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How Hoarseness Affects on Rating of Hypernasality
Source -Filter-Theory Approach

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**1. Introduction** Hypernasality ratings by auditory-trained SPEECH pathologists are usually the most effective way to diagnose the velopharyngeal function of patients with cleft palates. We, however, occasionally experience the difficulty in rating hypernasality complicated by hoarseness. We have recently reported that artificially adding hoarseness by a pitch-synchronous waveform editing, decreases the hypernasality of voices uttered by cleft palate (Imatomi et al.1999). In order to make more a comprehensive scale on hypernasality ratings for hoarse hypernasality, we extended our previous study on adult voices and adopted a simpler approach, i.e. inverse filtering. **2. Procedure** We used speech samples of normal speakers, cleft palate patients, and patients with laryngeal problems. To obtain a hypernasal voice with hoarseness, we synthesized the stimuli based on the source-filter theory. First, the inverse filtering was applied to the normal and hoarse voices to obtain source signals. The source signals were then fed to filters, of which the frequency responses were computed from the spectral envelopes of two different voices (one without and the other with severe hypernasality). Four stimuli consequently were synthesized that is two sources and two spectral envelopes. Several speech pathologists participated in the perceptual experiment with 42 trials, of which 24 were for the target stimuli, (four voices by 6 repetitions) and 18 were foli stimuli. The subjects were asked to rate their hypernasality. **3. Results and Discussions** The following table is the result of preliminary data by speech pathologists:

| Stimuli | | Rating scores of hypernasality | |
|---------|--------------------|----------------|-----------|
| Source | spectral envelope | subject 1 | subject 2 |
| normal | normal | none | none |
| hoarse | normal | none | none |
| normal | hypernasal | moderate-severe | severe |
| hoarse | hypernasal | mild | mild |

This result suggests that hypernasal voices with hoarseness tends to be less hypernasal than those without hoarseness.