

Stop Signs and their Location **A Linguistic Analysis**

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Abstract: The main objective of this project is to determine whether there is a relationship between the linguistic context of a stop sign and the language of intersection on which it is located. This research analyzes a sample of 2816 stop signs in seven different neighborhoods of the City of Montreal. For every borough, the total number of stop signs was divided into nine categories, according to the language of the sign and its intersection. Subsequently, frequency charts and chi-square tests were deduced in order to determine the correlation between sign and intersection language within each of the neighborhoods. As a result, it was found that only few of the regions depicted a considerable correlation.

Introduction

Over the years, the population of Montreal has experienced quite a few issues concerning language bias. This has affected many spheres such as education, culture, politics, business, economy, immigration, employment, plus many more. And essentially, it influenced what is of interest to us in this project – stop signs! As a consequence, linguistic anthropology is what I have decided to focus on in my research, and the following is the central question under investigation: is there a relationship between the linguistic context of a stop sign and the language of the intersection on which it is located?

This analysis is carried out in various regions of Montreal, which suggests that correlation might be present in some areas, and absent in others. For this reason, regional comparison is also a part of my research. I think it is very interesting that Montreal has such language policies, which caused them to re-name a number of street-names from English to French over the last 40 years or so (and this includes some principal streets like Maisonneuve). While some regions of the city stayed very Anglophone – both in terms of street-names and stop signs. And this is what essentially I am looking at in this project; I would like to know which of the investigated municipalities portray some sort of a linguistic connection between stop-signs and street-names. Also, it would be interesting to find out whether such connections relate to the 'principal' language of a municipality – this can be looked at with respect to the number of French, English and bilingual people living in an area.

Note that in this research report, for the purpose of consistency, I use the words municipality, neighbourhood and borough interchangeably, to refer to the areas of Montreal under analysis. Although in fact, these are different notions.

Methods

To begin with, the complete sample of 2816 stop signs was classified into seven categories according to the municipality within which they were located. These seven categories are as follows: Plateau, Notre-Dame-de-Grace (NDG), Cote-Saint-Luc (CSL), Ville Marie (VM), Westmount, Hampstead, and Cote-des-Neiges (CDN). First, the total number of French, English, and bilingual/other stop signs was calculated for the entire sample, and every street-intersection was classified and counted in the same manner. Unfortunately, this linguistic information was not recorded (in the master data sheet) for 58 stop-signs,

and therefore could not be classified. Subsequently, the same type of categorization was done within each of the seven municipalities. And finally, each stop-sign within every municipality was recorded in one of the following categories: English Sign/English Intersection, English Sign/ French Intersection, English Sign/ Other (bilingual or unordinary) Intersection, French Sign/English Intersection, French Sign/French Intersection, French Sign/Other Intersection, Other (Bilingual) Sign/English Intersection, Other Sign/French Intersection, Other Sign/Other Intersection. From the obtained data, a mix of 2x2, 2x3 and 3x3 chi-square tests, as well as frequency charts were deduced. The calculated chi-square values helped determine whether there was a relationship between the linguistic content of stop signs and their intersection locations, for each of the aforementioned regions in Montreal.

Results

The entire sample of 2816 items was divided into seven groups according to the municipality within which they were located:

1. Plateau – 219 stop signs
2. Cote-des-Neiges – 459 stop signs
3. Cote-St-Luc – 366 stop signs
4. Hampstead – 341 stop signs
5. Notre-Dame-de-Grace – 622 stop signs
6. Ville Marie – 302 stop signs
7. Westmount – 507 stop signs

The languages of Signs and Intersections were calculated for the whole sample:

Language	Number of signs	Number of intersections
<i>French</i>	1523	342
<i>Bilingual/Other</i>	221	995
<i>English</i>	1013	1478
<i>Empty</i>	58	0

Table 1 Language of Sign and Intersection for Total Sample

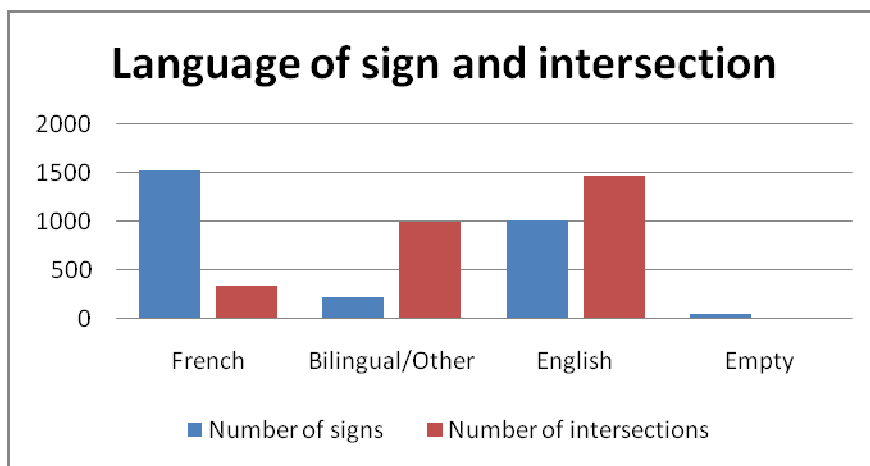


Figure 1 Language of Sign and Intersection for Total Sample

Subsequently, the language of stop signs and their location (intersection) was determined for each neighbourhood.

Borough	Language	Total Signs	Total Intersections
Plateau	French	219	138
	other	0	67
	English	0	14
	empty	0	0
CDN	French	417	86
	other	38	266
	English	1	107
	empty	3	0
CSL	French	9	0
	other	53	51
	English	304	315
	empty	0	0
Ham	French	28	0
	other	57	38
	English	256	303
	empty	0	0
NDG	French	569	29
	other	53	232
	English	0	360
	empty	0	1
VM	French	274	84
	other	17	153
	English	9	65
	empty	2	0
Westmount	French	6	5
	other	5	188
	English	443	314
	empty	53	0

(English predominant, - French predominant)

Table 2 Language of Stop Sign and Intersection for Every Municipality

The following table depicts the number of stop signs within nine categories, according to the language of the sign and intersection of its location. This is shown for all seven municipalities.

	Plateau	CDN	CSL	NDG	Ham	VM	West
English Sign/English Int.	0	1	264	0	228	6	278
English Sign/French Int.	0	0	1	0	0	0	5
English Sign/Other Int.	0	0	40	0	23	4	161
French Sign/English Int.	14	91	3	339	19	59	0
French Sign/French Int.	138	78	0	26	0	85	0
French Sign/Other Int.	67	247	5	203	9	130	5
Bil. Sign/Other Int.	0	15	5	29	4	15	4
Bil. Sign/English Int.	0	16	46	21	55	1	1
Bil. Sign/French Int.	0	7	0	3	0	0	0

Table 3 Number of Stop Signs in each Sign/Intersection Language Category within each Municipality

Chi-square Tests

These help determine whether there is some relationship between the language of stop sign and language of intersection (where it is located) that is unlikely to have occurred by chance. Let's look at this by municipality:

1. **Plateau:** because this municipality contained essentially only French stop signs, and none were English or other (thus 0s present in chi-square calculations), a chi-square statistic could not be calculated (as it only shows relevant results for values over 10). However, the following frequency chart was made, and showed that the predominant number of stop-signs of the Plateau region was concentrated in the French Sign/French Intersection category. Possibly this suggests that there is some connection between the language depicted on each of them.

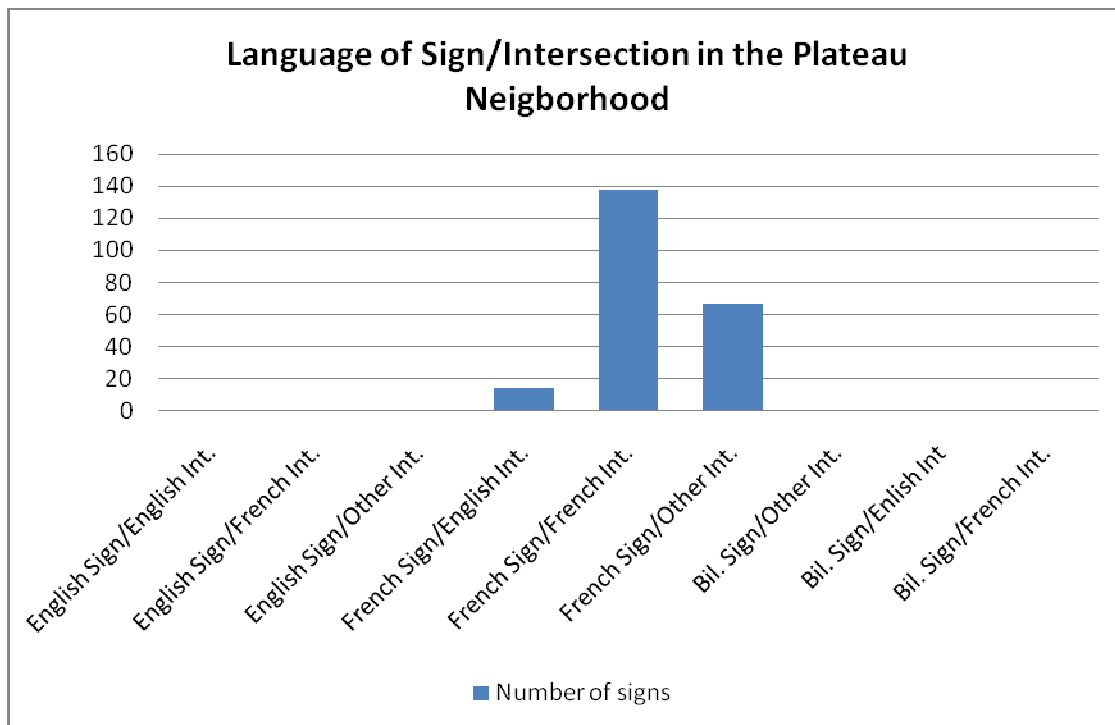


Figure 2 (see table of values in Appendix A)

- 2. Cote-des-Neiges:** The chi-square 2x3 test has produced a chi-square value of 9.8041, which is higher than the critical value of 5.99. This means that the differences between observed and expected values are significant, and there is a certain relationship between language of sign and intersection that would have unlikely occurred by chance. Comparing informally, through visual inspection, it can be seen that the main difference lies between the observed and expected number of French Sign/English Intersection items – there were much fewer of these than expected for this municipality. Also, there were more other Sign (Bilingual and English in this case) / English Intersection stop signs than expected. There were more French Sign/Other Intersection items than expected, and fewer Other Sign/Other Intersection than expected.

OBSERVED Sign Language	Intersection Language			
	English	French	Other	
French	91	78	247	416.00
Other/Biling	17	7	15	39.00
Totals of Columns	108.00	85.00	262.00	455.00
EXPECTED				
	English	French	Other	
French	98.74	77.71	239.54	
Other/Biling	9.26	7.29	22.46	

Figure 3 Chi Square Test for CDN (Observed and Expected)

- 3. Cote-Saint-Luc:** The calculated chi-square value for this 2x2 test is 0.5045, which is less than the critical value of 3.8415, and this means that there is no significant difference between the observed and expected values and thus no correlation between Sign and Intersection language.

Observed Frequencies:				
	English	Other	Total	
English	264	41	305	
Other	49	10	59	
Total	313	51	364	
Expected Frequencies:				
	English	Other	Total	
English	262.27	42.73	305	
Other	50.73	8.27	59	
Total	313	51	364	

Figure 4 Chi Square Test for CSL (Observed and Expected)

- 4. Hampstead:** The calculated chi-square value for this 2x2 test is 2.2674, which is less than the critical value of 3.8415, and this means that there is no significant difference between the observed and expected values and thus no correlation between Sign and Intersection language.

Observed Frequencies:				
	English	Other	Total	
English	228	23	251	
Other	74	13	87	
Total	302	36	338	
Expected Frequencies:				
	English	Other	Total	
English	224.27	26.73	251	
Other	77.73	9.27	87	
Total	302	36	338	

Figure 5 Chi Square Test for Hampstead (Observed and Expected)

- 5. Notre-Dame-de-Grace:** The chi-square 2x3 test has produced a chi-square value of 8.1601, which is higher than the critical value of 5.99. This means that the differences between observed and expected values are significant, and there is a certain relationship between language of sign and intersection that would have unlikely occurred by chance. Comparing informally, through visual inspection, it can be seen that the main difference lies between the observed and expected number of French Sign/English Intersection items – there were much more of these than expected for this borough. Also, there were fewer French Sign / Other Intersection stop signs than expected.

OBSERVED Sign Language	Intersection Lang			
	English	French	Other	
French	339	26	203	568.00
Other/Biling.	21	3	29	53.00
Totals of Columns	360.00	29.00	232.00	621.00
EXPECTED				
	English	French	Other	
French	329.28	26.52	212.20	
Other/Biling.	30.72	2.48	19.80	

Figure 6 Chi Square Test for NDG (Observed and Expected)

- 6. Ville Marie:** The 3x3 Chi square test has produced a chi square value of 23.1814, which is significantly greater than the critical value of 9.4877, suggesting some correlation between linguistic content of stop signs and their intersections, in this borough. From visual analysis, it can be seen that a major difference lies in the observed vs. expected number of stop signs within the French Sign/French Intersection category – suggesting a correlation between the two.

Observed Frequencies:		Inters. Lang			
Sign	Lang.	English	French	Other	total
English		6	0	4	10
French		59	85	130	274
Other		1	0	15	16
	total	66	85	149	300
Expected:		Inters. Lang			
Sign	Lang.	English	French	Other	total
English		2.20	2.83	4.97	10
French		60.28	77.63	136.09	274
Other		3.52	4.53	7.95	16
	total	66	85	149	300

Figure 7 Chi Square Test for Ville Marie (Observed and Expected)

7. Westmount: The calculated chi-square value for this 2x2 test is 3.8161, which is slightly less than the critical value of 3.8415, and this means that there is no significant difference between the observed and expected values and thus no connection between Sign and Intersection language.

Observed Frequencies:		English	Other	Total
English		278	166	444
Other		1	4	5
	Total	279	170	449
Expected Frequencies:		English	Other	Total
English		275.89	168.11	444
Other		3.11	1.89	5
	Total	279	170	449

Figure 8 Chi Square Test for Westmount (Observed and Expected)

Note that all complete chi square test calculations for each of the seven municipalities, can be found in Appendix B.

The final aspect I decided to look at is whether sign/intersection linguistic connections relate to the 'principal' language of the neighbourhood in question. This can be looked at with respect to the number of French, English and bilingual people living in the area. The following data table was obtained in collaboration with Andre Bourgoin-Horne, from the 2006 Census, and depicts the language distribution across the seven boroughs:

Municipality	English Speaking	French Speaking	Bilingual	Totals
Hampstead	4260	970	45	5275
CSL	11485	4615	330	16430
NDG	24930	15655	745	41330
CDN	13440	12410	485	26335
West	9330	3180	3870	16380
VM	8405	7830	290	16525
Plateau	5815	12215	895	18925
Total	77665	56875	6660	141200

Table 4 Mother Tongue as spoken in each Municipality

Municipality	English	French	Bilingual	Totals	Linguistic Link
Hampstead	256	28	57	341	No
CSL	305	9	53	367	No
NDG	0	569	53	622	Yes
CDN	1	417	38	456	Yes
VM	9	274	17	299	Yes
West	443	6	5	464	No
Plateau	0	219	0	219	Yes
Total	1024	1522	223	2758	4 out of 7

Table 5 Number of French, English and Bilingual stop signs by municipality and Presence of Linguistic Link between Sign and Intersection

Discussion

From the above data, it is necessary to draw conclusions that can help answer the central question of this research project: is there a relationship between the linguistic context of a stop sign and that of the intersection on which it is located? The answer to this question differs for each of the seven inspected neighbourhoods. To begin with, Figure 1 depicts that most stop signs in our sample were French (followed by English, then bilingual/other), however most intersections were English (followed by other/bilingual, and then French). Moving on, after having analyzed and categorized 2816 stop signs from seven different neighbourhoods in Montreal, it was found that some sign/intersection linguistic correlation is present in four of these boroughs, namely – in the Plateau, Cote-des-Neiges, Notre-Dame-de-Grace, and Ville Marie. However such relationship was not seen in Westmount, Hampstead, and Cote-St-Luc. An interesting observation about these results can be seen in Table 5 – the linguistic link between sign and intersection is present in neighbourhoods where most stop signs are French (Arrêt). However, this link is not necessarily French Sign/ French Intersection, as some of these areas involved mostly English Intersections. Moreover, another noteworthy point can be drawn from both tables 4 and 5 – although English seems to be the main mother-tongue in Westmount, Cote-St-Luc, and Hampstead, and all three primarily contain English stop signs and intersections; yet chi-square results showed no linguistic sign/intersection connection for any one of these regions!

To continue, let's look at the chi square test (and one frequency chart) for sign/intersection language correlation in each of the seven municipalities. Firstly, Figure 2 illustrates that all of the stop signs in Plateau were French, and they were primarily located on French intersections. Although no chi-square value could be deduced for these values (since the test is accurate only for values over 10), by visual inspection an obvious relationship between French signs and French intersections is viewed in the Plateau neighbourhood. The second group of stop-signs was located in Cote-des-Neiges. A 2x3 chi square test

produced a chi-square value of 9.8041 and a critical value of 5.99, which means there is a certain relationship between language of sign and intersection that would have unlikely occurred by chance here. Refer to Figure 3, to note that a major difference is the occurrence of bilingual signs on English intersections — much higher than expected (17 instead of 9.26), which suggests a possible correlation between them in the CDN neighbourhood. Subsequently, Figures 4 and 5 show 2x2 chi-squares with no substantial difference between observed and expected values (P values higher than 0.5), suggesting that no language link was present between stop signs and intersections in Cote-St-Luc and Hampstead. The following region NDG, on the other hand, demonstrated a good link between French stop signs being located on English intersections (as the observed value was significantly higher than expected). Consequently, the only 3x3 chi-square test was performed with values from Ville Marie, and resulted in a significant correlation between French stop signs located on French Intersections (P value of 0.000116). To recapitulate, only four of the investigated boroughs of Montreal showed a relationship of stop sign language and its intersection: French sign/French intersection in the Plateau, bilingual Sign/English intersection in Cote-des-Neiges, French sign/English intersection in Notre-Dame-de-Grace, and French sign/French intersection in Ville Marie.

In conclusion, it is important to note some of the possible sources of error of this research. One source of error can be the fact that different people were involved in data collection – although this helped us gather quite a large sample of artefacts, it may have created errors in consistency. Plus, data for 58 of the artefacts was missing, which reduced the scope of research. Moreover, because classification of all the intersections into English, French and Other was done only by one person, some people can disagree in terms of classifying a certain intersection in one or another category. Also, the fact that intersections were looked at, as opposed to individual street names also posed a constraint. Lastly, the time limitation prevented a possibility for wider analysis, and if a future opportunity allows to contribute more to this research, I would look further into individual boroughs, their official languages, a complete set of street names and how some of these names were changed in the past 40 years or so.

References

Statistics Canada (2006). Census Tract (CT) Profiles, 2006 Census. Retrieved April 10th, 2008, from <http://www12.statcan.ca/english/census06/data/profiles/ct/Index.cfm?Lang=E>

Appendix A: Table of Values for Figure 2

Language of Sign/Language of Intersection	Plateau
English Sign/English Int.	0
English Sign/French Int.	0
English Sign/Other Int.	0
French Sign/English Int.	14
French Sign/French Int.	138
French Sign/Other Int.	67
Bil. Sign/Other Int.	0
Bil. Sign/English Int	0
Bil. Sign/French Int.	0

Appendix B: Complete Chi Square Test Calculations for All the Municipalities

1. Cote-des-Neiges – 459 stop signs

Sign Language	Inter.Lang.			
	English	French	Other	
French	91	78	247	416.00
Other/Biling	17	7	15	39.00
Totals of Columns	108.00	85.00	262.00	455.00
	English	French	Other	
French	98.74	77.71	239.54	
Other/Biling	9.26	7.29	22.46	
	English	French	Other	
French	0.6072	0.0011	0.2321	
Other/Biling	6.4763	0.0112	2.4762	
Chi-square =	Sum of numbers in the third table =			9.8041
				Critical value = 5.99
d.f. = (rows-1)(column-1) = 2				

2. Cote-St-Luc – 366 stop signs

Observed Frequencies:				
		English	Other	Total
	English	264	41	305
	Other	49	10	59
	Total	313	51	364
Expected Frequencies:				
		English	Other	Total
	English	262.27	42.73	305
	Other	50.73	8.27	59
	Total	313	51	364
Level of significance	0.05			
number of rows	2			
number of columns	2			
degrees of freedom	1			
critical value	3.8415			
chi-square test statistic	0.5045			
P	0.477513			

3. Hampstead – 341 stop signs

Observed Frequencies:				
	English	Other	Total	
English	228	23	251	
Other	74	13	87	
Total	302	36	338	

Expected Frequencies:				
	English	Other	Total	
English	224.27	26.73	251	
Other	77.73	9.27	87	
Total	302	36	338	

Level of significance	0.05
number of rows	2
number of columns	2
degrees of freedom	1
critical value	3.8415
chi-square test statistic	2.2674
P	0.132119

4. Notre-Dame-de-Grace – 622 stop signs

Sign Lang.	Inters. Lang			
	English	French	Other	
French	339	26	203	568.00
Other/Biling.	21	3	29	53.00
Totals of Columns	360.00	29.00	232.00	621.00

	English	French	Other
French	329.28	26.52	212.20
Other/Biling.	30.72	2.48	19.80

	English	French	Other
French	0.2872	0.0104	0.3988
Other/Biling.	3.0779	0.1113	4.2744

Chi-square = Sum of numbers in the third table = **8.1601**

Critical value = 5.99

d.f. = (rows-1)(column-1) = 2

5. Ville Marie – 302 stop signs

Observed Frequencies:		Inters. Lang			
Sign Lang.	English	French	Other	total	
English	6	0	4	10	
French	59	85	130	274	
Other	1	0	15	16	
total	66	85	149	300	

		Inters. Lang			
Sign Lang.	English	French	Other	total	
English	2.20	2.83	4.97	10	
French	60.28	77.63	136.09	274	
Other	3.52	4.53	7.95	16	
total	66	85	149	300	

Level of significance	0.05
number of rows	3
number of columns	3
degrees of freedom	4
critical value	9.4877
chi-square test statistic	23.1814
p_value	0.000116

6. Westmount – 507 stop signs

Observed Frequencies:			
	English	Other	Total
English	278	166	444
Other	1	4	5
Total	279	170	449

Expected Frequencies:			
	English	Other	Total
English	275.89	168.11	444
Other	3.11	1.89	5
Total	279	170	449

Level of significance	0.05
number of rows	2
number of columns	2
degrees of freedom	1
critical value	3.8415
chi-square test statistic	3.8161
P	0.050762