

**SPEAKING STYLES ACROSS LANGUAGES:  
RATE AND F0 IN THREE FRENCH-ENGLISH BILINGUALS**

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**ABSTRACT:** Read and spontaneous speech have been shown generally to differ by various acoustic characteristics. If these differences are indeed systematic, then the same speaker would be expected to manifest analogous behavior when he/she speaks two different languages. This paper reports on the speaking rate and fundamental frequency in three bilingual speakers of French and English. The results show that, in the total speaking time, spontaneous speech is slower than read speech, and this was so in both languages. However, when pauses and hesitations are eliminated to obtain the net speech rate, these differences almost disappear. As for the mean F0, it was higher at a statistically significant level in read than in spontaneous speech in the two languages and for all three speakers. The same was true for the average pitch ranges, which were statistically significantly greater in read speech.

**Keywords:** Bilingualism, phonetics, speaking styles.

## 1. INTRODUCTION

One phenomenon that is believed to distinguish read from spontaneous speech is speaking rate. Spontaneous speech is produced on the spot and thus needs to be planned while it is produced, which takes time. Read speech is a ready-made product that only needs to be repeated and thus no planning as such is necessary. In a study by Hirschberg (1995), 16 out of 17 subjects produced read speech with a faster rate than spontaneous speech in terms of the number of syllables per second. Blaauw (1995) and Hamelers (cited in Blaauw 1995) found a contrasting effect: spontaneous speech was faster than read speech. The latter finding would seem to contradict the intuitive expectation that, if indeed a speaker needs to do less planning when reading, then he/she should be able to speak faster than in the spontaneous performance; these results, however, also depend on what kinds of read and spontaneous styles the speakers actually produce.

Whatever the differences in rate between the styles ultimately are, it is of interest to know whether they are due to a greater amount of pausing in one style, or whether there would be an actual slowing down of the speech in the slower style. An answer to this should be found by comparing the speech rates in the total speaking times with those in the net speaking times. If the rates in the two styles are the same in the net speaking times, then we can conclude that the observed difference in the total times was due to pausing. But if there is still a difference in the net times, then there seems to be a general slowing down of the actual speech.

The mean F0 level and F0 range may also correlate with speaking style, though the findings here, too, are somewhat contradictory. In Remez, Rubin and Ball (1985), there was more F0 variation in spontaneous than in read speech. Hamelers (cited in Blaauw 1995) and Blaauw (1995) found the opposite effect: spontaneous speech had a lower mean F0 and less F0 variation (as indicated by the F0 range, standard deviation and the size of pitch accents) than read speech. Ayers (1993) used the highest peak of each intermediate phrase as a measure of pitch range, and one of her two subjects had a statistically significantly higher average F0 in read speech, but the other speaker did not show a significant difference between the two types of speech. In this paper, we will compare the speaking styles in three French-English bilinguals in order to see if the speakers maintain the same stylistic differences across their languages. We will focus on the speaking rates in both the total and net speaking times, the average fundamental frequency and F0 range in two read tasks and three spontaneous monologues.

## 2. METHOD AND MATERIAL

The subjects were two males (M1 and M2) and one female (F1), ages ranging from 36 to 52. M1 is a native speaker of standard American English and standard French, M2 a native speaker of standard British English and standard French, and F1 a native speaker of standard American English who has lived in France and spoken French as her primary

language for the last thirty years. All subjects are university professors of English linguistics. The recordings were made in a sound-treated booth, and the assignments were given in writing, each on a separate sheet of paper. The tasks were performed first in English and then, in a different order, in French.

To obtain maximally natural speech, a presumed audience was proposed for each task. The subjects were first to tell “a monolingual friend” how they had acquired their two languages. Next they read a newspaper article on a topic in current politics to “an elderly person with normal hearing”. Then each subject described his/her doctoral thesis topic “to a linguist”. After that, the task was to read three pages from the comic book ‘Tintin - Explorers on the Moon’ to “two six-year-old children”, and last, the subjects told the story of Little Red Riding Hood to “a three-year old girl”. The two newspaper articles were different altogether, not translations of each other. All speakers changed their voice quality noticeably when telling the story of Little Riding Hood, as they did when reading from Tintin, which indicates that they did indeed assume a listener and did not just read mechanically.

For spontaneous speech, three subject matters were selected to see if the presence or absence of a ready-made story line would influence the speaking rate. Little Red Riding Hood was thought to have the most readily available story line, and thus was expected to be spoken faster than the other tasks, but it turned out that none of the speakers remembered the story very well. Of the remaining two, the thesis topic was expected to be more rehearsed, and thus spoken faster, than the language learning story. None of these predictions were borne out by the data.

Samples of about two minutes were selected from the beginning of each task for analysis; in two instances the total speech sample was only one minute and a half long. M2 did not talk long enough about his language acquisition in either language for this story to be included in the data at all. The duration measurements were made manually using Signalyze on a Macintosh. First, the total durations of the speech samples were taken, next, all pauses, breaths and hesitations were excluded to get the net speech rate. The F0-measurements were made, also manually, with MacSpeech Lab II.

### 3. THE RESULTS

#### *3.1. Speaking Rate*

The results for speaking rates in the total times are given in table 1; the comic book total reading time was not measured because of extensive pausing between the text captions. The speech rates for the total times are obtained by dividing the number of syllables, including the hesitations and false starts, as long as they were readily syllabifiable and not simply non-linguistic mumble, by the total speaking time, without eliminating anything from the samples. We can note that, overall, the average speaking rate is faster in read than in spontaneous speech in both languages, and for all speakers. For the

males, Riding Hood was spoken slower than the other tasks while the female had the slowest rate on her thesis topic in English. The reason for the slowness of the males is perhaps partly due to the fact that they did not remember the story very well, but the French version of the Riding Hood story still remains slower than the other French passages even though the potential memory problem has been removed by now. We will return below to the reasons for the overall slowest rate of the female in her description of her thesis in English. The language learning story was spoken fastest by F1 in both languages while for M1 it had an intermediate status. But overall, the rates in the spontaneous tasks were clearly lower than those in read speech.

Table 1. Speaking Rates for the Total Speaking Times

	ENGLISH			FRENCH		
	Means, syll/sec			Means, syll/sec		
	M1	M2	F1	M1	M2	F1
SPONTANEOUS SPEECH						
Riding Hood	2.44	2.45	2.13	3.5	2.91	2.66
Language learning	2.93	-	2.6	3.76	-	3.37
Thesis topic	<u>3.59</u>	<u>2.81</u>	<u>1.98</u>	<u>4.09</u>	<u>3.72</u>	<u>2.79</u>
Overall means	2.99	2.63	2.24	3.78	3.32	2.94
READ SPEECH						
Newspaper	4.03	3.15	3.55	4.9	4.11	3.61

To obtain the net speech times, only the effective speaking time was measured - all pauses, breaths, hesitations, etc., were excluded from the total time. The net speech rates were then the result of the division of the total number of syllables in the net speech by the net time. These results can be seen in table 2. The net speech rates for Tintin are included. For the males, the thesis topic has the fastest net rate in the spontaneous tasks in both languages, while the female, who manifested no systematic pattern across the tasks, has the slowest rate, again, for her thesis topic in English and the fastest on her language learning in French. Tintin was read at a somewhat slower rate than the newspaper articles in both French and English by the males, but the female did not slow down in French. Tables 1 and 2 also show that, overall, the absolute syllable rates are higher in French than in English for all speakers, both in net speech and in total speaking time. That this was not due to a practice effect can be seen from a comparison of the newspaper passages: the two texts were not identical and still, the French rates are faster.



Table 2. Net Speech Rates

	ENGLISH			FRENCH		
	Means, syll/sec			Means, syll/sec		
	M1	M2	F1	M1	M2	F1
SPONTANEOUS SPEECH						
Riding Hood	4.03	3.79	4.23	4.86	4.43	4.84
Language learning	4.01	-	4.0	5.13	-	5.07
Thesis topic	<u>4.66</u>	<u>4.29</u>	<u>3.23</u>	<u>5.25</u>	<u>5.53</u>	<u>4.59</u>
Overall means	4.23	4.04	3.82	5.08	4.98	4.83
READ SPEECH						
Newspaper	4.69	4.23	4.62	6.25	5.30	4.69
Tintin	<u>4.39</u>	<u>3.9</u>	<u>4.52</u>	<u>5.25</u>	<u>5.25</u>	<u>4.98</u>
Overall means	4.54	4.07	4.57	5.75	5.28	4.84

A comparison of tables 1 and 2 shows that the differences between the styles were not as clear in net speech as they were in the total times. We have a closer comparison in table 3, which shows the ratios of syllable rates in read speech to those in spontaneous speech for both the total and net times. We can see in these data that, for M2, there was no difference in the speaking rates in the two styles in net speech in English and the same holds for F2 in French. For the rest, the differences between the styles in the net speaking times are extremely small, unlike those in the total speaking times, so that we can conclude that the effective speaking time is roughly the same in the two tasks in both languages and for all speakers. But we have to note, however, that the female speaker did actually slow down somewhat in her spontaneous English, and M1 in his spontaneous French.

Table 3. Ratios of Read Speech to Spontaneous Speech

	ENGLISH			FRENCH		
	Syllable rate in read speech / syllable rate in spontaneous speech					
	M1	M2	F1	M1	M2	F1
Total time	1.35	1.2	1.58	1.3	1.24	1.23
Net speech	1.07	1.01	1.2	1.13	1.06	1.0

### 3.2. Fundamental Frequency

F0 level is one of the characteristics that may enable listeners to distinguish spontaneous from read speech. We selected the language learning stories to represent spontaneous speech and the newspaper articles read speech in the two languages. For M2, the thesis topic had to be chosen for spontaneous speech because his language learning samples were too short. With the exception of the smallest micro-variations, we measured the heights of all the F0 peaks in the same samples where the time measures were taken. These results are given in Herz in table 5. We can observe that the average F0 values are statistically significantly lower in spontaneous than in read speech in both English and French for all three speakers. We can also note that the standard deviations are systematically smaller in spontaneous speech, thus indicating less variability in spontaneous than in read speech in both languages.

Table 5. Mean F0 Heights in Hz

N = number of peaks

	M1			M2			F1		
	N	Mean	St.Dev.	N	Mean	St.Dev.	N	Mean	St.Dev.
ENGLISH									
Spontaneous	114	103.0	14.5	260	122.5	19.3	187	187.2	38.2
Read	252	109.6	18.4	474	147.2	32.0	304	238.8	53.0
		P<.0002			P = 0			P = 0	
FRENCH									
Spontaneous	243	99.6	15.4	282	128.5	30.0	406	186.3	42.9
Read	308	119.8	22.9	331	152.8	34.2	346	232.4	54.6
		P=0			P = 0			P = 0	

Together with the peak measurements, we also marked down the minimum and maximum F0 values of each intonational phrase to get an indication of the average F0 ranges, which are another indicator of variability. These results can be seen in table 6. The F0 ranges are smaller at a statistically significant level in spontaneous than in read speech in both languages and for all speakers.

## 4. DISCUSSION

Overall, we can observe that there are clear prosodic differences between read speech and spontaneous monologues, which hold across the two languages and for all three speakers. The speech rates (syllables/second) in the total speaking times were faster in the read than the spontaneous speech. When only the effective speaking time was considered, however, the differences between the styles became virtually non-existent. This means that the observed slower rates in the spontaneous speech were largely due

to pausing, i.e., speech planning, and not to an overall slowing down of the actual speech. The average F0 height was statistically significantly higher in the read speech, and the read speech also had a significantly higher pitch range than the spontaneous speech.

Table 6. Mean Pitch Ranges in Hz

N = number of intonational phrases

	M1			M2			F1		
	N	Mean	St.Dev.	N	Mean	St.Dev.	N	Mean	St.Dev.
ENGLISH									
Spontaneous	29	45.5	17.8	43	54.5	20.6	28	103.2	52.4
Read	42	60.3	18.7	48	114.3	45.0	35	197.0	69.9
		P<.0004			P = 0			P = 0	
FRENCH									
Spontaneous	43	53.6	20.1	38	92.9	41.9	34	130.2	66.2
Read	45	79.5	18.6	44	108.8	37.6	8	176.2	50.8
		P=0			P = .075			P < .00005	

There are obviously other factors besides just speaking styles that may influence speech rate. A person who is perfectly fluent in two languages, may have greater facility in one of them when it comes to a specific subject matter. For example, F1 had an overall slowest rate on her thesis topic in English (table 1), her native language. This might be explained by the fact that F1 did her doctoral thesis in France, in French, in a French theoretical framework, and most of her teaching and research activities still today take place in a French context. F1 is thus much more used to talking about linguistics in French than in English, and this could hardly fail to be a factor in her speech rate in this particular topic domain. The only potentially language dependent difference, present in all speakers, had to do with the absolute syllable rates, which were systematically higher in French than in English. English is a stress-timed and French a syllable-timed language, but this difference does not necessarily imply that there should be a difference in the syllable rates. The speaking rate difference is more likely to be due to English having more complex consonant clusters than French, and on the average, these consonant clusters would make English syllables longer in the time domain.

The results of this study are very neat in that there were clear acoustic differences between the two styles, and these differences were consistently in the same direction: read speech was not only faster than spontaneous speech, but it also had higher average pitch and average pitch range. How do we explain this in the face of those studies where the results show the opposite? The answer probably lies in the fact that read and spontaneous speech do not form a binary distinction, but both vary on a continuum. Joos (1961) proposes five styles - intimate, casual, consultative, formal and frozen - which depend on the degree of formality of the immediate situation and the social

distance between the interactants. Eskénazi (1993) adds to this the desired degree of the clarity of the message. Taken together, these three dimensions create three continua. In the present study, the styles were extremely closely matched on the continua across the languages: the tasks were the same, each requiring a similar amount of clarity, and the (imaginary) audiences and situations were also identical. This matching seems to be the reason for the neatness of our results, and the absence of similar matching would then be responsible for contradictory results.

A question remains: why should it be that read speech is faster and has a higher average pitch and a greater pitch range? We saw that the differences in speech rate in the total speaking times had to do mostly with pausing so that in the net speech times, where all pauses, breaths and hesitations were eliminated, there was practically no rate difference between the styles. Pausing presumably has to do with semantic and syntactic planning, and this is something we need to do less in read than in spontaneous speech, because read speech is reproduced from a ready-made product. This difference between the two styles may also explain the F0 differences. A higher overall pitch level, with more variability, and greater pitch range in the read speech may be the byproduct of the lesser need for planning. The illocutionary force is absent in read speech, or at least, it is very different from that in spontaneous speech, and this leaves the speaker with more free 'channels' between his speech planning and speech production mechanisms, which would then make room for more vivid elocution.

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