Speech and music rhythm
A pilot study on sung language

Giovanna Marotta e Martina Turconi
University of Pisa

A new line of research has appeared after the pioneering studies by A.D. Patel and J.R. Daniele (2003) on the relationship between speech and music rhythm. Their basic aim was to apply the quantitative measurement methods to the analysis of musical composition developed in the phonetics. The research question could be summarized as follows: "does the mother tongue rhythm of the composer influence the music rhythm of a composition?" The empirical results collected by Patel and Daniele (2003) relative to instrumental songs of the European classical music are promising: the quantitative values concerning music rhythm reflect the speech values, allowing a parallel categorization of music rhythm with the traditional classification of natural languages in *stress-timed* and *syllable-timed*.

In recent years, the research has addressed new linguistic areas (Jekiel 2014) and new musical genres as blues (Lorroque 2012), popular music and vocal music (Sadakata et al. 2004). Moreover, perceptual experiments have confirmed the rhythmic classification of languages based on quantitative measurements methods (Hannon 2009).

In our communication, we would like to present a pilot analysis on the sung speech's rhythm in Italian and in English. The result collected until now look very promising, because the sung speech seems to reflect the same rhythmic categorization of the composers' mother tongue. In fact, we assume that general rhythmic principles lead the motor behavior of human being on multiple levels (cf. Marotta 2012).

In particular, we analyzed both the *Pairwise Variability Index* of the melodic line's rhythm (using the method of Patel and Daniele 2003) and the *PVI* of the sung speech (see Grabe and Low 2002). The *corpus* consisted in Italian and English songs from the 60s and 70s[1]. Firstly, following Patel and Daniele (2003) method, we calculated the music *nPVI* for each song and then we determined the average of it for the English (51,7) and the Italian songs (57,5). Comparing the results with the linguistic *PVI* values by Grabe and Low (2002) and Ramus (2002), we are able to confirm that the same rhythmic categories operate at both linguistic and music levels. In other terms, the analysis show that the mother tongue rhythm of the composers overlaps with the music rhythm of their composition.

As regards the analysis of the sung speech, the raw application of *PVI* method (Grabe and Low 2002) was not satisfying, since the intervocalic *nPVI* value was higher for the Italian songs (66,7) than the English ones (61,7), putting the Italian ones in the *stress-timed* category and the second ones in the *syllable-timed* category. This could be explained by the variability of the songs' tempo; in fact, even if we have chosen "Moderato" songs, they did not exactly have the same tempo. Therefore, we decided to apply the *varco* method (Dellwo and Wagner 2003), because it allows the normalization

[1] We took into account Italian and English song and their corrisponding transposition: *Azzurro* by Adriano Celentano (1968) and the English transposition *Blue skies (Azzurro)* by Ken Dodd (1970); *Mi ritorni in mente* by Lucio Battisti (1969) - *Wake me, I am dreaming* by The Love Affair (1971); *Balla Linda* by Lucio Battisti (1968) - *Bella Linda* by The Grass Roots (1969); *Stand by me* by Ben E. King (1961) - *Pregherò* by Adriano Celentano (1962); *I'm a believer* by Niel Diamond (1966) - *Sono bugiarda* by Caterina Caselli (1967) e *Elenore* by The Turtles (1968) - *Scende la pioggia* by Gianni Morandi (1968).

of the speed rate. In this case, the results were encouraging: both the English *varcoΔV* (74) and *varcoΔC* (58,4) values were higher than the Italian ones (*varcoΔV* 58,3; *varcoΔC* 49,9). This confirm the difference between the two languages in sung speech with regard to timing classification.

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