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Abstract Title: Evaluation of a Deep Learning Sleep Staging Algorithm Utilizing a Single Frontal EEG Channel on a Clinical Population with Suspected or Known Obstructive Sleep Apnea

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Introduction:

Home Sleep Apnea Testing (HSAT) for the diagnosis of Obstructive Sleep Apnea (OSA) has emerged as a simpler and cheaper diagnostic option compared with attended in-lab Polysomnography (PSG). The identification of sleep stages forms an essential part of the OSA diagnosis as it allows for proper phenotyping of OSA, specifically the REM phenotype. The manual staging of sleep is arduous and costly, so the development of accurate Deep Learning (DL) algorithms that automatically classify sleep stages forms a crucial role in the diagnosis of OSA with HSAT. The purpose of this study is to investigate the accuracy of a DL sleep staging algorithm in a new miniaturized sleep monitoring device – Compumedics Ltd Somfit®.

Method:

40 participants were enrolled into the study and involved simultaneous recordings of full overnight PSG and Somfit data. The eligible participants were referred to the unit for investigation of suspected OSA or reassessment of known OSA. All PSG recordings were independently scored according to current ASSM guidelines by 3 qualified, experienced sleep scientists. A consensus hypnogram was generated from the 3 manual hypnograms and used as the final hypnogram for all subsequent comparisons against the Somfit® DL automatic hypnogram.

Results:

Overall percent agreement across five sleep stages (N1, N2, N3, REM and Wake) between Somfit automatic hypnogram and consensus PSG hypnogram is 75.89 [95% CI - 75.27; 76.98]. The estimate for kappa between Somfit and consensus PSG is 0.672 [0.667; 0.678]. Percent agreement for sleep/wake discrimination is 89.99 [89.58; 90.10]. The accuracy of Somfit sleep staging algorithm decreased with increasing severity of OSA – percent agreement was 79.67 [77.68; 81.66] for the normal subjects, 77.53 [76.03; 79.04] for mild OSA, 74.70 [72.77; 76.63] for moderate OSA and 72.82 [71.24; 74.70] for severe OSA.

Conclusion:

Agreement between Somfit and PSG hypnograms is close to that between manual PSG hypnograms thus confirming acceptability of the single frontal EEG electrode placement for accurate automatic staging.

Conflict of Interest: No -

Travel Grant: No

Early Career Scientists' Symposium: No