RESONANCE TUBE PHONATION IN WATER – THE EFFECT OF TUBE DIAMETER AND WATER DEPTH ON BACK PRESSURE AND BUBBLE CHARACTERISTICS AT DIFFERENT AIRFLOWS

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Resonance tube phonation with tube end in water is a voice therapy method in which the patient phonates through a glass tube keeping the free end of the tube submerged into water, creating bubbles.

The purpose of this experimental study was to determine flow-pressure relationship, flow thresholds between bubble types and bubble frequency as function of flow and back volume.

A flow driven vocal tract simulator was used for recording the back pressure produced by resonance tubes with inner diameters 8 and 9 mm submerged at water depths 0-7 centimeters. Visual inspection of bubble types through video recording was also performed.

The static back pressure was largely determined by the water depth. The narrower tube provided a slightly higher back pressure for a given flow and depth. The amplitude of the pressure oscillations increased with flow and depth. Depending on flow, the bubbles were emitted from the tube in three distinct types with increasing flow; one by one, pairwise and in a chaotic manner. The bubble frequency was slightly higher for the narrower tube. An increase in back volume led to a decrease in bubble frequency.

This study provides data on physical properties of resonance tube phonation with tube end in water. This information will be useful in future research when looking into the possible effects of this type of voice training.

Key words: Resonance tube phonation in water, backpressure, tube diameter, water depth, voice therapy.