

Exploiting the effect of pitch contour shape on perceived duration

Wencui Zhou, Max Planck Institute for Psycholinguistics, Nijmegen, the Netherlands

Carlos Gussenhoven, Radboud University Nijmegen & Queen Mary University of London

The shape of pitch contours has been shown to have an effect on the perceived duration of vowels (Yu 2007 [1]). For instance, low pitched vowels sound shorter than high pitched vowels, and dynamic contours sound longer than level contours. Strikingly, the effect of pitch height, as observed on level tones, goes against widespread production patterns, since low tones show a universal tendency to be longer than high tones. However, the difference between level tones and dynamic tones is in agreement with production patterns, since dynamic tones show a universal tendency to be longer than level tones. In this contribution, we partly replicate Yu's findings with Chinese and Dutch listeners, but find that rising contours are heard shorter than high level contours. Importantly, we would like to argue on the basis of our results that when perception goes against production patterns, the perceptual effect may be exploited for enhancement (cf. Stevens & Keyser 1989 [2], Gussenhoven 2007 [3]). Specifically, we claim that the perception effect for level tones is used as an enhancement feature for the durational difference that accompanies a tonal distinction in a dialect of Dutch.

Some varieties of Dutch have a lexical tone contrast, known as Accent 1 versus Accent 2. In almost all dialects in which this contrast has been reported, longer duration is used as an enhancement of the Accent 2 tone contour, which helps to keep it distinct from Accent 1. The intonation system of Dutch includes a contrast between the High Rise, or H* H%, and the Low Rise, L*H H%, by the side of other question intonations. The tonal dialect of Venlo reinterpreted this contrast as a lexical tone contrast: the Low Rise is the interrogative form for Accent 1 and the High Rise that for Accent 2. We will argue that this distribution is explained by the fact that in IP-internal nuclear syllables the High Rise has a high level contour and the Low Rise a rising contour.

Twenty native Mandarin and twenty native Dutch speakers¹ were tested for their perception of the duration of vowels [a] and [i] in four disyllabic foreign words [mek^ha], [mek^hi], [meka] and [meki]. A comparison between duration perception of vowels with a high level F₀ 250Hz and a rising F₀ from 140 Hz to 275 Hz showed that both Chinese and Dutch participants perceived high level contour longer than rising contour, particularly in vowel [a], but not in vowel [i]. With regard to the perceptual situation of Accent 1 versus Accent 2 in the dialect spoken in Venlo, our cross-linguistic results indicated that the influence of high level and rising contours on perception of vowel duration is commonly present in speech perception despite language backgrounds, but this phenomenon was only observed in vowel [a] in present study.

¹ All native Dutch speakers speak standard Dutch, and none of them is from Limburg where lexical tone contrast exists in the local dialect.

[1] Yu, A. C. L. (2007). Tonal effects on perceived vowel duration. *Laboratory Phonology* 10. Berlin: Mouton de Gruyter.

[2] Stevens, Kenneth N. and Samuel J. Keyser (1989). Primary features and their enhancement in consonants. *Language* 65: 81-106.

[3] Gussenhoven, C. (2007). A vowel height split explained: Compensatory Listening and Speaker Control. In J. Cole & J.I. Hualde (eds.) *Laboratory Phonology* 9. Berlin/New York: Mouton de Gruyter. 145-172.