

ORAL SESSION 1: TECHNOLOGY FOR HEALTH

Detecting apnea in community dwelling older adults

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Purpose Sleep apnea affects over 10% of older adults. (Statistics Canada, 2018). Yet, the number of persons treated is lower than that. Challenges include the long wait lists at sleep labs, related to the complexity and costs of testing in a sleep lab. There are a number of bed-based sensor systems that monitor breathing rhythms. However, analysing huge data sets of mat data is in itself complex and resource intensive. We present community-based pressure mat data analysed using signal processing and classification techniques to look for sleep apnea. (Azimi, Bouchard, Goubran & Knoefel, 2020). **Method** Nine older adults, living in various housing in Ottawa, Canada, had fibre-optic based pressure mats (Tactex Inc.) placed under their mattresses to monitor mobility (2013 – 2015). The mats had 72 pressure sensors distributed in 3 sets of 8x3 arrays. Sensors were sampled at 10 or 20 Hz. We defined the Central Apnea Index (CAI) as the number of Central Sleep Apnea (CSA) events detected per hour. Moderate CSA was defined as $15 \leq \text{CAI} \leq 30$. The engineering techniques were pre-processing (including occupancy extraction, filtering, signal combining and concatenating), followed by classification using a classical support vector machine (SVM). We then returned to the participant charts to look for sleep diagnoses. **Results and Discussion** The nine older adults (6 women), average age 75.6 years (range: 65 to 80), typically had mobility challenges. The number of days of data collected per participant ranged from 99 to 393. This generated a data base of 1,783 days or some 222 billion pressure values. The average CAI for the group was 9.39 (SD 6.24). One participant was classified as having moderate CSA, 6 were classified as mild and 2 as normal. When reviewing the clinical charts, one mild CSA participant was on a CPAP machine. The participant with the worst CSA had not been identified with a sleep illness. The data from this latter CSA participant included 99 nights. The number of apneas ranged from 50 to almost 400 episodes per night, over periods in bed of 7 to 10 hours per night. This equated to a range of CAIs of 7 to 41 (average = 24.6). Sleep apnea is a serious condition. We retrospectively analysed the breathing patterns of nine community-dwelling older adults and were able to detect one who would have had sufficient apnea periods to warrant sleep lab follow-up – no previous diagnosis of sleep condition. Another participant on a CPAP machine appeared to have been synced back into the mild CSA range. The apnea numbers varied significantly for the person with abnormal CAI, suggesting that depending on the night in the sleep lab, they might have been diagnosed with mild, moderate or severe CSA. We believe that a home-based smart mat system could be used to triage persons awaiting full sleep lab assessments. More work needs to be done to see how much variability there is in the number of apneas per night.

References

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