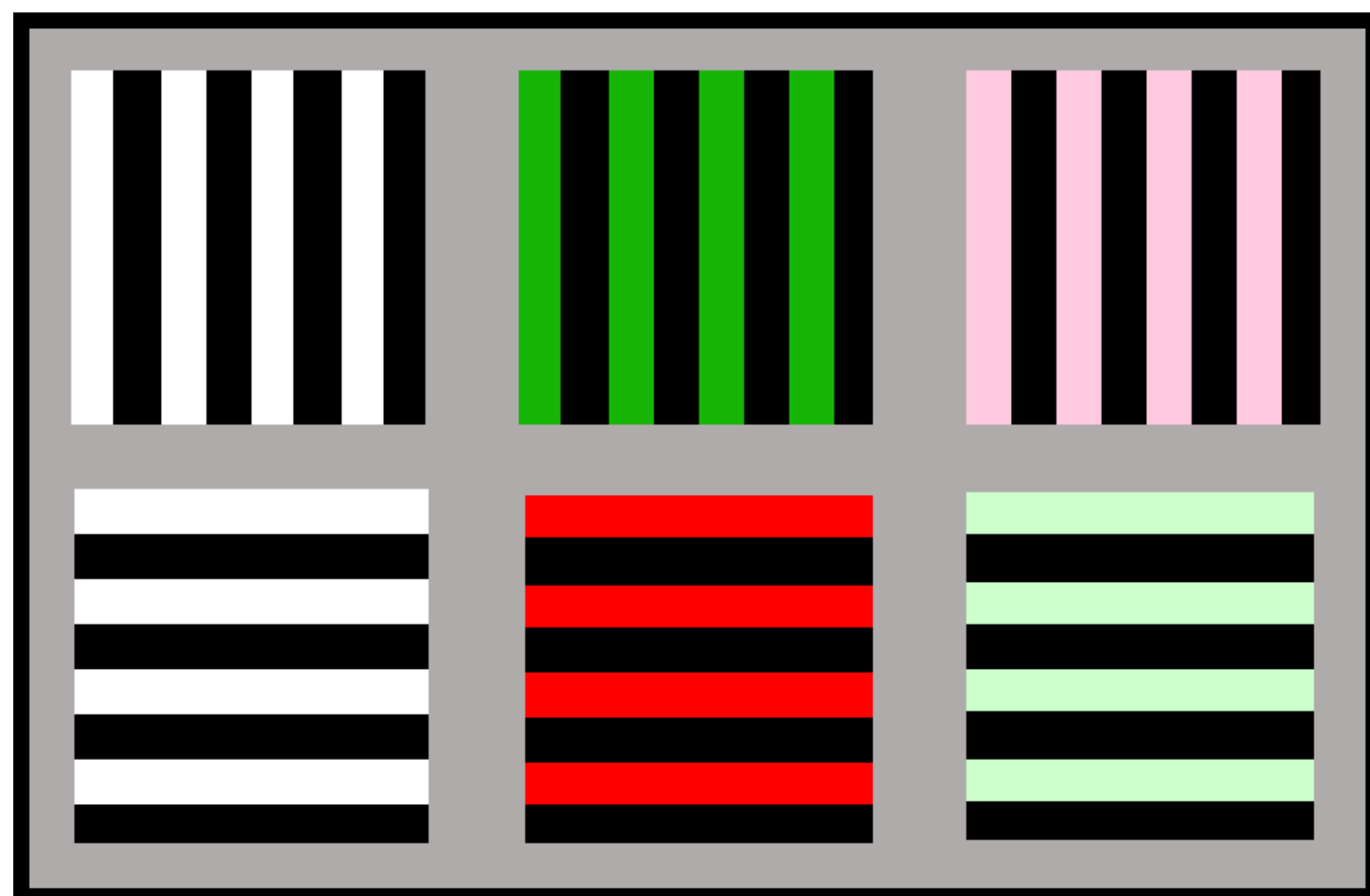# Classification Analyses of fMRI Data Predict Perceived Color

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Background

The McCollough Effect is a long lasting color illusion. We are using fMRI to uncover its neural bases.

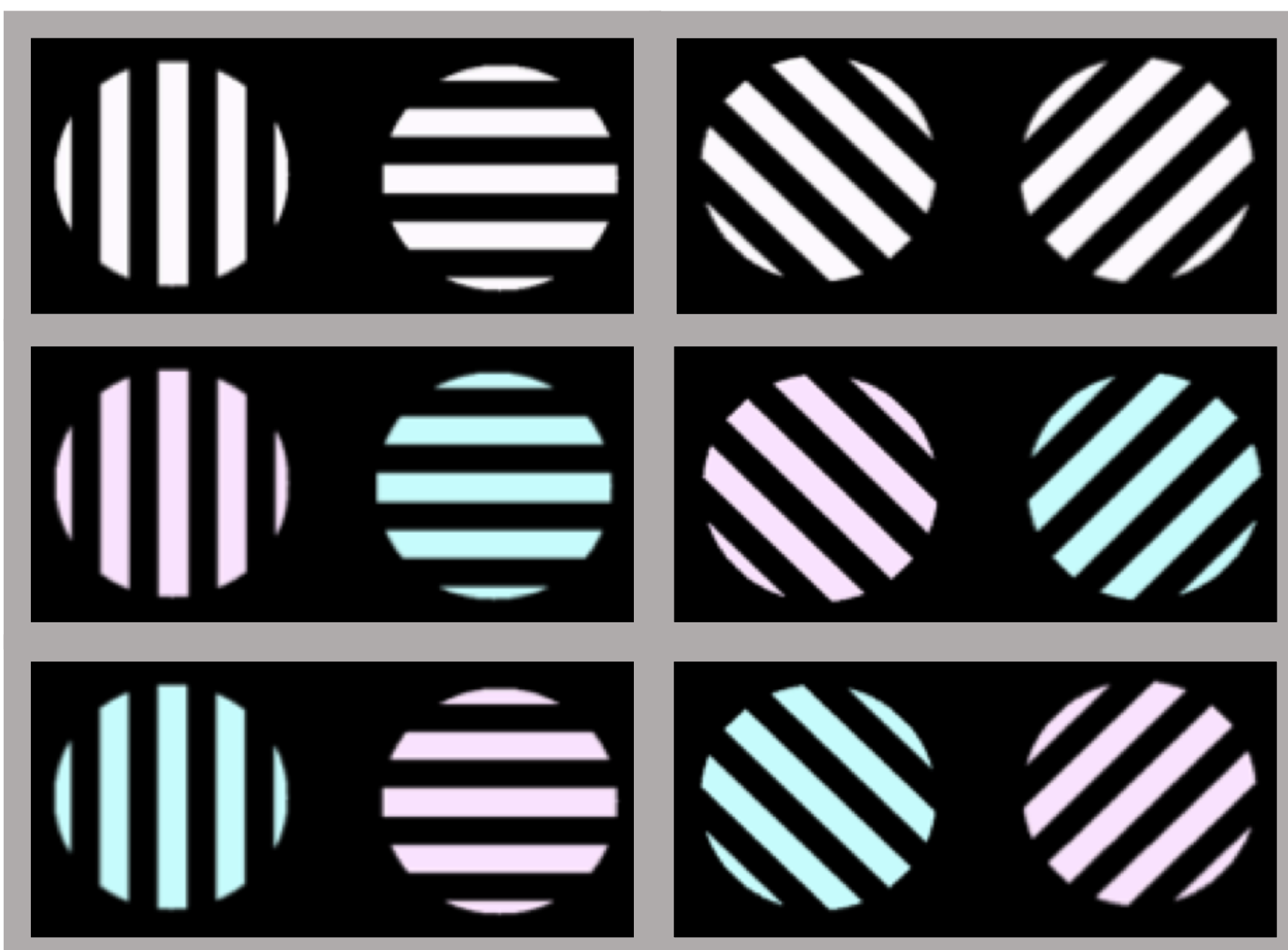

Pre-Adapt   Adapt   Post-Adapt

Questions:
1. Can we determine which color was presented based on the pattern of activation?
2. What is the best way to perform this classification analysis?

Classification Analysis

Input: patterns of activity across voxels for each condition

Output: Best guess of condition

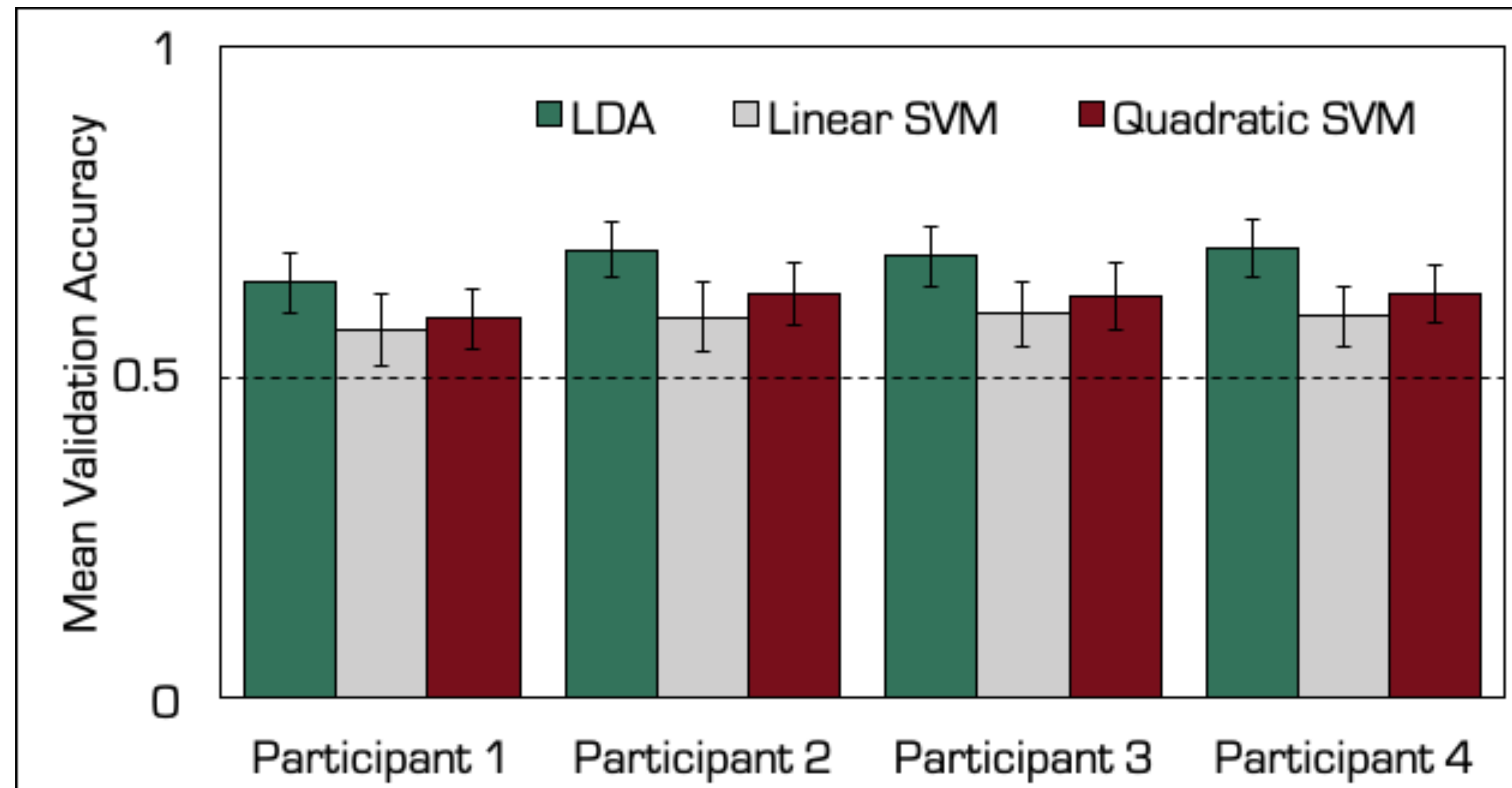fMRI responses measured in 6 conditions

Trained classifiers
- LDA, Linear SVM, Quadratic SVM

Classifying:
- Black-and-white versus color
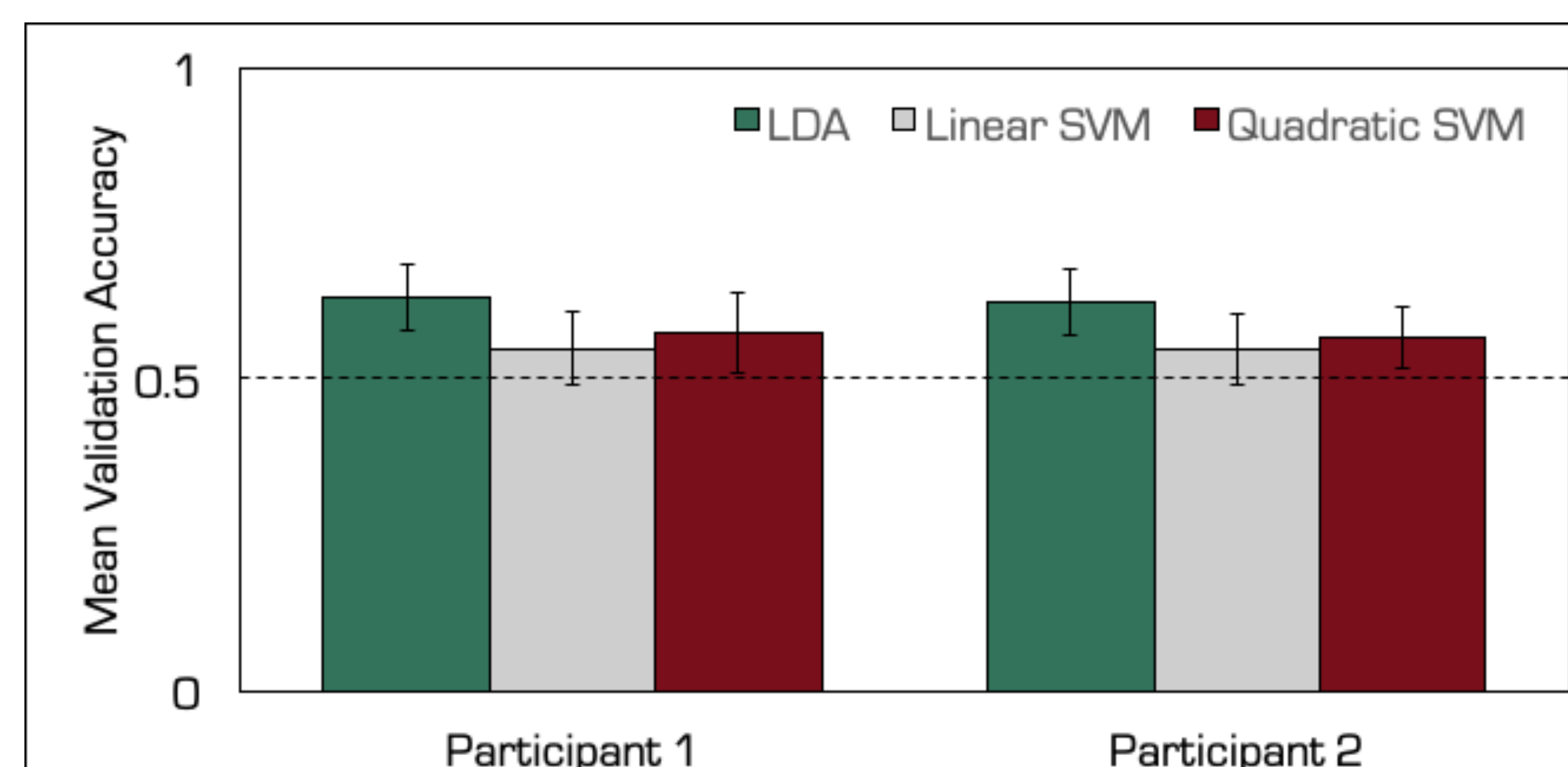- Across different orientations
- Across different scanning sessions

Can we classify color?

- 4 participants, ~2000 visual cortex voxels/participant

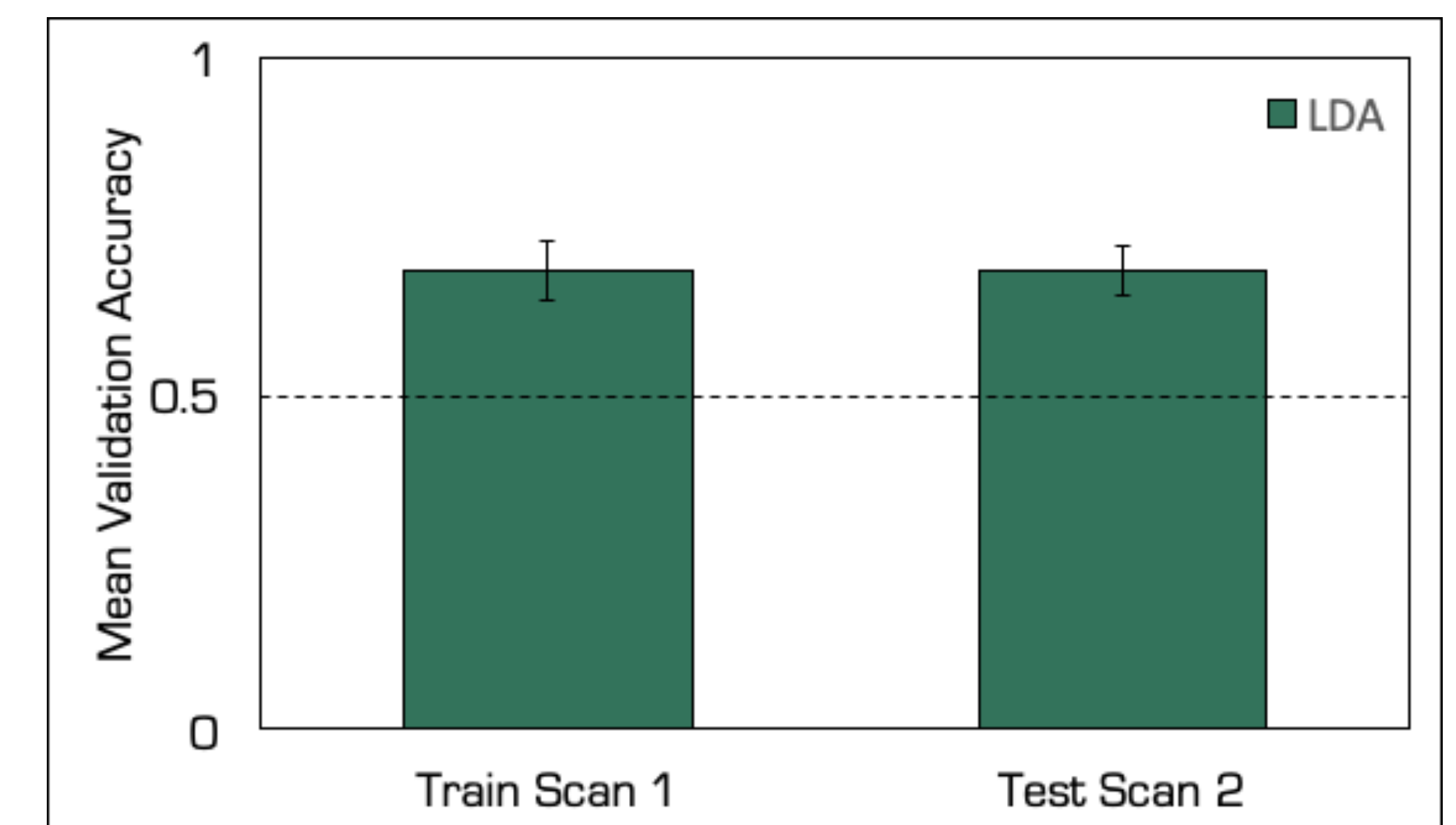**Yes! All methods perform above chance (50%)**

Can we classify color independent of orientation?

Yes! We can train using only diagonal stimuli and test on cardinal stimuli.

What is the best way to classify?

Which classifier works best?

LDA consistently performs better

How many folds of cross validation?

10-fold cross validation suffices
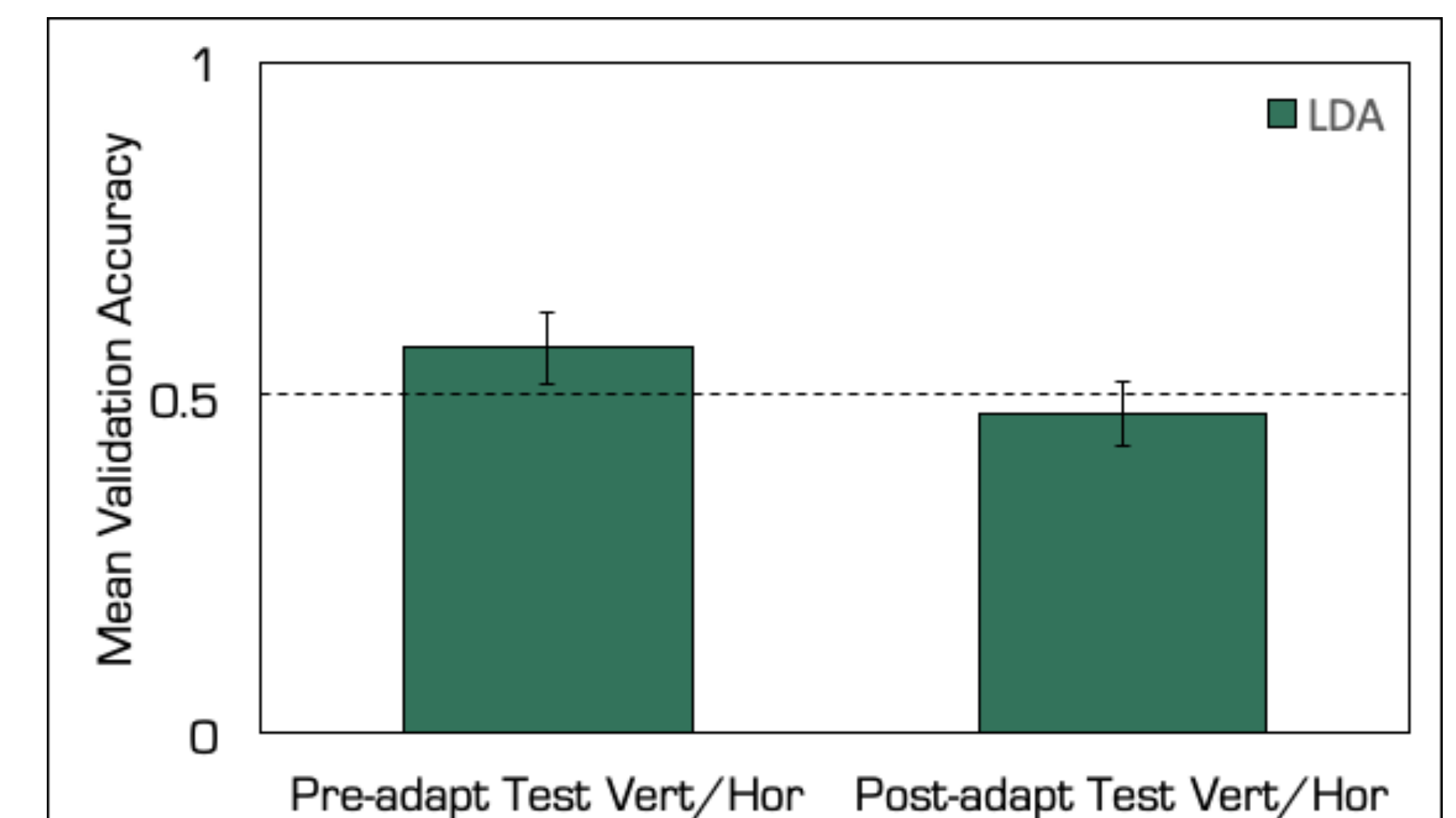
Can we train across scans?

- 1 participant with data from two scans, unaffected by McCollough Effect

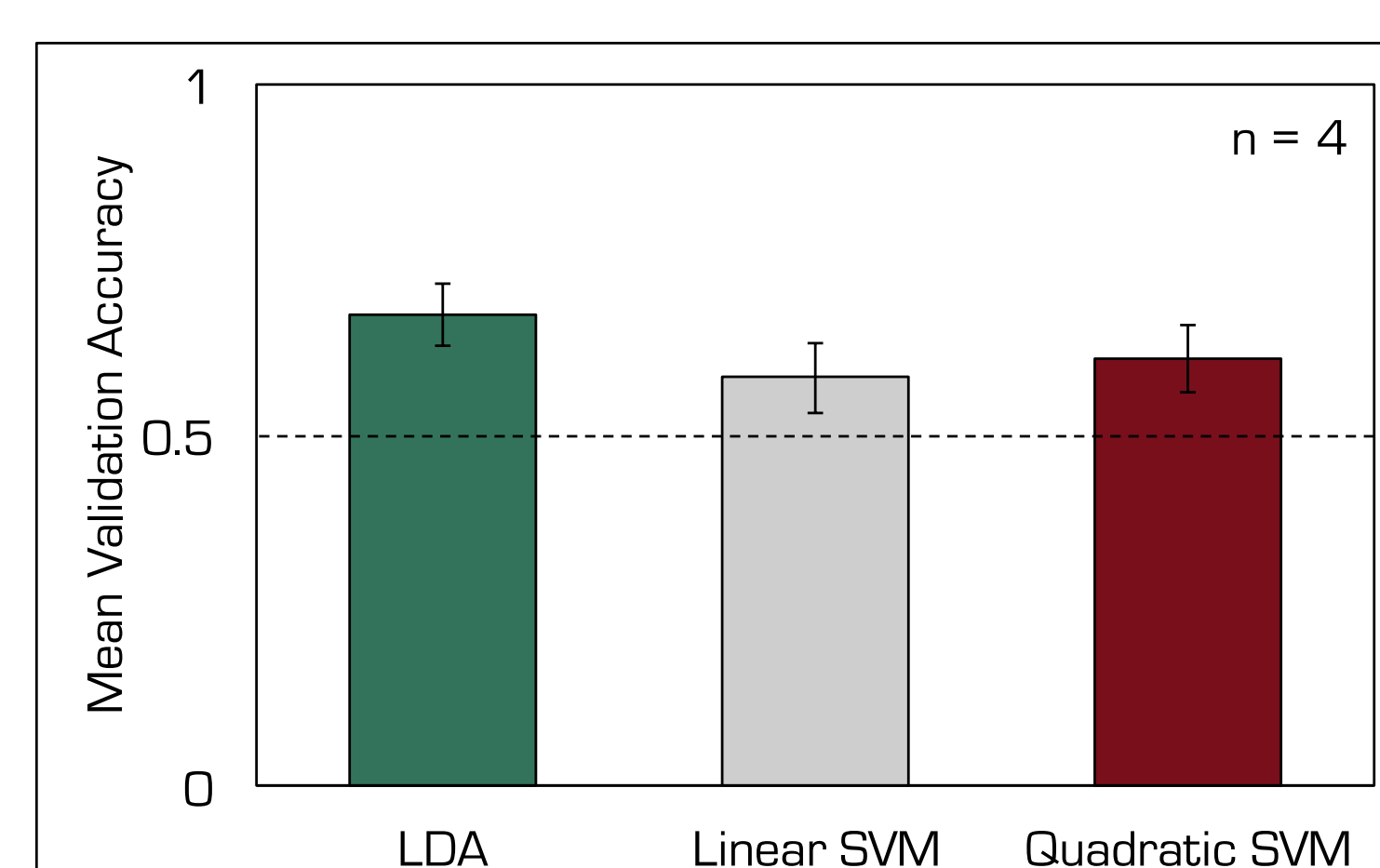**Yes! We can train on data from one scan and accurately classify data from another.**

Does the classifier mistake illusory colors as real?

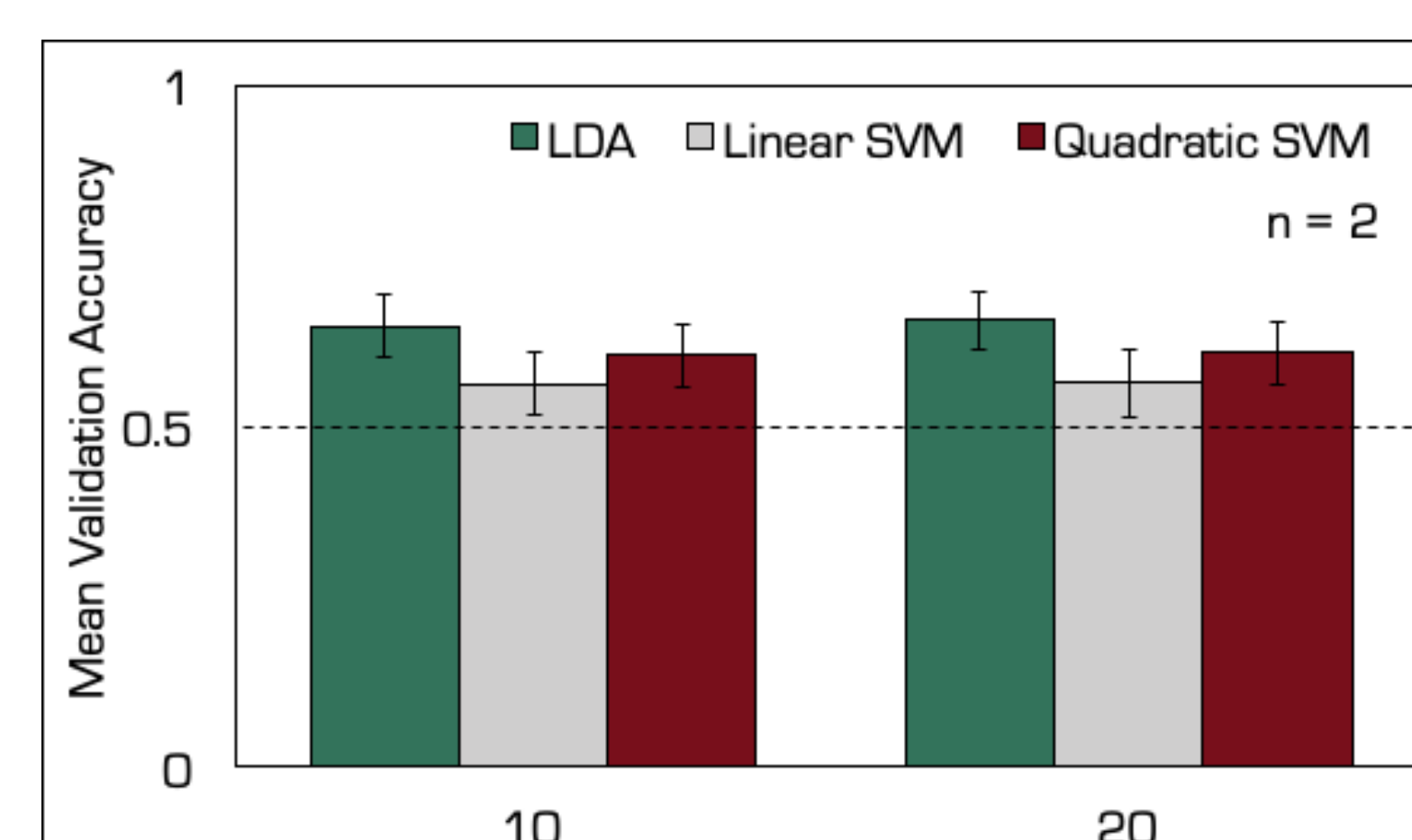- 1 participant with pre-adaptation and post-adaptation scans, with McCollough Effect

Conclusions

- We can classify color vs black and white based on patterns of fMRI activity

- LDA is the best classification method for our data

- Classifier may show effects of the illusion, which will allow us to localize neural bases