Deciphering Miller’s Magical Number 7: 
The Effect of Increased Focus Switching on Working Memory Capacity

Crystal Burnette
Leigh Anne Campbell

Research advisor: Dr. Kara Bopp
What is the capacity of memory?

- 7 ± 2 - Miller (1956)

- Working memory capacity prominent researchers
  - Baddeley (1974)
  - Cowan (1999, 2005)
  - Oberauer (2002)

- Working memory:
  - Storage
  - Processing
<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
<td></td>
</tr>
</tbody>
</table>
Method

- 20 Wofford students
- Pre-test measures
  - Digit span (forward and backward), digit symbol, vocabulary
- Task: Find the repeated item in a series
  - Verbal condition: Digits
  - Visuo-spatial condition: Positions in a 4x4 grid
- Six stimuli per location
  - Practice trials presented 1 location
  - Testing trials presented 2 or 3 locations, alternating and counterbalanced
- 84 trials total
Verbal Task – 3 locations
Visuospatial Task – 3 locations
Example: Memory load = 6

<table>
<thead>
<tr>
<th>Location</th>
<th>Trials</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>7 14  2 14 10 8</td>
</tr>
<tr>
<td></td>
<td>12 10 3 10 5 9</td>
</tr>
<tr>
<td>3</td>
<td>1 16 1 8 7 2</td>
</tr>
<tr>
<td></td>
<td>9 3 9 14 16 10</td>
</tr>
<tr>
<td></td>
<td>13 6 13 5 1 4</td>
</tr>
</tbody>
</table>
Accuracy & Memory Load

• Accuracy higher on verbal compared to visuospatial condition
• Accuracy decreased as memory load increased
• Verbal and visuospatial follow same pattern as memory load increases
Accuracy & Location

- Accuracy higher in 2 location than 3 location trials
- Trials with same memory load have different accuracies according to the number of locations
  - Switching between 3 locations resulted in lower accuracies than switching between 2 locations
BPT & Memory Load

- BPT = before (repeat) presentation time
- BPTs are relatively consistent as memory load increases
- BPTs are higher in the visuospatial than in the verbal condition
• Capacity (with rehearsal) can be larger than 7+/−2 items
• Working memory capacity is reduced when required to hold items in separate groups
Future Directions

- Pilot training study
- Goal: Improve working memory of dementia patients
  - 4 dementia patients each trained for 5 consecutive days on 1 location repeat task
- Hypothesis: Training will increase WM capacity
Thank you!

- We’re happy to answer any questions now!
Accuracy by location: 2 locations

**Verbal condition**

- Y-axis: Accuracy
- X-axis: Memory Load (ML4 to ML10)
- Lines represent:
  - TopLeft loc
  - BotLeft loc

**Visuospatial condition**

- Y-axis: Accuracy
- X-axis: Memory Load (ML4 to ML10)
- Lines represent:
  - TopLeft loc
  - BotLeft loc
Accuracy by location: 3 locations

**Verbal condition**

Accuracy by Memory Load for different locations:

- TopLeft loc
- BotLeft loc
- TopRightLoc

**Visuospatial condition**

Accuracy by Memory Load for different locations:

- TopLeft loc
- BotLeft loc
- TopRightLoc