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Title: Snoring - Validation of different objective measurements

Ms. Erna Sif 29485 Arnardottir ernasif@landspitali.is [1,2], Ms. Magdalena Osk 29486 Sigurgunnarsdottir magdals@landspitali.is [1], Mr. Gunnar Atli 29487 Sigurdsson gunnaratli@noxmedical.com [3,4], Mr. Gudmundur 29515 Saevarsson gummi@noxmedical.com [4], Mr. Sveinbjorn 29516 Hoskuldsson sh@noxmedical.com [4] and Prof. Thorarinn 29538 Gislason thorarig@landspitali.is MD [1,2]. [1] Department of Respiratory Medicine and Sleep, Landspitali - the National University Hospital of Iceland, Reykjavik, Iceland ; [2] Faculty of Medicine, The University of Iceland, Reykjavik, Iceland ; [3] Whiting School of Engineering, John Hopkins University, Baltimore, MD, United States and [4] Nox Medical, Nox Medical, Reykjavik, Iceland .

Body: Introduction: Recently, snoring, independent of sleep apnea has been reported to have serious health consequences including carotid atherosclerosis. Detection of snoring is currently dependent on limited, poorly defined methods both for registration and analysis. Our study aims to add knowledge on how to measure and analyze snoring for future studies relating snoring to important health outcomes. Methods: Snorers were assessed with full in-laboratory polysomnography (Embla A10, Natus Medical Inc). Snoring was assessed with two overhead microphones, one chest microphone (T3 device, NoxMedical), a piezoelectric vibration sensor and an accelerometer on the neck and vibration in the nasal cannula. Results: Our preliminary findings of n=8 snorers showed a high correlation between the measured noise level of the chest microphone and the average dB of the two overhead microphones with the majority of events within 3dB of each other. The fundamental frequency of snore events was measured from 50-250 Hz by sound analysis. However the three vibration sensors (piezoelectric, accelerometer and cannula) could only measure a range from 0-100 Hz. Therefore they could not pick up all snore events. The cannula additionally had a high noise floor, allowing it to be maximally 67% sensitive to snore events. The piezoelectric sensor was more sensitive to postural effects than the accelerometer and showed a significant increase in measured power when the subject lay on the same side as the sensor was positioned. Discussion: Sound measurement of snoring is the most accurate objective analysis of snoring. Both cannula and neck vibration assessments of snoring have issues, causing them to miss out on a portion of snore events.