Default, salience, and executive control network functional connectivity changes in behavioural variant FTD and Alzheimer's disease

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Behavioural variant FTD (bvFTD) and Alzheimer's disease (AD) have shown distinct atrophy patterns and divergent brain functional connectivity in the salience network (SN) and default mode network (DMN). The frontoparietal-based executive control network (ECN), however, has been less studied. We compared functional connectivity patterns in 3 large-scale networks (DMN, SN, and ECN) in a Singaporean sample of bvFTD, early-onset AD (EOAD), and healthy older adults. We included 13 EOAD subjects (3 males, all right-handed, age 61.9(7.8) years), 10 bvFTD subjects (3 males, one left-handed, age 61.6(6.1) years), and 12 age-/gender- matched healthy controls (2 males, all right-handed, age 61.5(6.5) years) who underwent 8-minute eyes-open (with fixation) task-free fMRI (Siemens, 3T). Three seeds corresponding to the hubs of DMN (right angular gyrus, ANG), SN (right frontoinsula, FI) and ECN (right dorsolateral prefrontal cortex, DLPFC) were used to construct whole-brain functional connectivity maps. Group-level voxel-wise two-sample t-tests were performed to reveal group differences in functional connectivity (height threshold of $p<0.01$ and cluster threshold of $p<0.05$) with age and gender as covariates. Compared with controls, AD and bvFTD showed similar functional connectivity reductions in the ECN both within and between networks, including connectivity between right DLPFC and parietal regions and between right DLPFC and subcortical/temporal regions. Both groups exhibited divergent connectivity patterns in DMN and SN consistent with previous findings: AD weakened DMN connectivity in anterior and posterior DMN but strengthened SN connectivity (right FI - ventromedial prefrontal cortex), while bvFTD strengthened DMN connectivity in posterior DMN regions, but weakened SN connectivity (right FI - medial superior frontal gyrus and mid- and anterior cingulate cortex). Reduced ECN connectivity in bvFTD and EOAD provides insight into and contributes to the "network-based neurodegeneration" hypothesis in both disorders.

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