ABSTRACT
Predicting Cognitive Decline in Older Adults Through Multi-Voxel Pattern Analysis

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Alzheimer’s disease (AD) is a progressive neurodegenerative disorder that is associated
with cognitive and structural decline beyond what is seen in normal, healthy aging. Functional
magnetic resonance imaging (fMRI) research indicates that prior to the onset of measureable
cognitive impairment, individuals at-risk for AD demonstrate different patterns of neural
activation than individuals at lower risk. Thus, differences in task-activated fMRI may be
beneficial in predicting cognitive decline at a “pre-symptomatic” stage. The present study
utilizes multi-voxel pattern analysis (MVPA) of baseline fMRI task-related activation to predict
cognitive decline, with the hypothesis that famous and non-famous name task activation will
discriminate older adults who go on to experience cognitive decline from those who do not.
Ninety-nine cognitively intact older adults underwent neuropsychological testing and a semantic
memory fMRI task (famous name discrimination). After follow-up neuropsychological testing
18-months later, participants were classified as “Stable” (n = 65) or “Declining” (n = 34) based
on ≥ 1.0 SD decline in performance on cognitive measures. MVPA was able to differentially
classify the famous and non-famous names with 90% accuracy, thereby supporting the general
approach. Mean MVPA classification of famous and non-famous names was 83% accurate for
both the Stable and Declining groups. Finally, MVPA produced greater than chance
classification accuracy of participant groups for both famous name activation (56%) and non-
famous name activation (55%) as determined via binomial distribution. The results of the current
study suggest that MVPA possesses potential in predicting cognitive decline in older adults.