

# A review of epileptiform discharge free EEG analysis for the detection of epilepsy

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## Background

There is developing evidence in the general population that network/computer analysis of inter-ictal electroencephalograms (EEGs) can be used to detect epilepsy<sup>1</sup>. Methods include analysis using machine learning and network analysis and there are methods which do not require the presence of inter-ictal epileptiform discharges for analysis and/or classification<sup>2</sup>.

## Key question

- How strong is the evidence for epilepsy diagnosis from inter-ictal EEG analysis in the general population using network analysis and other computer analysis methods?

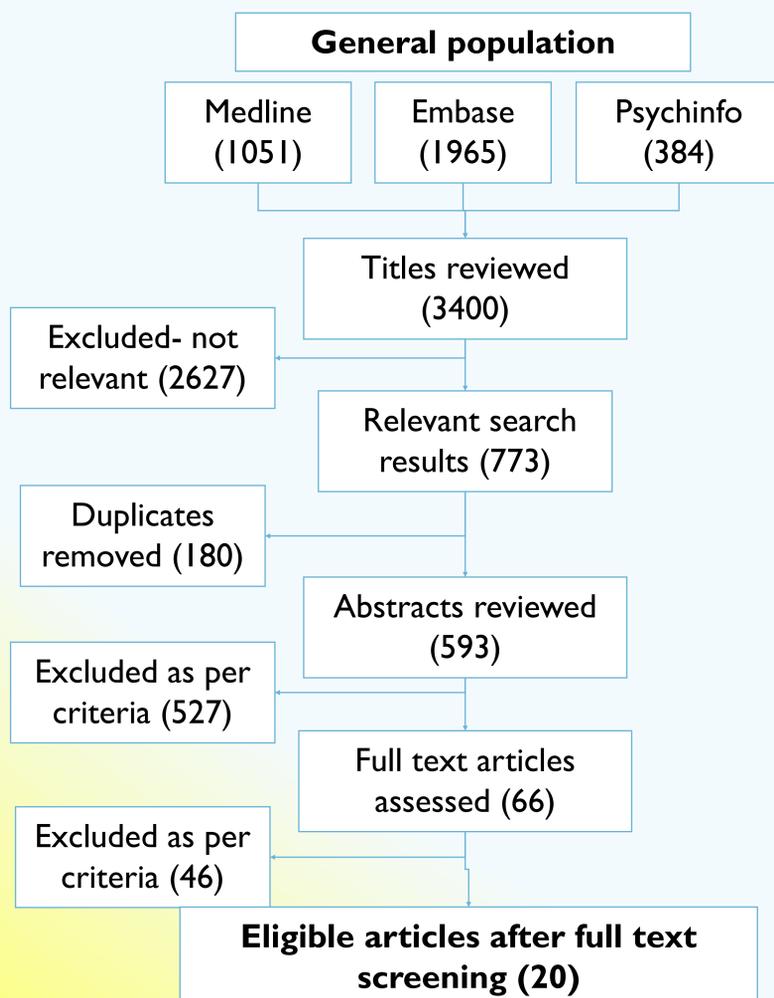
## Methods

A literature search was performed.

Table 1: Criteria for screening

Inclusion criteria
Inter-ictal/resting state EEG
Paper published in full
Paper includes/reviews primary data
Paper published since 2008
Only EEG used for analysis

Figure 1: Flow diagram of literature search and screening. A separate search for studies in the ID/autism populations was also conducted.



## Results

Table 2: Results of the literature search in the general population.

Aim	Network analysis	Other computer analysis	ID/autism
EEG comparison	One review, seven reports	Two reports	None
EEG classification	Two cross-sectional studies	One review, seven cross-sectional studies	None

Figure 2: 11 papers use network analysis. The EEG data is converted to a network. Network features, such as connectivity, are then derived and compared between patients and controls.

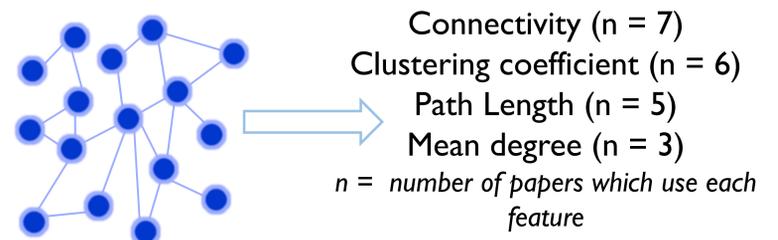


Figure 3: Inter-ictal EEG analysis methods report high classification accuracies in the general population.

17 papers in one review<sup>2</sup> and a further 5 cross-sectional studies → Classification accuracy >90%

In the intellectual disability (ID) and/or autism populations:

- There is a higher prevalence of epilepsy
- Epilepsy has diagnostic challenges<sup>3,4</sup>

No studies were found concerning epilepsy diagnosis specific to these populations, though similar analysis methods have been applied to these populations.

## Conclusions

Resting EEG features derived from network/computer analysis differ significantly between people with and without epilepsy. Diagnostic algorithms in the general population report high accuracies and could be clinically useful.

There is a lack of such research within the ID/autism populations where such methods could be particularly useful.

## References

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