Residency as Social Network: Burnout, Loneliness, and Network Centrality

Jordan Shapiro, MD
Burnt Out on Burnout

- Endemic
- Epidemic
- Multifactorial
- Negative consequences
- Individual affliction, individual interventions
- Hard to fix
When Our Favorite Model Fails

• **Eg: Medical Model**
  – Focuses on aberrant structure and function

• **Treatment Plan:**
  – If it’s too ______, then ______ it.

• **Algorithmic approach**
  – This is okay!
  – Pitfalls of this approach with wellness
Inspirations

CONNECTED
THE SURPRISING POWER OF OUR SOCIAL NETWORKS AND HOW THEY SHAPE OUR LIVES
NICHOLAS A. CHRISTAKIS, MD, PhD, AND JAMES H. FOWLER, PhD

loneliness
Human Nature and the Need for Social Connection
John T. Cacioppo & William Patrick

“One of the most important books about the human condition to appear in a decade.” — Daniel Gilbert, author of Stumbling on Happiness
Loneliness

• It’s all about *perceptions* – lonely vs alone

• Consequences

• Residency is unique

• Global applicability

• Easy to measure – never been measured
Social Network Theory

- Connected individuals form networks
- Strength of connections allows for influence
- Many things spread through social networks
- Not as easy to measure – never been measured
Figure 1: Description of Loneliness and Social Network Aspect of the Study

3-Item Loneliness Scale

Connectivity To Co-Residents

Social Network Analysis

**Measures of Network Centrality**

- **Betweenness Centrality**
  - Extent to which a person’s connections are connected, taking into account the number of paths of connection between other individuals a person lies on.\(^{18,19}\)

- **Closeness Centrality**
  - Extent to which a person is directly or indirectly near all other individuals in a network.\(^{18,19}\)

- **Clustering Co-Efficient**
  - Measuring of the clustering of individuals, or personal network density, which demonstrates cliques and embeddedness within the network.\(^{18,21}\)

- **Eigenvector Centrality**
  - Extent to which central individuals in the network are connected to other well-connected individuals or groups of individuals. Connectivity weighted by centrality of one’s connections.\(^{18,20}\)

**Network Degree (Number of Connections)**

- **In Degree**
  - Number of individuals in the network that feel connected to a given person.\(^{18,19}\)

- **Out Degree**
  - Number of individuals in the network a given person feels connected to.\(^{18,19}\)

Note: Below each description of the given measure of degree or centrality is a graphic. In each of the graphics, the black circle has a greater measure of degree or centrality.

Figure by: Jordan Shapiro, MD
**In Degree**
Number of individuals in the network that feel connected to a given person.\(^\text{18,19}\)

**Out Degree**
Number of individuals in the network a given person feels connected to.\(^\text{18,19}\)

**Eigenvector Centrality**
Extent to which central individuals in the network are connected to other well-connected individuals or groups of individuals. Connectivity weighted by centrality of one’s connections.\(^\text{18,20}\)
Results
Burnout

% of Residents Meeting Burnout by Subscale

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emotional Exhaustion (≥ 27)</td>
<td>45%</td>
</tr>
<tr>
<td>Depersonalization (≥ 10)</td>
<td>49%</td>
</tr>
<tr>
<td>Emotional Exhaustion &amp; Depersonalization</td>
<td>33%</td>
</tr>
</tbody>
</table>
Results

Loneliness

Loneliness Scores By Burnout Subscales

- Emotional Exhaustion (Subscore ≥ 27): 5.6, 4.5
- Depersonalization (Subscore ≥ 10): 5.4, 4.6
- Emotional Exhaustion & Depersonalization: 5.8, 4.6

Significance:
- Emotional Exhaustion (Subscore ≥ 27): \( p = 0.002 \)
- Depersonalization (Subscore ≥ 10): \( p = 0.024 \)
- Emotional Exhaustion & Depersonalization: \( p = 0.001 \)
Results

Burnout and Social Network Measures

**Connectedness**
- Perceived connectedness and burnout
  - $3 + 4$
  - 4
- No association with any burnout subscores

**Network Centrality**
- No association with emotional exhaustion or depersonalization scores
- + association of personal accomplishment with several measures of centrality
  - In- and out-degree
  - Closeness and eigenvector centrality
### Other Results

<table>
<thead>
<tr>
<th></th>
<th>EE</th>
<th>DP</th>
<th>EE + DP</th>
<th>PA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>43/95 (45%)</td>
<td>47/95 (49%)</td>
<td>31/95 (33%)</td>
<td>73/95 (77%)</td>
</tr>
<tr>
<td><strong>Year in Training</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First year</td>
<td>18/38 (47%)</td>
<td>18/38 (47%)</td>
<td>13/38 (34%)</td>
<td>34/38 (89%)</td>
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<tr>
<td>Second year</td>
<td>11/26 (42%)</td>
<td>12/26 (46%)</td>
<td>8/26 (31%)</td>
<td>16/26 (62%)</td>
</tr>
<tr>
<td>Third year</td>
<td>12/23 (52%)</td>
<td>11/23 (48%)</td>
<td>8/23 (35%)</td>
<td>17/23 (74%)</td>
</tr>
<tr>
<td>Fourth year</td>
<td>2/7 (29%)</td>
<td>6/7 (86%)</td>
<td>2/7 (29%)</td>
<td>5/7 (71%)</td>
</tr>
<tr>
<td><strong>Training Program</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IM-C</td>
<td>28/55 (51%)</td>
<td>31/55 (56%)</td>
<td>22/55 (40%)</td>
<td>2/55 (76%)</td>
</tr>
<tr>
<td>IM-P</td>
<td>6/14 (43%)</td>
<td>5/14 (36%)</td>
<td>4/14 (29%)</td>
<td>13/14 (93%)</td>
</tr>
<tr>
<td>MP</td>
<td>9/25 (36%)</td>
<td>11/25 (44%)</td>
<td>5/25 (20%)</td>
<td>17/25 (68%)</td>
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<tr>
<td><strong>Year in Training + Program</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First year + IM-C</td>
<td>10/17 (59%)</td>
<td>11/17 (65%)</td>
<td>8/17 (47%)</td>
<td>15/17 (88%)</td>
</tr>
<tr>
<td>First year + IM-P</td>
<td>6/14 (43%)</td>
<td>5/14 (36%)</td>
<td>4/14 (29%)</td>
<td>13/14 (93%)</td>
</tr>
<tr>
<td>First year + MP</td>
<td>2/7 (29%)</td>
<td>2/7 (29%)</td>
<td>1/7 (14%)</td>
<td>6/7 (86%)</td>
</tr>
<tr>
<td>Second year + IM-C</td>
<td>9/21 (43%)</td>
<td>11/21 (52%)</td>
<td>7/21 (33%)</td>
<td>14/21 (67%)</td>
</tr>
<tr>
<td>Second year + MP</td>
<td>2/5 (40%)</td>
<td>1/5 (20%)</td>
<td>1/5 (20%)</td>
<td>2/5 (40%)</td>
</tr>
<tr>
<td>Third year + IM-C</td>
<td>9/17 (53%)</td>
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<td>7/17 (41%)</td>
<td>13/17 (76%)</td>
</tr>
<tr>
<td>Fourth year + IM-C</td>
<td>3/6 (50%)</td>
<td>2/6 (33%)</td>
<td>1/6 (17%)</td>
<td>4/6 (67%)</td>
</tr>
<tr>
<td>Fourth year + MP</td>
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Limitations

• It’s rough being single
  – Single center
  – Single training program
  – Single point in time

• Lack of validity evidence for social network tool
Modeling Future Burnout Research

• Social networks as a dynamic model for burnout/resilience:
  – Time
  – Space

• Predicting at risk residents

• Better explaining the hidden curriculum
Take Home Points

• Feeling disconnected is associated with greater burnout

• Sense of personal accomplishment is associated with greater network centrality

• All models are wrong – the many model approach captures more of reality

• Networks allow for the spread of everything...
  – What’s your fallout zone going to look like?
Thank you 😊

Questions?