



Using the Auburn Neural Network App (ANNA) in Prevention Research



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Presentation Outline

Informational Content

- ❑ What is ANNA?
- ❑ How can ANNA be used for prevention research?
- ❑ How does ANNA calculate “traditional” connectivity measures?
- ❑ How does ANNA calculate “dynamic” connectivity?
- ❑ Questions?

Hands-on Activity

- ❑ Demonstration: ANNA in Action.
- ❑ Hand-out: Guide to using ANNA.

What is ANNA?

- ❑ The Auburn Neural Network App
- ❑ Could be “Automated Neural Network Analytics”
- ❑ A dual use program:
 - ❑ Visualize individual or group level dynamic network functioning.
 - ❑ Generate functional connectivity datasets (including dynamic measures).
- ❑ Tool for investigating brain-behavior relationships.

Some basic info

- ❑ Approach similar to graph theory.
- ❑ Plots ROI-ROI connectivity (of desired radius).
- ❑ MNI space.
- ❑ Bounding box = SPM8.
- ❑ Expects a list of ROIs defining two neural networks.
- ❑ Colors are Bonferroni corrected.
- ❑ Red=Net1; Blue=Net2; Green=Negative Connectivity.

How can ANNA be used for prevention research?

- ❑ Task based or resting state.
- ❑ ROI-ROI analyses.
- ❑ Hypothesis testing/improving model fit.
 - ❑ Generate functional connectivity datasets (traditional and dynamic measures).
 - ❑ Group and individual differences.
- ❑ Network visualization within conditions, individuals, or groups.
- ❑ Compare functioning side by side.
- ❑ Examine network response to events/stimuli.

How can ANNA be used for prevention research?

- ❑ Traditional: average correlation across time.
- ❑ Dynamic: combine variance and average correlation estimates to investigate network interaction and the stability of connections over time.
- ❑ Dynamic: T-values, Density, Entativity (and absolute value of each).

How does ANNA calculate “traditional” connectivity?

- ❑ Regions of Interest (ROIs) entered into ANNA.
 - ❑ Two networks in a simple text file list.
- ❑ All possible pairwise correlations are calculated.
- ❑ Results for each participant “vectorized”; added to dataset.
 - ❑ Similar to “graph theory” approach.
- ❑ Average network connectivity: Average of all connections within a single network
- ❑ Network density: Proportion of significant connections within a network, after correction.

How does ANNA calculate “dynamic connectivity”

- ❑ A “dynamic connectivity” dataset is first created.
 - ❑ Based on a “window correlation” containing 5 TRs.
 - ❑ Allows: T-value and density calculations.
- ❑ A “dynamic connectivity correlation matrix” is then created.
 - ❑ Allows: Entativity and other advanced calculations.
 - ❑ Entativity: extent to which network connections are correlated.

What do they mean?

- ❑ T-value: tested against 0; extent to which connection was stable (and not = 0).
- ❑ Density: #Sig TRs/TotalTRs; % of TRs (time) that connection was significant after Bonferroni correction.
- ❑ Entativity: extent to which network wide connectivity fluctuates with individual connections
- ❑ extent to which the network “acts as one”; “comes online” as connectivity in any one connection increases.

Could also measure

- ❑ Network states: number/proportion of times a network is in one state or another (100% dense; 0%; just left; just right, etc.).
- ❑ Network efficiency: correlation between connection strength and network entativity
- ❑ Extent to which effort produces results (i.e. a network's emergent property).
- ❑ More!

How can you generate your own datasets?

- ❑ Open terminal.
- ❑ Type command.
- ❑ Need more info?: see the “Guide to using ANNA”

Questions?