

Pitch and Duration as Cues in Perception of Neutral Tone under Different Contexts in Standard Chinese

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In Standard Chinese, besides the four lexically distinctive full tones, there exist weak elements in terms of neutral tones. Neutral tone can be considered to be related to both tone and stress system in Standard Chinese. Neutral tone doesn't occur in the initial position of a word and is assumed to be associated with weak syllable that is short and light, such as the second syllable in /ti⁴ti⁰/ (little brother, hereafter "1~4" stands for four lexical tones, tone1 to tone4 respectively, "0" for neutral tone). The neutral tone is a mid-pitch target and its F₀ realization is associated with the tone of the preceding syllable. Morphologically, some neutral tone words have contrastive meanings with their normal stress counterparts. For example, with normal stress (strong-strong), "地道" /ti⁴tao⁴/ means 'tunnel', while with neutral tone (strong-weak) "地道" /ti⁴tao⁰/ means 'purely'. The research on the acoustic correlates of neutral tone and its perceptual space will help understand the characteristics of the spoken Chinese.

Many previous acoustic studies confirmed that the correlative acoustic cues for perceiving stress include pitch, duration, intensity, spectral balance or spectral tilt (timber). In stress languages, such as English and Dutch, pitch is the most salient acoustic cue for pitch accents at utterance level. For lexical stress, duration is the most related cue for Dutch listeners. Spectral balance or spectral tilt is an important cue, but not as reliable as duration. Overall, intensity is the least important cue for stress perception of Dutch and English. In English, vowel reduction is a pervasive phenomenon in unstressed syllables. However, vowel reduction is less pervasive and the poorest acoustic cue in Dutch.

In Standard Chinese, the acoustic correlates of word stress or sentence stress are identical as in stress languages. However, in regards with pitch and duration, it's still a disputing issue which cue is mostly related to the weak syllable in neutral tone.

In the previous studies, neutral tone was only investigated in isolated words. And different conclusions were drawn due to different methodologies used in perception experiments. The present study, therefore, conducted a psychoacoustic experiment with the continuum of pitch and duration for the minimal pair /mo²ku⁰/~/mo²ku¹/ differed in stress in three conditions, i.e., isolation, on-focus and post-focus, with the aim to explore the perception spaces and the contribution of pitch and duration to neutral tone perception.

The results showed that in a tone language, i.e., Standard Chinese, the way the two acoustic cues influence the perception of neutral tone is not an exact match to that in Indo-Euro languages such as Dutch and English.