Social networks in ADRD

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Social connectedness preserves cognitive function in older adults

"More frequent participation in social activities and a higher level of perceived social support were associated with higher level of cognitive functioning."

"Even at more severe levels of global disease pathology, cognitive function remained higher for participants with larger network sizes. A similar modifying association was observed with tangles."
Social and biological mechanisms remain unclear and contested

- Absence of unifying theory of social risk and resilience
- Measurement heterogeneity and imprecision
  - Number of relationships
  - Frequency of social contacts
  - Perceived social support
  - Participation in social activities
  - Subjective loneliness
  - Marital status
Social and biological mechanisms of social connectedness
<table>
<thead>
<tr>
<th>Social Bridging</th>
<th>Social Bonding</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Definition:</strong> Access to and engagement with peripheral, irregular, or heterogeneous social ties</td>
<td><strong>Definition:</strong> Social roles, sense of belonging, and emotional support and affirmation accessible through close relationships and primary social units</td>
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<tr>
<td><strong>Biological mechanism:</strong> Exposure to novel social stimuli that are cognitively enriching builds cognitive reserve against neurodegeneration</td>
<td><strong>Biological mechanism:</strong> Affects cortisol and oxytocin levels, and buffers the effects of stress on the brain</td>
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<th>Social Stress</th>
<th>Social Influence</th>
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<tbody>
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<td><strong>Definition:</strong> Distress resulting from losses or exits from relationships and social roles, or dysfunction and strain in ongoing relationships</td>
<td><strong>Definition:</strong> Process by which an individual’s attitudes, beliefs, or behavior are modified by the presence or action of others</td>
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<td><strong>Biological mechanism:</strong> Hypersecretion of stress hormones affects inflammation, amyloid deposits, neuroplasticity, and neurodegeneration</td>
<td><strong>Biological mechanism:</strong> Health behaviors associated with inflammation, and amyloid deposits, neuroplasticity, and neurodegeneration</td>
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Precision measurement of social connectedness
Personal social network methods disaggregate distinct dimensions of social connectedness

- Collects data about the individual people in the social network
- Yields data on the structure, function, and composition of individuals’ social networks
Personal social network methods disaggregate distinct dimensions of social connectedness

Step 1: Elicit names of people in the personal network (“alters”)
Social Bridging

Thinking about yesterday, who were the people you talked to or spent time with for more than five minutes, whether you are close to them or not?

Social Bonding

Who are the people in your life with whom you discuss important matters? Who are the people you can really count on?

Social Stress

Who are the people who are a burden to you or who make your life difficult?

Social Influence

Who are the people who are always talking about your mental and physical health and trying to get you to do things about them?
Personal social network methods disaggregate distinct dimensions of social connectedness

**Step 1:** Elicit names of people in the personal network (“alters”)

**Step 2:** Ask follow-up questions about each alter
Social Bridging

Is [NAME] the same race or ethnicity as you?

Social Bonding

Does [NAME] tell you they care what happens to you?

Social Stress

Does [NAME] hassle you, cause problems, or make life difficult?

Social Influence

Does [NAME] give you suggestions when you have a problem about what you should do?
Personal social network methods disaggregate distinct dimensions of social connectedness

Step 1: Elicit names of people in the personal network (“alters”)
Step 2: Ask follow-up questions about each alter
Step 3: Determine how alters are connected to each other
Social Bridging

- Racial and educational heterogeneity
- Presence of weak ties
- Low density (i.e., interconnectedness)
- Diversity of social roles
- Low mean frequency of contact

Social Bonding

- Mean number of support functions
- High mean closeness
- High density (i.e., interconnectedness)
- Strong relationship with spouse and children
- Proportion kin

Social Stress

- Mean of hassles/causes problems
- Number of burdensome ties
- Ego is caregiver to one or more ties

Social Influence

- Proportion of alters who advise
- Proportion of health regulators
- Mean number of alters who exercise regularly
Insights from personal social network analysis
Social Networks in Alzheimer’s Disease Study (SNAD)

Social Bridging

*Definition:* Access to and engagement with peripheral, irregular, or heterogeneous social ties

*Biological mechanism:* Exposure to novel social stimuli that are cognitively enriching builds cognitive reserve against neurodegeneration
Is social bridging associated with consensus diagnosis?

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<tbody>
<tr>
<td><img src="image1" alt="Normal Network" /></td>
<td><img src="image2" alt="MCI Network" /></td>
<td><img src="image3" alt="Dementia Network" /></td>
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</tbody>
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- **Ego**
- **Kin**
- **Friend**
- **Strong tie**
Is social bridging associated with subjective cognitive decline?
Is bridging network typology associated with subjective cognitive decline and cognitive function?

*K-means cluster on network size, density, kinship, emotional closeness, contact frequency

Note. Difference are not significant if the 95% CI overlaps with the solid references line. Differences in probabilities are in comparison to ‘No SCD + cognitively normal. Probabilities are derived from logistic regression model controlling for age, sex, education.
Is social bridging associated with cognitive reserve (CR)

Visualization of network characteristics by CR Residual method for measuring CR

Residual method for measuring CR

Visualization of network characteristics by CR
Does social bridging mediate the relationship between educational attainment and cognitive function and decline?

Bridging explains 29.2% of the educational disparity in MoCA and 23.5% of the educational disparity in CCI.
Are socioeconomic characteristics of older adults’ residential neighborhoods associated with cognitive function?
Acknowledgements

Coauthors: Adam Roth, Siyun Peng, Max Coleman, Andy Saykin, Liana Apostolova, and Shannon Risacher

Funders: This work was funded by the National Institute on Aging (5R01AG057739; 5P30AG010133), and by an Indiana University Collaborative Research Grant through the Vice President for Research. This project also received support from the Indiana Clinical and Translational Sciences Institute, funded in part by Award Number UL1TR002529 from the National Institutes of Health, National Center for Advancing Translational Sciences, Clinical and Translational Sciences Award. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Other acknowledgements: Thank you to faculty and staff at the Indiana Alzheimer Disease Center, the Indiana University Department of Sociology, the Indiana Consortium for Mental Health Services Research, and the Indiana University Network Science Institute for their contributions to project conceptualization and data collection. Thanks, also, to Evan Finley, Hope Sheean, Adam Roth, Siyun Peng, William McConnell, Bernice Pescosolido, Erin Pullen, Kate Eddens, Alex Capshew, Tugce Duran, Mary Austrom, Sujuan Gao, and Frederick Unverzagt.