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Interactions of word-stress pattern with musical interval  
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## Acoustic perception of English in a musical context:

### Interactions of word-stress pattern with musical interval structure

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#### Abstract

This article deals with the English phonetic accentuation of the singing voice. The results of a perceptive test, using a voice synthesised by Mbrola, have enabled to refute the null hypothesis which implies that the perception of words in a musical context is independent of the configuration of word-stress pattern and melodic interval. Thus, disyllabic words with the following structure HL-Sw (High Low-Strong weak) and LH-wS (Low High-weak Strong) are better perceived than the ones with the structure LH-Sw (Low High-Strong weak) and HL-wS (High Low-weak Strong). This experiment suggests, amongst other things, that the musical configuration of acoustic parameters does influence our perception of English phonetic structures.

#### Introduction

Music perception research has shown that key acoustic factors, such as pitch, determine the salience of notes [1]. In English, pitch variation also plays a major role in the realisation and the perception of the phonetic accent [2]. Besides, results in phonetic research imply that vowels tend to have an intrinsic pitch [3] and that the first degree of accentuation is determined by vowel quality [4]. Taking into account those past experiments, it is pertinent to analyse to what extent the combination of word-stress pattern and melodic interval influences our perception of phonetic units.

#### Method

**Subjects.** 44 subjects, aged 20-35. All were English native speakers, and lived in London at the time of testing.

**Stimuli.** 24 disyllabic words were synthesised using *Mbrola* [5]: Twelve words with a stress-pattern of Strong-weak [Sw] and twelve words with a stress-pattern of weak-Strong [wS]. An interval of a perfect fifth (130.8 Hz – 196 Hz) was created between the two syllables, either Low-High or High-Low. An aperiodic sound (pink noise) was uniformly mixed with the disyllables to reduce the audio quality of the recording.

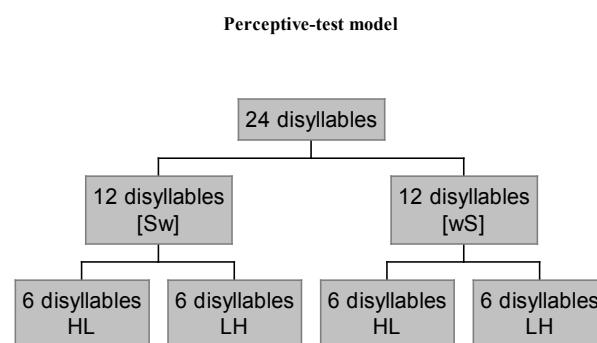


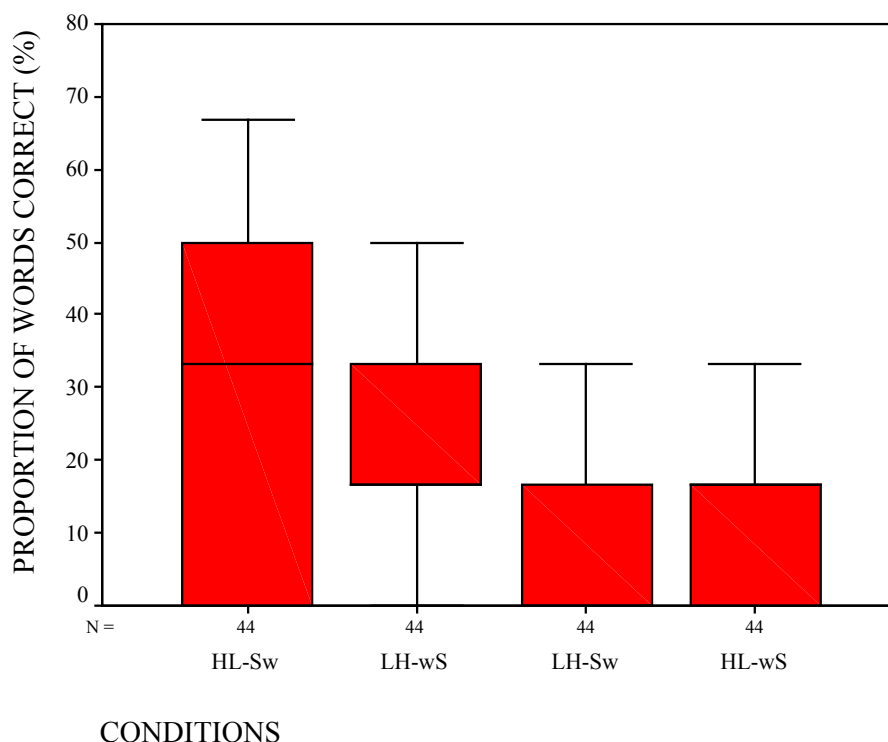
Figure 1 – Perceptive test model

#### Sound example 1 – Original perceptive test

**Procedure.** Subjects were given a sheet with 24 empty cases. They had to write down their best guess for each stimuli.

#### Results.

Perception of disyllables is strongly impeded when high frequency is associated to the reduced vowel (see graphic below).



**Figure 2 – Proportion of words correct (%)**

## Results

The ANOVA test demonstrates that the difference between the two categories is significant ( $F = 18.57$ ,  $df = 175$ ,  $p < .001$ ). Moreover, Scheffé's test indicates two binary categories. The first one is constituted by disyllables with the structure LH-Sw and HL-wS; the second one with disyllables characterised by LH-wS and HL-Sw.

## Conclusions

The perception of phonetic units in a musical context is influenced by the configuration of English stress-pattern and melodic interval. The results of the perceptive tests imply that the efficient realisation of the English phonetic accent is interlinked with specific musical configurations, which notably associate high pitch with full vowels and low pitch with reduced vowels.

## References

[1] JONES, M. R. (1985), Structural Organization of Events in Time: A Review, in MICHON & JACKSON (1985), (eds.).

JONES, M. R. (1987), Dynamic Pattern Structure in Music: Recent Theory and Research, *Perception and Psychophysics* 41, pp. 621-634.

[2] FOX, A. (2000), *Prosodic Features and Prosodic Structures*, Oxford: Oxford University Press.

[3] HAYWARD, K. (2000), *Experimental Phonetics*, London: Longman.

OHALA, J. (1978), The Production of Tone, in FROMKIN (1978), (ed.), *Tone: A Linguistic Survey*, New York: Academic Press, pp. 5-39.

[4] FEAR, B., CUTLER, A. & BUTTERFIELD, S. (1995), The Strong/Weak Syllable Distinction in English, *Journal of the Acoustical Society of America* 97, pp. 1893-1904.

[5] Cf. <http://tcts.fpms.ac.be/synthesis/mbrola.html>

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