Examples of factor analysis in medical education
Why factor analysis?
Why factor analysis?

<table>
<thead>
<tr>
<th>Conceptualizing a Study</th>
<th>No Confidence</th>
<th>Total Confidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Select a suitable topic area for study. <em>aicotopi</em></td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
<td></td>
</tr>
<tr>
<td>2. Decide when to stop searching based on a literature review. <em>aicostop</em></td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
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<tr>
<td>3. Refine a problem so it can be investigated. <em>aicorefn</em></td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
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<tr>
<td>4. Decide when to quit searching for related research/writing. <em>aicorela</em></td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
<td></td>
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<tr>
<td>5. Develop a logical rationale for a particular research idea. <em>aicologc</em></td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
<td></td>
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<tr>
<td>6. Organize your proposed research ideas in writing. <em>aicoorgn</em></td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
<td></td>
</tr>
<tr>
<td>7. Articulate a clear purpose for the research. <em>aicopurp</em></td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
<td></td>
</tr>
<tr>
<td>8. Place one’s study in the context of existing research and justify how it contributes to important questions in the area. <em>aicoctxt</em></td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
<td></td>
</tr>
<tr>
<td>9. Explain (in a general way) the importance of theory to research. <em>aicotheo</em></td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
<td></td>
</tr>
<tr>
<td>10. Relate specific questions of interest to underlying theory. <em>aicoundr</em></td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
<td></td>
</tr>
</tbody>
</table>
Ragins & McFarlin Mentor Role Instrument

• Assesses mentoring roles
• Evaluates perceptions of mentoring relationship
• Psychometrically valid
• But...
Ragins & McFarlin Mentor Role Instrument

- Developed to look at cross gender mentoring
- Validated in R&D organizations
- Has not been used in Clinical and Translational Science arena
Psychometric Properties of the Mentor Role Instrument when Used in an Academic Medical Setting


Methods

• Population:
  – Trainees at the beginning of training

• Statistics:
  – **Pearson correlation**: inter-item correlation
  – **Chronbach’s alpha**: internal consistency of each purported scale
  – **SEM**: confirm the factorial validity of the scale
  – **Pearson correlation**: degree to which the two higher dimensions correlated with three mentoring outcomes
Reliability: Inter-Item Correlation

- **Pearson correlation:**
  - 0.57-0.93
  - 75% of correlations $\geq 0.69$
- Strong inter-item reliability
Reliability: Internal Consistency

- Chronbach’s alpha
  - 0.82-0.97
  - Strong internal consistency
Factorial validity: SEM

Figure 1. Higher order factor analysis. Higher order factor analysis of the Ragins and McFarlin Mentor Role Instrument. The model obtained a good fit to the data, with a chi square of 764.4, df of 483, p of ≤ 0.001, a root mean square error of approximation (RMSEA) of 0.06, and a Tucker Lewis index (TLI) and a comparative fit index (CFI)
Concurrent Validity

• Mentoring satisfaction and
  – Career dimension (0.67)
  – Psychosocial dimension (0.71)

• Mentoring effectiveness and
  – Career dimension (0.63)
  – Psychosocial dimension (0.56)

• Type and frequency of mentoring and
  – Career dimension (0.30)
  – Psychosocial dimension (0.19)
Conclusions

• RMMRI can be used in this new setting
• Questions and thoughts?
Clinical Research Appraisal Inventory

- Multiple dimensions
  - Conceptualizing a study
  - Designing a study
  - Collaborating with others
  - Funding a study
  - Planning and managing your research study
  - Protecting research subjects and the responsible conduct of research
  - Collecting, recording, and analyzing data
  - Interpreting data
  - Reporting your study
  - Presenting your study
Clinical Research Appraisal
Inventory

• 92 items!
Making it shorter...

- **Exploratory factor analysis:**
  - 6 factors (down from 10)

- **Confirmatory factor analysis:**
  - Varied the number of items per scale (1-3/scale and all 92)
  - 2 items per scale had the lowest standard deviation
Led to the following...

- Designing a study and collecting data
- Reporting, interpreting, and presenting
- Conceptualizing and collaborating
- Planning
- Funding
- Protecting research subjects
Questions from 3 dimensions are not represented

- Collecting, reporting, and analyzing data
  - Subsumed into designing a study
- Interpreting data
  - Subsumed into reporting, interpreting, and presenting
- Presenting your study
  - Subsumed into reporting, interpreting, and presenting
Did we loose something?

• Designing a study:
  – Design the best data analysis strategy for your study
  – Determine an adequate number of subjects for your research project

• Reporting, interpreting, and presenting
  – Write the results section of a research paper that clearly summarizes and describes the results, free of interpretive comment
  – Write a discussion section for a research paper that articulates the importance of your findings relative to other studies in the field
Conclusions

• Shorter instrument
• More parsimonious structure
• Questions and thoughts?