

## How to Measure Sleep Apnea and Hypopneas (SAHs)

Alyssa Williams - University of Rhode Island - Biomedical and Electrical Engineering

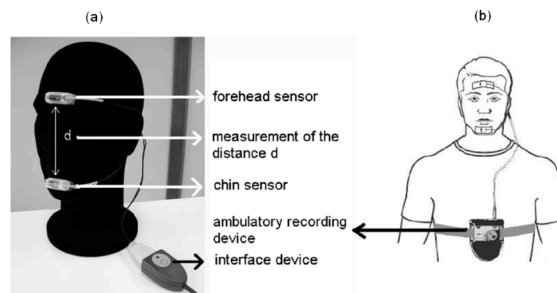
Over eighteen million people in the United States are affected with sleep apnea and hypopneas (SAHs). An apnea is when a person, usually sleeping, stops breathing for short periods of time, usually 10 to 20 seconds. This is known to disrupt sleep, waking the person up or putting them into a shallower sleep. A hypopnea is less severe and usually shortens breathing, not stopping it.

There are three major types of sleep apnea, obstructive, central, and mixed. Obstructive sleep apnea is the most common, while central is less common. This usually happens within adults, but central sleep apnea is also common in children.

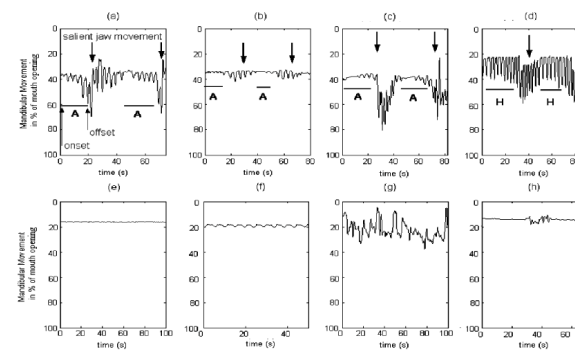
In western countries, obstructive sleep apnea happens in two percent of adult females and four percent of adult males. The event that occurs for someone with obstructive sleep apnea has four components. First, their airway collapses. Then, the person tries to take a breath and fails. Then, the oxygen level in their blood drops, from not being able to breathe. When the persons' brain notices that the oxygen level is too low, it sends signals for the person to wake up and breathe.

Central sleep apnea is less common than obstructive sleep apnea. When someone suffers from central sleep apnea, their brain fails to send a signal to the muscles of breathing. The usual occurrence happens in infants and adults with heart disease. This also happens from medication, high altitudes and premature infants. Infants usually outgrow central sleep apnea when they grow up.

A new way to test for SAHs is by measuring midsagittal jaw movement. It records the midsagittal jaw movement, or opening the mouth. It uses a device called JawSens sensor, that is supplied by Nomics, Angleur, Belgium, that measures these jaw movements. This device is shown in the picture on the top right. The results are shown to the bottom right.



The results were taken in a hospital setting, using a polysomnography. Compared with SAHs recorded manually, the sensitivity and specificity were 86.1% and 87.4% respectively. This method was 73.1% better than manual recording. It is non-invasive, more accurate, more comfortable, and can be used at home. Future ideas include measurement of SpO<sub>2</sub>, which would increase the sensitivity and specificity. Also, recording nasal flow in addition to the midsagittal jaw movement would help distinguish what type of SAH it is.



### References:

- Destiné, Jacques, Frédéric Senny, and Robert Poirrier, "Midsagittal Jaw Movement Analysis for the Scoring of Sleep Apneas and Hypopneas." *IEEE Transactions on BioMedical Engineering*. 55.1 (2008): 87-95
- Palta, Mari, et. al "Prospective Study of the Association between Sleep-Disordered Breathing and Hypertension." *New England Journal of Medicine*. 342.19 (2000): 1378-84  
[http://www.medicinenet.com/sleep\\_apnea/article.htm](http://www.medicinenet.com/sleep_apnea/article.htm)