Towards translation of whole-brain neural mass models to clinical practice: finding the right level of model complexity | Xenia Kobeleva

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Whole-brain neural mass models can effectively simulate resting-state fMRI signal in subjects with cognitive impairment, however the elevated model complexity of some implementations might hinder their translation to clinical practice. Here, we compared various Hopf models of increasing complexity (e.g., locally vs. globally fitting model parameters at edges and nodes) to a model with arbitrarily fixed model parameters to simulate brain dynamics of elderly subjects with and without cognitive impairment. Our aim was to assess which level of model complexity was needed for better descriptions of empirical rs-fMRI data and whether these models were able to recapitulate brain network properties. We found that all tau-dependent models performed significantly better compared to the fixed model, so no added value was provided by increased model complexity. We conclude that, at the spatial scale commonly used in whole-brain modeling studies, models with globally fitted model parameters meaningful information on subjects' cognitive abilities and brain dynamics, diminishing the need for more sophisticated heterogeneous models. These results might facilitate the translation of simpler and less computationally complex models to clinical application.