, 2010; Maxwell, 2010; Shattuck-Hufnagel, 1988). For English, the monolinguals realized prominent syllables through a decrease in  $f_0$  from the penultimate to the ultimate syllable.

We did not find salient differences between the two monolingual group measurements for duration and intensity, although goals of future research may be to investigate these factors in larger monolingual groups. As the difference between intensity and duration of the penultimate and ultimate syllables in Sylheti monolingual speech was negligible, we interpret that a lower pitch of the penultimate (and here first because the words were disyllabic) syllable in relation to the ultimate syllable is the primary correlate of prominence realization in Sylheti.

The second aim of this research was to explore the realization of prominent syllables in Sylheti-English bilinguals residing in the London Bangladeshi community. Our analyses only found significant group differences for  $f_0$ , substantiating the important role of pitch in prominence realization in Sylheti and English.

For  $f_0$ , our findings showed that Sylheti production of the late and early arrivals, who were born in Bangladesh, was not significantly different from the Sylheti monolinguals, with both groups revealing a rise from the penultimate to the ultimate syllable of the disyllabic words. This lack of significant difference in Sylheti between the Sylheti monolinguals and the late and early arrivals indicates first language maintenance within this community. Such findings are somewhat in contrast to the previously discussed studies (Colantoni & Gurlekian, 2004; de Leeuw et al., 2012; Mennen, 2004; O'Rourke, 2005; Queen, 2001; Simonet, 2011), which showed that prosodic features are malleable even in first-generation bilinguals. However, it is important to note that the late and early arrivals displayed some variation in production patterns, with some speakers indeed displaying a falling  $f_0$  contour.

These overall Sylheti monolingual-like patterns found in our late and early arrival speakers may have been due to the dense language environment of the London Bangladeshi community. For example, in the study by de Leeuw et al. (2012), it could be argued that the German-English bilinguals were not the dominant ethnic group within the local Vancouver community (most immigrants to British Columbia speak either Cantonese, Mandarin, or Punjabi as their home language, German ranks 10<sup>th</sup> as most popular home language in British Columbia, see e.g., Statistic Canada, 2016). In contrast, the Bangladeshi community is one of the largest ethnic groups in the London Boroughs studied here, so there may have simply been more opportunities for the bilinguals of the current study to speak their L1, also with new arrivals, which would give rise to more native-like phonetic realizations in the heritage language. This interpretation would align with our finding that the bilinguals who used Sylheti more frequently were also more likely to produce the prominent syllables in line with the Sylheti monolinguals. In other words, the bilinguals of the current study might have had more opportunity to speak their native language than the bilinguals in the other research, and those who took advantage of this opportunity would have displayed more Sylheti-like prosody patterns.

However, our finding that the late arrival's Sylheti production did not significantly differ from the monolingual Sylheti speakers, may also be explained by examination of the prosodic variable in question. If a decrease in  $f_0$  on the prominent syllable is considered unique among the world's languages (Neppert, 1999), it may also be that the realization of this prosodic variable was more salient to the Sylheti-English bilinguals, and, therefore, potentially more easily maintained than prosodic variables examined in other studies.

Furthermore, in their Sylheti, bilinguals who were born in the UK were not significantly different from the late or early arrivals, but they were significantly different from the Sylheti monolinguals, displaying a production trend toward English. To some extent, these findings align with segmental research in similar communities that has shown that second-generation speakers often exhibit non-native features in the heritage language (Kupisch et al., 2014; Mayr & Siddika, 2016; McCarthy et al., 2013, 2014, 2011; but see Kirkham & McCarthy, 2020). This pattern might have been driven by their Sylheti language use patterns. Overall, less Sylheti use was associated with their falling English pitch realization, but it could also be in line with the fact that *some* of the late and early arrivals were patterning somewhat English-like, and that the second-generation speakers acquired the falling English pitch realization from the late and early arrivals (see, e.g., Rothman, 2007).

For English production, we found incremental differences between the bilingual groups, with the late arrivals producing Sylheti-like pitch patterns and the early arrivals and those born in the United Kingdom approximating the monolingual English pattern. These findings are similar to previous segmental research, which found that first-generation speakers typically exhibit patterns that reflect their first and dominant language (Khattab, 2000; Mayr & Siddika, 2016; McCarthy et al., 2013), and second-generation and those who arrived in the UK as children behave similarly to their monolingual peers (Evans et al., 2007; Mayr & Siddika, 2016; McCarthy et al., 2013, 2014, 2011). Such trends are again possibly due to differences in language use and linguistic experience between our speaker groups. The late arrivals spent their early adulthood in Bangladesh. Their increased exposure to English would have started when they arrived in the United Kingdom, with Sylheti often continuing to be the dominant language spoken at home and in the community, in contrast to the other two bilingual groups who used significantly less Sylheti.

It is noteworthy that the early arrivals were the only group that had acquired monolingual-like prominence patterns in both languages. Thus, the combination of early Sylheti exposure coupled with continued English use thereafter potentially contributed to the patterns for the prosodic feature explored in the current study. Although not investigated in the current study, it is also possible that socio-indexical factors play a role in the production patterns of the early arrival and second-generation bilinguals, such as attitudes and affiliation toward the heritage and majority language and culture (see, e.g., Alam & Stuart-Smith, 2011; Heselwood & Mcchrysal, 1999, 2000; Kirkham, 2011; Sharma & Sankaran, 2011). One avenue for future research could be to incorporate factors such as identity, attitudes, and style.

Our final aim was to explore the effect of language use, length of residence, and age of arrival on the bilinguals' prominence realization. Our findings highlighted language use as a key driver in the bilinguals' prosodic patterns. Specifically, our correlation analyses showed that an increase in English use was associated with a more monolingual-like English prominence realization, and an increase in Sylheti use resulted in more monolingual-like Sylheti prominence, regardless of when the bilinguals arrived in the UK. This finding became apparent when all groups were merged together. Again, this result, which is somewhat in contrast to other research (which shows that age of acquisition can be a significant factor in determining language proficiencies [see, e.g., Ortega, 2014, for an overview]) may again have arisen due to the unique community we

investigated. As already mentioned, it may be that because the community was large and dense, it was simply possible to have more diverse input from the L1 than other minority communities would receive in their L1. Moreover, previous studies into L2 acquisition and the interaction between the L1 and L2 have focused on segmental aspects, with only a few studies exploring prosodic variables (de Leeuw, 2019, 2020; de Leeuw et al., 2012; Mennen, 2004; O'Rourke, 2005; Queen, 2001; Simonet, 2011). It may, therefore, be that age of acquisition effects can be more easily compensated with enough language input for prosodic dimensions of speech, but not as readily for segmental aspects of speech.

In brief, although our findings are based on a small subset of the London Bangladeshi community, and likely do not represent the group in its entirety, we found that, overall, there was a salient difference in prominence realization between Sylheti and English monolinguals, with Sylheti pitch tending to evidence a rising contour and English pitch tending to evidence a falling contour from the prominent penultimate syllable to the ultimate syllable (see also Khan, 2008; Maxwell, 2010; Shattuck-Hufnagel, 1988). Moreover, when groups were compared, prominence tended to be a relatively robust variable in Sylheti, such that only those born in the UK evidenced a significant difference from the Sylheti monolinguals. Alternatively, prominence realization in English was only *not* successfully acquired by the late arrival group, whereas the early arrivals and those born in the UK realized prominence similar to the English monolinguals.

Although we found these intergenerational group differences, our results further suggested that language use was the most significant predictor variable in determining prominence realization, with more Sylheti use associated with Sylheti-like prosodic patterns, and more English use associated with English-like prosodic patterns. These findings enhance both our understanding of prosody in the world's languages, as well as the production of prosody in bilinguals more generally.

## COMPETING INTERESTS

We have no conflict of interest to disclose.

## NOTE

<sup>1</sup>An issue when examining bilinguals is always that the descriptors used for one language are not necessarily applicable to the other (i.e., it is widely accepted that English is a stress bearing language, although this is debated with regard to Sylheti, which is considered to be closely related to Bengali, and, therefore, the term “stress” is not necessarily appropriate for both languages). We decided to use the term *prominence* to describe our phonetic variable as we considered it to be the most neutral term which could be applied to both languages in question, given that the primary purpose of this research was to investigate prosodic patterns in Sylheti-English bilinguals.

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## APPENDIX A

TABLE A1. Full group comparisons table and effect size for bilinguals Sylheti, English, and both language use (all  $df = 21$ )

Group contrast	Estimate	SE	<i>t</i> Statistic	<i>p</i> Value	Cohen's <i>d</i>
Sylheti					
early - late	−34.8	5.59	−6.230	<.00**	3.03
early - second	−3.5	6.21	0.563	.84	0.30
late - second	31.3	6.06	5.167	<.00**	2.72
English					
early - late	18.11	4.94	3.66	<.00**	3.42
early - second	−8.67	5.49	−1.57	.29	0.34
late - second	−26.78	5.36	−4.99	<.00**	3.08
Both					
early - late	16.74	5.21	3.21	.01*	3.03
early - second	12.12	5.79	2.09	.11	0.30
late - second	−4.61	5.65	−0.82	.70	2.72

\*  $p \leq .05$ , \*\*  $p \leq .001$ .

## APPENDIX B

TABLE B1. Summary statistics including effect size (Cohen's *d*) for Tukey HSD adjusted pairwise group comparisons for (A) Sylheti and (B) English *f*<sub>0</sub> measures

Comparison	Estimate	SE	<i>t</i> (df = 24)	<i>p</i> Value	Cohen's <i>d</i>
A) Sylheti					
early - late	-0.32	0.41	-0.79	.86	-0.33
early - monolingual	-0.94	0.48	0.72	.23	-0.95
early - second	0.48	0.45	1.06	.71	0.49
late - monolingual	-0.61	0.47	-1.32	.56	-0.62
late - second	0.81	0.44	1.82	.29	0.83
monolingual - second-generation	1.42	0.51	-2.79	.04*	1.44
B) English					
early - late	-1.99	0.60	-3.35	.01*	-1.51
early - monolingual	0.46	0.65	0.72	.88	0.35
early - second	0.39	0.65	0.61	.93	0.29
late - monolingual	2.46	0.63	3.71	.00**	1.86
late - second	2.38	0.67	3.58	.01*	1.80
monolingual - second-generation	-0.07	0.71	-0.11	.99	-0.06

\*  $p \leq .05$ , \*\*  $p \leq .001$ .