Methodological issues (in memory and skill research)

Elements of an experiment
- **Variable:**
  - A characteristic whose value can change
- **Independent variable (aka factor):**
  - Manipulated by the experimenter
- **Dependent variable (aka measure):**
  - Measured for effects of manipulating the independent variables
  - E.g., Number of words recalled

Independent variables
- **Learning environment**
  - Two levels: Dry, Wet
- **Recall environment**
  - Two levels: Dry, Wet
- **Factorial (fully-crossed) design**
  - $2 \times 2 = 4$ cells
    - Dry/Dry, Dry/Wet, Wet/Wet, Wet/Dry

Results

Main effect
- The effect of one independent variable, averaged over levels of the other(s)
  - Neither main effect is **significant**
  - I.e., $p > .05$ for both

Interaction
- The effect of one factor differs depending on the level of the other factor
  - The effect of Recall environment differs depending on Learning environment
  - Perceptual clue: The lines aren’t parallel
### Hypothetical results

<table>
<thead>
<tr>
<th>Number of words recalled</th>
<th>Learn dry</th>
<th>Learn wet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recall dry</td>
<td>16</td>
<td>10</td>
</tr>
<tr>
<td>Recall wet</td>
<td>12</td>
<td>8</td>
</tr>
</tbody>
</table>

- **Additive effects** of being wet at learning and recall

### Within vs. between subjects

- **Within-subjects manipulation**
  - Same participants for each level of the factor
- **Between-subjects manipulation**
  - Different participants for each level of the factor

### Matching groups

- **General goal:** Want conditions to be matched on everything but the independent variable
  - General approach: *random assignment*
    - Of participants to groups (between)
    - Of levels to participant (within)
- **Suppose we want to compare experts vs novices**
  - Can’t use random assignment
    - Formally, a *quasi-experiment*
  - Need to think about whether the groups differ in relevant ways

### Internal validity

- **Does the study support a strong causal inference?**
  - The problem is *confounds*
    - Unwanted differences between conditions
    - Variables that correlate with an independent variable
- **Godden and Baddeley:**
  - 4 min between Learning and Recall
  - To let people change environments
    - Could have distracted from rehearsal
    - In the conditions that had worse recall
External validity

• The degree to which the results are applicable to the real world
• Godden and Baddeley:
  – Environments were, in a sense, real-world
  – But would they transfer to study strategies?

Methodological skill

• Skills involved in research include:
  – Reading tables and graphs
  – Interpreting interactions
  – Spotting confounds
• Mostly cognitive and perceptual
  – As opposed to motor
  – Cognitive and perceptual skills will be the focus of the course