The Production of /l/ in Italian by HS and L2 Italian Speakers in Australia: Exploring the Effect of Syllable Position and Adjacent Vowel Quality

Valentina De Iacovo, John Hajek

Università degli Studi di Torino, The University of Melbourne

valentina.deiacovo@unito.it, j.hajek@unimelb.edu.au

Abstract

Heritage speakers (HS) are often noted for having a distinct sound or accent compared to both monolingual (L1) and second language (L2) speakers of the same language. In this study we focus on the production of the lateral approximant /l/ in Italian by HS and L2 speakers of the language in Melbourne (Australia) to investigate whether speaker status has an effect: in English both light (or clear) and dark (velarized) alveolar laterals occur depending on syllabic structure, while in Standard Italian /l/ is always a plain alveolar without secondary velarization. In this pilot study we conducted a production task with a set of words where /l/ occurred in different syllable positions and contexts, and which were read by three groups: HS, L2 and L1 Italian speakers. Results showed that the HS behave differently from both L1 and L2 speakers. However, while syllable position and structure influence the realization of /l/ between groups, there is no statistically significant difference within groups. Nevertheless, the quality of the adjacent stressed vowel influences the degree of lightness/darkness of the lateral sound across all groups.

Index Terms: bilingualism, lateral approximant, Italo-Australian community, heritage speakers, Italian L2

1. Introduction

1.1. Italian heritage speakers in Australia

Following WWII, more than 270,000 Italians moved permanently to Australia between 1947 and 1976 [1] – with the largest concentration establishing itself in Melbourne, the capital city of the State of Victoria. While those who migrated (so called *1st generation*) usually speak a regional dialect and/or a regional variety of Italian as L1 and Australian English (AuE) as L2, their children (*2nd generation*), born and educated in Australia, normally speak AuE as their L1 and/or a regional dialect and/or a regional variety of Italian as their heritage language. According to the most recent census conducted in 2021, more than 1.1 million Australian residents reported having Italian ancestry. Of these some 384,000 live in Victoria [2]. By far the largest proportion of Italian migrants and their descendants is from Central-Southern Italy (e.g. Sicily, Calabria and Abruzzo), although there was also significant permanent migration from Northeast Italy (specifically the Veneto and Friuli-Venezia Giulia regions).

A long tradition of linguistic research on the Italian community in Australia has to this point focused mainly on sociolinguistic practices and interactions within the community and on language shift [3, 4 for a review]. Some very recent research has now started to explore the potential effects of attrition and language contact from a phonetic perspective due to the bilingualism and/or trilingualism (regional dialect, regional Italian and AuE) of those speakers [5, 6]. With this contribution we aim to contribute further to this developing field of research by focusing specifically on the production of lateral /l/ in Italian. We compare separate groups of Italian HS and L2 speakers with a group of L1 Italian speakers to investigate the pronunciation of this consonant in a language contact context where at least some lateral velarization might be expected to appear in HS speech due to the effect of simultaneous proficiency in AuE.

1.2. Lateral /l/ in Italian vs Australian English

Traditionally, in Standard Italian (SI) the lateral approximant /l/ is reported to be fully alveolar without any secondary place of articulation [7]. However, there are also some very brief reports that in regional varieties of Italian it can also occur as semi-velarized or prevelarized depending on the syllabic context in different parts of northern (Veneto, Emilia-Romagna) and central-southern (Tuscany, Campania, Apulia, Sicily) Italy [8, 9]. It can also be velarized or retroflexed in some Italian dialects [10, 11] which then influences in turn the regional variety of spoken Italian. In terms of previous acoustic analysis of the lateral /l/, in Italian the only existing phonetic study we are aware of is based on a group of 10 Florentine Italian male speakers [12] where /l/ is analysed only in word-medial syllable-initial position within a CV'CV sequence, e.g. *calata* 'dropped') and for which measured acoustic frequency ranges were reported to be 500-810 for F1 and 1165-1430 for F2.

In AuE, /l/ is usually described as surfacing as 'light' or 'clear' [l] in syllable-onset position, and velarised as [ɫ] i.e. 'dark' in coda position, while it is also often dark before a morpheme boundary preceding a vowel [13, 14]. However, [15] has suggested that syllable onset /l/ is more dorsal or velarized in AuE than in other varieties of English, claiming that the distinction clear vs dark is neutralized. This claim finds some confirmation in a recent study on AuE [16] in which initial electropalatographic (EPG) measurements for one speaker showed that lateral velarization appeared to occur equally in both onset and coda positions. That said, the general consensus still is the degree of velarization still appears to be relative according to syllable context in AuE: it is claimed specifically that velarization will always be greater in syllable-codas than in onsets, and in intervocalic word-medial ambisyllabic position the lateral may be intermediate with respect to relative velarization [13]. Such gradience in velarization related to syllable position has since been confirmed experimentally across different groups of AuE speakers [17] (see also below).

In addition to this, while the lateral is known also to influence adjacent vowel quality in AuE [18], the quality of vowels adjacent to the lateral consonant are also known to influence its relative darkness (e.g. [19]).

1.3. HS, L1, L2 and previous studies on lateral approximants in HS and L1 in migration settings

From a linguistic perspective, the term 'heritage speakers' (HS) sometimes also known as second generation migrants, refers to the children of the original migrants, who have lived in a bilingual/multilingual environment from an early age. While first generation immigrants are dominant in the native language of their home country, even if they may also have undergone L1 attrition, HS have as their dominant language, as noted above, the language of the host country [20]. From a phonetic perspective, there is also evidence that HS behave differently from L2 speakers who have acquired the L2 later in life. According to [21] for example, HS are able to maintain the Mandarin Chinese post-alveolar contrast in production and, in contrast to native L1 speakers and late L2 learners of Mandarin, tend to keep Mandarin and English sounds apart. [22] investigated the contrast between /l/ and /ɫ/ in L1 Albanian speakers resident in London and with L2 English to see what the impact, if any, of the allophonic distribution of lateral velarization in English might be. They found a stronger trend for light /l/ to become dark in coda position than for dark /ɫ/ to become light in onset position in Albanian. [17] investigated velarization of /l/ in the AuE of Anglo-Celtic and Lebanese Australians. As previously noted, results confirmed a positional effect, with /l/ darker word-finally than in word-initial position. Interestingly, the degree of darkness is also related to gender, ethnic identity, and social networks.

1.4. Aim of the study

If, on the one hand, SI has only a plain alveolar lateral, while AuE presents a clear or dark alveolar according to syllabic context, how do HS of Italian produce /l/ in Italian, particularly with respect to position within the syllable?

In this pilot study we investigate whether Italian HS and AuE L2 speakers produce /l/ in Italian as L1 speakers do and, if not, whether there is any difference between HS and L2. We also explore what if any potential differences are related to syllable structure and the preceding/following stressed vowel. Given the reported difference between SI and AuE with respect to the articulation of /l/, and the absence of any syllable effect in the former, and its reported conditioning effect in the latter, we therefore want to investigate: (1) if the place of articulation of the lateral /l/ produced by HS is 'clear' alveolar in all syllabic positions or, if as a result of HL attrition, and contact with and the dominance of AuE, /l/ is velarized, i.e. 'dark, in different syllable positions; (2) to see if velarization occurs to the same degree among HS and L2 speakers, given their shared proficiency in AuE; and (3) to see the extent to which the adjacent stressed vowel influences the degree of lightness/darkness of the lateral, assuming that back vowels (a, o, u) are more likely to contribute to lateral velarization than front vowels (i, e) [18]. In order to do so, we conducted a production experiment to determine the potential velarizing effect of specific syllabic structures on /l/ based also in part on the position in the word as well as the effect of the nature of the adjacent stressed vowel.

Our first hypothesis is that L1 Italian speakers will produce light alveolar /l/ in all contexts, while HS and L2 speakers will differentiate light and dark laterals based on onset or coda position respectively. Assuming that is the case, our second hypothesis is that /l/ produced by L2 will be darker than those produced by HS regardless of context – since they are likely to be the most influenced by their L1 AuE in contrast to HS who may be expected to gravitate towards L1 Italian norms given their longstanding exposure to and proficiency in Italian. As no previous acoustic studies on Italian have previously taken into account the role played by the syllabic structure and the potential influence of the adjacent stressed vowel, with this study we also aim at giving some first quantitative results about these matters more generally.

2. Experimental setting

2.1. Set of target words

In order to test potential differences in the realization of /l/ based on syllable structure, a set of words was created with the lateral in onset or coda position. Words employed (Table 1) were disyllabic (with initial stress) and for each category we always included 5 orthographic vowels (a, e, i, o, u). To do this, in a few cases, we also made use of nonsense words. We decided to test 3 possible syllabic structures where /l/ can occur in Italian:

- word-initial syllable-onset position followed by a stressed ('lVCV, *lato*)
- word-medial syllable-onset position preceded by a stressed vowel ('CVlV *pala*);
- word-medial syllable coda position preceded by a stressed vowel and followed by a voiceless stop /p, t, k/ ('CVlCV *salta*);

Table 1. *Target words used in the production task.*

'lVCV	lato	lega	lina	loro	Luca
'CVlV	pala	pela	fila	sola	mula
'CVlCV	talpa	scelta	milto	polpa	culpa
	salta	telca	pilco	volta	adulto
	palco	felpa	ilpa	solco	sulca

2.2. Production experiment

The experiment was created and hosted using the Gorilla platform [23] on a Dell Latitude 7490 laptop. Speakers read aloud once a list of written carrier phrases in Italian containing the target word such as "Ho detto *lato* proprio ora" (I said *side* just now) which were presented to them in random order. Recordings were made in a quiet room at the University of Melbourne, using a Rodelink Lav microphone. Only three tokens were not considered because of mispronunciation and a final set of 747 tokens was used for the purpose of analysis.

2.3. Participants

For this study we recruited 10 HS of Italian (henceforth HS), 10 L2 Italian speakers (EN) and 10 L1 Italian speakers (L1). The HS group consisted of women (aged 51-65), born in Melbourne or elsewhere in Victoria and with Italian background from the centre or south of Italy. They also speak Italian fluently, and habitually in the family. The EN group was made up of L1 English female students (aged 19-22), all Melbourne born and who were also studying Italian at post-beginner level at university. Their proficiency in Italian is education-derived. The L1 group involved L1 Italian speakers (aged 30-67) born and recorded in the north of Italy. All participants were naive to the purpose of the experiment and did not report any speaking or reading difficulties. In order to have a homogeneous group in terms of vocal tract, only female speakers were involved in this study.

2.4. Acoustic measurements

Target sounds were manually measured and labelled using Praat [24] according to the position of the lateral in three different syllable sequences (onset lateral /ˈlVCV/, /ˈCVlV/, and coda lateral /ˈCVlCV/) and the preceding or following stressed vowel (a, e, i, o, u). F1 and F2 formant values were extracted and downloaded into a csv file using a Praat script [25] which extracted 10 interval points of F1 and F2 measures for each target /l/ in the wav file and the associated Textgrid (see Results). Subsequently, the midpoints of the F1 and F2 estimated formants were automatically extracted and were also converted to the Bark scale using the formula recommended in [26]: F1/2 Bark = [(26.81 × F1/2) / (1960 + F1/2)] − 0.53. We present results here for mid-point only.

While F1 and F2 values on their own are important in understanding lateral articulations, the proximity between the two is considered to be the primary acoustic cue of relative velarization. Darker laterals have a lower F2, closer to F1, while clearer laterals have a generally lower F1 but a higher F2 [19]. The F2-F1 Bark measurement, used in previous studies to measure /l/ velarization [e.g. 27], was also adopted in order to better quantify the lateral's clearness or darkness from a perceptual perspective [17].

It is well-known that the acoustic identification of velarized versus vocalized laterals is difficult [19]. Since our analysis here relies exclusively on acoustic data, and given the pilot nature of our study including the relatively limited size of our sample, we have not tried through other means to identify and separate potentially vocalized tokens from the tested sample. Given the relatively low frequency (5.8%) of vocalized /l/ in previous experimental work on AuE [17], this may not be such an issue but remains nevertheless something for future non-acoustic assessment.

3. Results

3.1. F1 and F2 Hz and F2-F1 Bark

Our analysis was performed using R [27]. Mean values for lateral F1 and F2 at mid-point grouped by type of syllable structure and sequence (/ˈlVCV/, /ˈCVlV/, /ˈCVlCV/) and group (L1, HS, L2) are shown in Table 2. On initial inspection, it seems that variation occurs within the three groups according to syllable context. L1 group also shows more variation in F2 values compared to HS and L2. HS speakers show much lower F2 values in all the syllable contexts compared to the other groups, indicating that /l/ is generally darker (with the /ˈlVCV/ context clearer than for the other two tested contexts due to a noticeably lower F1). Based on F1 and F2 values, laterals in coda position are clearer for the L1 group and become progressively darker in turn for L2 and HS groups respectively. Unexpectedly, in both syllable onset positions (/ˈlVCV/ and /ˈCVlV/) L2 speakers show higher F2 values than L1 speakers, pointing to potentially clearer onset laterals for that group.

In Table 3 (with respective boxplots in Figure 1) we show the means and standard deviations of F2-F1 Bark normalization for the three syllable contexts investigated. We note firstly that there is variation in F2-F1 Bark within all three groups, with the L1 group having the highest average values (range 7.69-8.15) in all three categories when compared to the other two (HS 6.43-7.07, L2 7.42-7.78), corresponding to a generally more fronted place of articulation (i.e. more alveolar and less velarized). Particularly striking is the unexpectedly high 'clear' value (8.15) for L1 in syllable-final position. The HS and L2 groups on the other hand show gradient velarization according to syllable type and location: F2-F1 Bark values fall in a cline from word-initial to word-medial and then syllable-final position – consistent with previous reports for AuE ([13], [17]). The cline is, however, more moderate for L2 than it is for HS. At the same time overall F2-F1 Bark mean values for /l/ are much higher for both L1 and L2 groups than for HS (respectively 7.97 for L1, and 7.53 for L2 but only 6.63 for HS). Overall, the L1 group produces the clearest /l/ followed by L2 (especially in non-coda position), with much lower values for HS in all contexts indicating these speakers generally produce much more velarized laterals.

Table 2. *Lateral F1 and F2 midpoints' mean in Hz by type and group.*

Type	ˈlVCV		ˈCVlV		ˈCVlCV	
Group	F1	F2	F1	F2	F1	F2
L1	365	1595	408	1691	380	1743
HS	368	1459	414	1495	415	1446
L2	409	1732	452	1781	411	1661

Table 3. *F2-F1 mean in Bark and SD by type and group.*

Group		ˈlVCV	ˈCVlV	ˈCVlCV	Overall
L1	mean	7.71	7.69	8.15	7.97
	SD	1.42	1.57	1.77	1.67
HS	mean	7.07	6.78	6.43	6.63
	SD	1.53	1.83	2.28	2.07
L2	mean	7.78	7.61	7.42	7.53
	SD	1.81	1.77	2.29	2.10

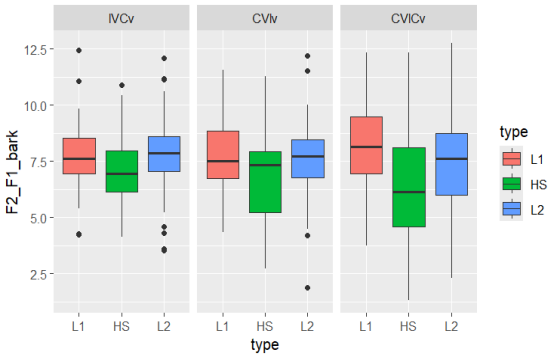

Figure 1: *Boxplots of F2-F1 Bark by type and group (L1, HS, L2).*

Before conducting any significance test, we first assessed the assumption of equality of variance with a Levene's test. Because the test showed that the assumption of equality was not met ($p < .001$), we decided to use a Games-Howell test which generally offers the best performance in these scenarios. The test revealed that F2-F1 Bark was significantly different overall among the three groups (HS-L1 and HS-L2 p values $< .001$, L1-L2 $p < .05$). As a next step, a sequence of the same test was conducted at syllable level to examine whether there were significant differences in F2-F1 Bark among the three groups. In coda position preceding a consonant (/ˈCVlCV/) the test revealed a significant difference between L1 v. HS and HS v. L2 ($p < .001$) as well as between L1 v. L2 ($p < .05$) for /l/. A significant difference was only found for /l/ in word-medial syllable-onset position following a stressed vowel (/ˈCVlV/)

between L1 and HS ($p < .05$), while no significant effect was found with respect to the word-initial syllable with lateral onset (/ˈlVCV/) amongst the three groups. Within group results were very different: surprisingly there was no effect of syllable context in any group - even in the case of coda /l/ v. word onset /l/ for HS ($p = 0.66$). This may be the result of variability seen in high standard deviation values.

3.2. Effect of the adjacent stressed vowel

Our third research question related to the extent to which the nature of the adjacent stressed vowel influences or correlates in some way with the degree of clearness/darkness of the lateral, assuming that back vowels would, due to tongue dorsum retraction, contribute more to velarizing the lateral compared to front ones. It should be borne in mind that the five vowels we tested are captured orthographically <a, e, i, o, u> and small differences in phonetic vowel quality between It and AuE are not unexpected, but were not explored here. Table 4, 5 and 6 show F2-F1 Bark mean values of the lateral midpoints for each of vowels in each of the three syllabic contexts, i.e. /ˈlVCV/, /ˈCVlV/ and /ˈCVlCV/ respectively. From a first overview, all groups (IT, HS, L2) show a difference in the degree of clearness/darkness on the basis of the front/back vowel distinction, regardless of syllable structure: back vowels show lower F2-F1 Bark differences, corresponding to a greater velarization of /l/. Comparing the three speaker groups, however, the lowest recorded values are for HS <a> and <o> before word-medial /l/ and syllable final coda /l/ in /ˈCVlCV/.

Based on those general results, we then conducted another Games-Howell test to test for statistical significance. In coda position (/ˈCVlCV/) results revealed a significant difference between L1 and HS when the lateral is preceded by <a>, <e>, <o>, <u> ($p < .001$) and between HS and L2 when it is preceded by <o> and <u> ($p < .01$). A significant difference is also found in onset position (ˈlVCv) between L1 and HS ($p < .001$) and between HS and L2 ($p < .05$) when /l/ is followed by <o>. Not surprisingly, within group comparisons also confirmed significant differences in vowel effects in the predicted direction, with significant difference in L1 and HS group ($p < .001$) between front and back vowels in coda position.

Table 4. *F2-F1 mean in Bark and SD by type and group.*

ˈlVCV						
Group		_i	_e	_a	_o	_u
L1	mean	8.78	8.13	7.01	7.47	7.15
	SD	2.32	0.75	1.11	0.70	0.93
HS	mean	8.53	7.38	6.31	5.70	7.43
	SD	1.31	1.80	0.94	0.8	0.92
L2	mean	9.18	8.11	6.51	7.05	8.07
	SD	2.38	1.48	1.44	1.40	1.06

Table 5. *F2-F1 mean in Bark and SD by type and group.*

ˈCVlV						
Group		i_	e_	a_	o_	u_
L1	mean	9.05	8.59	6.51	6.85	7.46
	SD	1.53	1.52	0.85	0.92	1.38
HS	mean	8.57	7.71	5.58	5.23	6.68
	SD	1.14	1.04	1.50	1.72	1.41
L2	mean	9.13	7.32	6.62	6.96	8.02
	SD	1.82	2.15	0.90	1.22	1.52

Table 6. *F2-F1 mean in Bark and SD by type and group.*

ˈCVlCV						
Group		i_	e_	a_	o_	u_
L1	mean	9.80	9.15	6.92	6.98	7.80
	SD	1.24	1.13	1.37	1.25	1.65
HS	mean	8.62	7.07	4.99	5.32	6.13
	SD	2.40	2.26	1.10	1.72	1.68
L2	mean	8.77	7.61	6.14	6.71	7.89
	SD	2.98	1.54	1.80	1.82	2.19

4. General discussion and conclusion

In this contribution we have presented the results of a pilot study aimed at exploring the production of lateral approximant /l/ in HS and L2 speakers of Italian in Australia compared to L1 speakers. Overall, velarization varied across the three groups, with an effect most evident in coda /l/ and with none for word-initial /l/. The L1 group produced the clearest laterals overall – – consistent with descriptions of Standard Italian. That said, they also show some predictable vowel-conditioned velarization. The L2 group who could be expected to show significant velarization due to the influence of AuE also appeared to produce generally clear laterals. In coda position /l/ in both L2 and HS speakers is significantly different from IT, albeit much more velarized for HS than for L2. Overall, however, our results also show that L2 are able to produce laterals in a manner much more similar to L1 than HS, who instead tend to produce much more velarized laterals across the board. Neither of these findings was predicted. It is possible that the L2 group was hyperarticulating during the task, and in so doing avoiding velarization. We initially expected HS to land somewhere in the middle between L1 and L2 speakers, given the potentially counter-balancing influence of Italian and AuE. This was not the case – they had the darkest laterals in all syllable contexts. Moreover, a suggested syllable-conditioned cline in velarization gradience was not found to be significant: /l/ was relatively dark in all contexts. The reasons for overall darkness are not clear, but there are a number of possible explanations. It may, for instance, be due to the effect of a local Italo-Australian accent of Italian in which velarization is characteristic and borrowed from AuE. It may also lateral velarization is more widespread in Central and Southern Italy than is currently reported and has been retained in the speech of our HS speakers. Both of these hypotheses require further investigation.

With respect to vowel interactions, we predicted that for articulatory reasons of tongue retraction, laterals would show greater evidence of velarization when adjacent to the stressed back vowels (a, o, u). This was confirmed, with particularly greater effect for <o> for HS.

Future work, ideally based on a larger data sample, will explore the dynamics of formant trajectories to understand better the nature and process of velarization. It should also explore lateral production in the AuE of our two Australian groups, HS and L2, to see to what extent their results for Italian correlate with their articulation of /l/ in English.

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