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Can subglottal pressure be estimated from intra-oral pressure in speech and singing ?

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The direct measurement of subglottal pressure is challenging, because it requires a very invasive approach. It consists in placing a pressure transducer below the glottis by tracheal puncture between the cricoïd cartilage and the trachea first ring. Other methods have been proposed, which estimate the subglottal pressure using less invasive approaches. The most common one is to estimate subglottal pressure from intra-oral pressure measured during the closed phase of voiceless consonants (Smitheran & Hixon, 1981; Hertegard et al., 1995). This approach has been validated in the case of normal speaking voice. However, few studies have explored its validity for soft or loud voice, for whisper or pressed voice, and in the case of singing.

This study explores the possibilities and limitations of estimating subglottal pressure from intra-oral pressure in speech and singing. Two subjects (a speaker and a trained singer) were recorded while uttering CV segments (plosive consonant followed by a vowel) with different voice qualities (normal, soft, loud, whisper, pressed). The singer sung sentences at several pitches covering his comfortable tessitura in the two main laryngeal mechanisms. Two recording sessions were conducted with a one-year time interval in between. Several methods for estimating subglottal pressure from intra-oral pressure signal are compared. A good agreement between estimates and direct measures is found in many cases. Bad agreement may be found in the case of soft phonation, for productions in laryngeal mechanism M2, and in the case of pressed speech.

References

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