Tense and lax vowels - degree of constriction or pharyngeal volume?

Abstract

This article reports a series of model experiments where tense vowel configurations were transformed in steps to lax configurations in order to estimate the contribution of each articulator to the spectral contrast. Traditionally, the contrast of tenseness in vowels has been associated with the degree of constriction of the passage between the tongue arch and the palate and with vowel quantity, both being associated with magnitude of muscular tension and energy. Alternatively it has been claimed that the contrast is no different to simple raising and lowering of the tongue. But the behaviour of the tongue arch alone is known to be inadequate for tuning the vocal tract. It is necessary to look at pharyngeal constrictions as well. In addition, activity in the pharynx has been focused by recent interest in tongue root position (ATR). The apparent correlation with quantity has been attributed to extra tension requiring more time to execute, but this is too simple. In continuous speech, the tongue frequently has to pass through a tense configuration to get to a lax configuration. For these experiments, it is argued that there are two distinct contrasts. Tenseness is expressed in vocal tract configuration providing an audible timbre contrast due to spectral contrast. Quantity is expressed separately in a temporal contrast. It is concluded that the degree of constriction and degree of ATR provide equal contributions to the spectral contrast (except for low pharyngeal [a]-like vowels where vowel constriction and ATR are contradictory). Further, the contrast in rounded vowels is further enhanced by associated increase of larynx depression, lip rounding and tongue blade depression for tense vowels.