Is neurogenesis in the dentate gyrus compromised in parkinson’s disease?

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THE DENTATE GYRUS

- The seminal discovery that the human dentate gyrus (DG) retains its ability to generate neurons throughout life (Eriksson et al., 1998), has raised the possibility that therapies could be developed to protect or promote this neurogenesis as it deteriorates due to aging, insult and disease.
- Distinction of dopaminergic neurones decreases neurogenesis in the Dentate Gyrus (DG) of rodents and primates.
- O’Sullivan et al (2011) identified in post-mortem analysis that Parkinson’s disease (PD) patients had evidence of reduced neurogenesis in the DG which was related to the duration of illness.
- This suggests that neurogenesis could be compromised in Parkinson’s disease (PD).

THE CDR SYSTEM PICTURE RECOGNITION TASK: AN OBJECT PATTERN SEPARATION TASK

- The task measures delayed object recognition memory.
- The subject initially sees 20 different pictures of everyday scenes and objects, presented one at a time on a computer screen.
- Subsequently after an interval of around 10 minutes these pictures are re-presented, intermixed with 20 very similar but different pictures (see examples below).
- For each picture, the volunteer has to decide whether it or not the picture was shown originally by pressing either YES or NO buttons as quickly as possible. (Ohm, 2007; Tatebayashi, 2003).

CONCLUSIONS

- To determine whether PD patients perform more poorly on difficult discriminations in an object pattern separation task than age-matched controls.
- In this analysis, data from 348 PD patients on the CDR System picture recognition task were compared to that from 1578 healthy age and gender matched controls

OBJECTIVE & METHODS

- To identify original pictures and reject novels ones.

RESULTS

- **GRAPH 1**: Object Pattern Separation - Ability to identify Original Pictures & Reject Novel Ones (LSmeans with 95% Confidence Intervals)
- **GRAPH 2**: Object Pattern Separation - Time Taken to Identify Original Pictures & Reject Novel Ones (LSmeans with 95% Confidence Intervals)

DENTATE GYRUS ACTIVITY IN PATTERN SEPARATION

- fMRI work has identified that making difficult discriminations in object pattern separation tasks (a deciding whether a closely similar picture is or is not the original) is accompanied by notably increased activity in the DG (Kirwan and Stark, 2007).
- The same pattern is seen in patients with amnestic Mild Cognitive Impairment (aMCI) compared to age matched controls (Wesnes, 2010).
- The findings are consistent with the known declines in neurogenesis in the DG which accompany normal ageing, as well as the greater decline in neurogenesis seen in aMCI.

FIGURE 1: Dentate Gyrus - Roles in neurogenesis and pattern separation and consequences of either disruption or therapy

**REFERENCE**


REFERENCES

