Intersubject correlations within default network during repeated movie viewings.

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**Background:** The default network (DN) is a set of brain regions that typically decrease in activity during cognitive tasks (Raichle et al., 2001). Research suggests the DN is involved in self-generated thoughts (Andrews-Hanna, 2012), which frequently occur during the 'resting state' (Mazoyer et al., 2001). Attempts to obtain continuous measures of brain activity under more controlled, naturalistic conditions has led to the use of movies as stimuli during fMRI experiments. *Inscapes*, an abstract, non-social movie has been shown to decrease head movement and to evoke functional connectivity (FC) patterns that are similar to task-free Rest, particularly in the default and frontoparietal networks (Vanderwal et al., 2015). Due to the abstract nature of this unique paradigm, it is not yet known if the “rest-like” levels of DN FC are time-locked to the stimulus or if the high DN FC reflects self-generated thought with time-courses unique to each participant. Intersubject correlations (ISCs) are a voxel-wise measure of synchronicity between individuals that take advantage of the long and variable time-courses evoked by movies (Hasson et al., 2004). ISCs of the DN provide a way to assess whether DN activity during abstract viewing is stimulus-evoked or intrinsically generated. The current study examines DN ISCs during *Inscapes* and a complex comparison movie (*Oceans 11*).

**Methods:** 34 healthy adults (18 females, mean age = 24.4 ± 5.1 years) underwent two scanning sessions 1 week apart. Functional data were collected during 3 counter-balanced 7-minute conditions: *Inscapes*, *Ocean's 11*, and *Rest* (eyes-open with fixation cross). Pre-processing used CPAC (Craddock et al., 2013) and included spatial smoothing (6mm Gaussian kernel), CompCor nuisance signal regression with 5 components (Behzadi et al., 2007), and registration using ANTS. ISCs were calculated for all voxels across subjects (pairwise) where voxel A in subject 1 was correlated with voxel A in subject B and so on (Hasson et al., 2004). Correlations were then Fisher z-transformed and averaged at each voxel. ISCs were restricted to the DN using a mask from Yeo et al. (2011). To test for significant differences between time points, the Pearson’s coefficients were entered into a dependent t-test. All maps were corrected for multiple comparisons using Gaussian Random Field theory (Z > 2.3, cluster significance p < 0.05, corrected).

**Results:** No participant had a mean FD of >0.2mm. Mean ISCs for the DN as a whole were significantly higher during the initial viewing relative to the second viewing of both *Inscapes* and *Oceans*. Within the DN, two clusters in the left dorsolateral pre-frontal cortex (BA 8) and right inferior frontal cortex (BA 47) demonstrated higher regional ISCs during the second viewing of *Inscapes*; no regions were higher at time 2 for *Oceans*.

**Conclusions:** First, the presence of strong ISCs in the DN as a whole during passive movie-watching indicates that BOLD-signal time courses in the DN were time-locked to the movie stimuli. Such time-locked processes may include constructive and associative operations that aid in making sense of sensory information by relating the imagery to self-generated knowledge and memories. Second, the reduction in DN ISCs on second viewing suggests that greater individual mind wandering may occur when the stimulus is not novel. Third, the existence of focal regions of greater synchronicity upon second viewing may be driven by processes that recruit previous knowledge of the stimulus, such as prediction or working memory, that were shared across participants. Overall, DN activity during passive viewing of movie stimuli appears to become less stimulus-locked at repeated viewings.