1. With the Hebbian principle of "what fires together, wires together," adaptive rewiring drives neural plasticity in forming modular, small-world networks in the brain.
2. In highly simplified models of adaptive rewiring, dynamic activities of neural populations are represented by a network of coupled logistic maps.
3. Such models are governed by two parameters, namely turbulence and coupling strength.
4. The former, constraints the chaotic behaviors of model units, while the latter defines the degree to which the activity of each model unit is moderated by its neighbors.
5. Models of coupled logistic maps thus far have used uniform parameters across the system, preventing any cognitive functionality.
6. More specifically, cognitive functionality can only emerge in non-symmetrical systems.
7. Hence, in order to be a valid mechanism for neural plasticity, adaptive rewiring must be robust against non-uniformity of parameters.
8. Furthermore, function-specific structures should emerge from such parameterizations.
9. In this study, we investigated the effect of non-uniformity of parameters of coupled logistic maps on the outcome of adaptive rewiring.
10. In a baseline conditions, we used the same parameters for all model units. In four other conditions, we imposed an "engram" in a subset of the model by deviating the value of only one parameter from the baseline levels.
11. All models evolved to structures akin to brain networks with respect to various network statistics. This finding offers computational support for robustness of adaptive rewiring against symmetry-breaking conditions.
12. Moreover, pairwise comparison of models revealed considerable differentiations in structural and functional connectivities among conditions. In other words, imposition of such "engrams" led to function-specific structures and behaviors.
13. This implies that functional and structural differentiation can be used to identify functional components in a network, upholding the use of structural and functional connectivity measures in neuroimaging.