Validation of a smartphone-based EEG among people with epilepsy: A prospective study -

Our objective was to assess the ability of a smartphone-based electroencephalography (EEG) application, the Smartphone Brain Scanner-2 (SBS2), to detect epileptiform abnormalities compared to standard clinical EEG. The SBS2 system consists of an Android tablet wirelessly connected to a 14-electrode EasyCap headset (cost ∼ 300 USD). SBS2 and standard EEG were performed in people with suspected epilepsy in Bhutan (2014-2015), and recordings were interpreted by neurologists. Among 205 participants (54% female, median age 24 years), epileptiform discharges were detected on 14% of SBS2 and 25% of standard EEGs. The SBS2 had 39.2% sensitivity (95% confidence interval (CI) 25.8%, 53.9%) and 94.8% specificity (95% CI 90.0%, 97.7%) for epileptiform discharges with positive and negative predictive values of 0.71 (95% CI 0.51, 0.87) and 0.82 (95% CI 0.76, 0.89) respectively. 31% of focal and 82% of generalized abnormalities were identified on SBS2 recordings. Cohen's kappa (κ) for the SBS2 EEG and standard EEG for the epileptiform versus non-epileptiform outcome was $\kappa = 0.40$ (95% CI 0.25, 0.55). No safety or tolerability concerns were reported. Despite limitations in sensitivity, the SBS2 may become a viable supportive test for the capture of epileptiform abnormalities, and extend EEG access to new, especially resource-limited, populations at a reduced cost.

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