

Author's Accepted Manuscript

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PII: S1053-8119(17)30496-2
DOI: <http://dx.doi.org/10.1016/j.neuroimage.2017.06.027>
Reference: YNIMG14109

To appear in: *NeuroImage*

Received date: 4 April 2017
Revised date: 9 June 2017
Accepted date: 13 June 2017

Cite this article as: Tamara Vanderwal, Jeffrey Eilbott, Emily S. Finn, R. Cameron Craddock, Adam Turnbull and F. Xavier Castellanos, Individual differences in functional connectivity during naturalistic viewing conditions *NeuroImage*, <http://dx.doi.org/10.1016/j.neuroimage.2017.06.027>

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Individual differences in FC during naturalistic viewing conditions

Individual differences in functional connectivity during naturalistic viewing conditions.

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Abstract

Naturalistic viewing paradigms such as movies have been shown to reduce participant head motion and improve arousal during fMRI scanning relative to task-free rest, and have been used to study both functional connectivity and stimulus-evoked BOLD-signal changes. These task-based hemodynamic changes are synchronized across subjects and involve large areas of the cortex, and it is unclear whether individual differences in functional connectivity are enhanced or diminished under such naturalistic conditions. This work first aims to characterize variability in BOLD-signal based functional connectivity (FC) across 2 distinct movie conditions and eyes-open rest (n=31 healthy adults, 2 scan sessions each). We found that movies have higher within- and between-subject correlations in cluster-wise FC relative to rest. The anatomical distribution of inter-individual variability was similar across conditions, with higher variability occurring at the lateral prefrontal lobes and temporoparietal junctions. Second, we used an unsupervised test-retest matching algorithm that identifies individual subjects from within a group based on FC patterns, quantifying the accuracy of the algorithm across the three conditions. The movies and resting state all enabled identification of individual subjects based on FC matrices, with accuracies between 61 and 100%. Overall, pairings involving movies outperformed rest, and the social, faster-paced movie attained 100% accuracy. When the parcellation resolution, scan duration, and number of edges used were increased, accuracies improved across conditions, and the pattern of movies>rest was preserved. These results suggest that using dynamic stimuli such as movies enhances the detection of FC patterns that are unique at the individual level.

Keywords: naturalistic viewing, fMRI, identification algorithm, Inscapes, movies

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