External validation of a data-driven algorithm for muscular activity identification during sleep

Several automated methods for scoring periodic limb movements during sleep (PLMS) and rapid eye movement (REM) sleep without atonia (RSWA) have been proposed, but most of them were developed and validated on data recorded in the same clinic, thus they may be biased. This work aims to validate our data-driven algorithm for muscular activity detection during sleep, originally developed based on data recorded and manually scored at the Danish Center for Sleep Medicine. The validation was carried out on a cohort of 240 participants, including de novo Parkinson's disease (PD) patients and neurologically healthy controls, whose sleep data were recorded and manually evaluated at Paracelsus-Elena Klinik, Kassel, Germany. In the German cohort, the algorithm showed generally good agreement between manual and automated PLMS indices, and identified with 88.75% accuracy participants with PLMS index above 15 PLMS per hour of sleep, and with 84.17% accuracy patients suffering from REM sleep behaviour disorder (RBD) showing RSWA. By comparing the algorithm performances in the Danish and German cohorts, we hypothesized that inter-clinical differences may exist in the way limb movements are manually scored and how healthy controls are defined. Finally, the algorithm performed worse in PD patients, probably as a result of increased artefacts caused by abnormal motor events related to neurodegeneration. Our algorithm can identify, with reasonable performance, participants with RBD and increased PLMS index from data recorded in different centres, and its application may reveal inter clinical differences, which can be overcome in the future by applying automated methods.

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