Role of the Frontal Polar Cortex in Category Learning: Rule Integration or Switching?  
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**Introduction**

Category learning is a critical neurobiological function that allows organisms to simplify a complex world. Category learning involves:
- Striatum
- Medial temporal lobes
- Other brain regions

One of the less investigated brain regions involved in category learning is the rostromedial frontal polar cortex (FPC). It is often associated with:
- Representational switching (like switching rules in Wisconsin Card Sorting Test)
- Representational integration

The goal of the current study was to find out the precise role of FPC by comparing two common rule-based category learning tasks:
- Matching
- Classification

**Tasks and Predictions**

**Matching Task**
- Match a reference stimulus to 4 target stimuli on a single dimension
- Rule switch after 4 correct trials

**Classification Task**
- Classify one stimulus to category A or B
- Rule switch after 4 correct trials

Matching and classification place different demands on switching and integration:
- In matching, a rule can be known with certainty after a single correct answer
- In classification, participants may need to integrate evidence for the rule even after an initial correct response

**Results**

All trials were divided into two phases:
- Rule Application - last 4 and more correct trials
- Rule Learning - all other trials

**Predictions**

Switching demands should be equal in rule application (no switching) as well as in rule learning trials across the tasks
Integration demands should be different in rule application and may be different in rule learning across the tasks

**Method**
- N = 27 (2 non-learners) at Siemens Skyra 3T
- 4 scanning runs per each task
- FSL+ANTs+Nipype+Randomise

Significant for Rule Application in Classification > Baseline Whole Brain mask (p=0.07)

Significant for Rule Learning > Application in Matching with the Frontal Pole mask (p<0.05)

FPC was used as a seed region to explore its connection with the caudate, which was previously associated with integration

**Conclusions**

- Frontal polar cortex was associated with rule integration in rule-based category learning
- FPC was connected to the caudate that was previously associated with rule integration