p419 - Validation of automatic absence seizures detection in single-lead frontal EEG

Loeckx D[1], Buckinx T[1], Lagae L[2] [1]Epihunter NV, Hasselt, Belgium, [2]University of Leuven, Department of Development and Regeneration, Division of Pediatric Neurology, Leuven, Belgium

Purpose: Self-reported absence seizure frequency is highly unreliable. A wearable solution to better detect absence seizures may help improve the quality of life of people with epilepsy and their caregivers and help neurologists to better personalize therapy. E.g., making absence seizures more visible for children in class could improve learning and social interaction and reduce stigma. Critical for such a solution is an algorithm to automatically detect absence seizures.
Method: We have developed a deep learning convolutional neural network for the automatic detection of absence seizures. We have retrospectively validated the algorithm on a dataset of 8 subjects with absence epilepsy (6 typical absence, 1 juvenile absence and 1 other), covering 141h of routine EEG data and 279 seizures. As input, we use the difference between Fp1 and Fz to simulate frontal single-lead wearable EEG. The outcome of the algorithm was compared to manual EEG annotations using a leave-one-out validation. We calculated sensitivity, positive predictive value, and false alarm rate.
Results: The validation showed a sensitivity of 99.6% (98.3%-100%; 1 seizure missed in 279 seizures), a positive predictive value of 90.3% (79.5%-100%, 30 false positives and 278 true positives), and a false alarm interval of 4.7h or 5 false alarms per 24h. The false positives were mainly concentrated in 2 subjects, both with typical absences, with respectively 15 and 9 false alarms each. From the hindsight, most of them could also have been classified as a seizure.
Conclusion: We have shown that automatic absence seizure detection is possible on a single-lead frontal EEG using deep learning with high sensitivity and positive predictive value and low false alarm rates.