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In-field validation of epihunter for the detection of absence seizures using wearable EEG

Mobile devices

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Background

Self-reported absence seizure frequency is highly unreliable. A solution to better detect absence seizures may help improve the quality of life of people with epilepsy and their caregivers, and help neurologists and researchers to better assess therapy impact. E.g. making absence seizures visible for children in class could improve learning and social interaction. Epihunter has developed a wearable absence seizure tracker. It is based on a consumer EEG headset streaming data to a smartphone that runs a deep learning algorithm. Results of the algorithm on frontal single-lead EEG derived from clinical EEG were shown in [1]. This abstract describes initial results on in-field data.

Materials & Methods

Epihunter has collected in-field EEG data of 5 subjects with each >20h of EEG data and, on average, >1 seizure/h. The data is collected in an uncontrolled real-life situation, using Brainlink, a commercially available wearable EEG device by Macrotellect, and the epihunter app. For each subject, we manually annotated the absence seizures (defined as spike-trains lasting more than 3s) in the most recent 5-6h of data (26.5h, 137 seizures). We validated the results of the detection algorithm described in [1] with the manual annotations, calculating sensitivity (SEN), positive predictive value (PPV), and false alarm interval (FAI). These were respectively 99.6%, 90.3% and 4.7h in [1].

Results & Conclusions

The in-field validation showed a SEN of 95.6% (40%-100%; 6 FN on 131 seizures), a PPV of 91.0% (50%-100%; 13 FP and 131 TP), and a FAI of 2.04h (0.46h-infinity). The FPs were concentrated in 2 subjects, who have mainly focal onset impaired awareness seizures. From the hindsight, most of them could have been classified as a seizure. We have shown that automatic absence seizure detection is possible on wearable single-lead EEG, using an algorithm developed from clinical EEG.

[1] Loeckx, D., Buckinx, T., & Lagae, L. (2019). Validation of automatic absence seizures detection in single-lead frontal EEG. IEC2019, accepted