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Chest, head and whistle registers in an untrained female singer analyzed by videokymography, strobolaryngoscopy and sound spectrography

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There has been a lack of objective data on the singing voice registers, particularly on the so called "whistle" register, occurring in the top part of the female pitch range, which is accessible only to some singers. This study offers unique strobolaryngoscopic and high-speed (7812.5 images/s) videokymographic data on the vocal fold behavior of an untrained female singer capable of producing three distinct voice qualities, i.e., the chest, head and whistle registers. The sound was documented spectrographically. The transition from chest to head register, accompanied by pitch jumps, occurred around tones B4-C#5 (500-550 Hz) and was found to be associated with a slight decrease in arytenoids adduction, resulting in decrease of the closed quotient. The register shifts from head to whistle, also accompanied by pitch jumps, occurred around tones E5-B5 (670-1000 Hz) without any noticeable changes in arytenoids adduction. Some evidence was found for the vocal tract influence on this transition. The mechanism of the vocal fold vibration in whistle register was found principally similar to that at lower registers: vibrations along the whole glottal length and vertical phase differences (indicated by sharp lateral peaks in videokymography) were seen on the vocal folds up to the highest tone G6 (1590 Hz).