Dental Pain Experiment

*Response: A measure of relief from pain (the higher the value the more pain relief).

Dental Pain Experiment

*Conditions:
 * Factor 1: Drug: Codeine or Placebo
 * Factor 2: Acupuncture: Active or Inactive
 * Treatments are combinations of Drug and Acupuncture.

Dental Pain Experiment

<table>
<thead>
<tr>
<th>Drug</th>
<th>Acupuncture</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Placebo</td>
<td>Inactive</td>
<td>None</td>
</tr>
<tr>
<td>Codeine</td>
<td>Inactive</td>
<td>Drug only</td>
</tr>
<tr>
<td>Placebo</td>
<td>Active</td>
<td>Acupuncture only</td>
</tr>
<tr>
<td>Codeine</td>
<td>Active</td>
<td>Both</td>
</tr>
</tbody>
</table>

Dental Pain Experiment

*Experimental Units: 32 males after dental surgery.
 * There will be variation due to different severity of surgery and different perceptions and tolerances to pain.

Blocking Variable

*Create blocks by sorting the 32 men into groups of 4 based on how much pain they have just after surgery.

Randomization

*Randomly assign the four treatments (combination of Drug and Acupuncture) to the four mean in each block.
 * Do a separate random assignment for each block.
Lecture 28: Dental Pain Experiment

Sources of Variation

* Treatment (which can be split up into)
  * Drug
  * Acupuncture
  * Drug*Acupuncture
  * Block

Partial ANOVA

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drug</td>
<td>1</td>
</tr>
<tr>
<td>Acupuncture</td>
<td>1</td>
</tr>
<tr>
<td>Drug*Acupuncture</td>
<td>1</td>
</tr>
<tr>
<td>Block</td>
<td>7</td>
</tr>
<tr>
<td>Error</td>
<td>21</td>
</tr>
<tr>
<td>C. Total</td>
<td>31</td>
</tr>
</tbody>
</table>

Informal Analysis

* Drug
  * Codeine: 1.4250
  * Placebo: 0.8875
  * On average, Codeine produces more pain relief than Placebo.

Informal Analysis

* Acupuncture
  * Active: 1.48125
  * Inactive: 0.83125
  * On average, Active sites produce more pain relief than Inactive sites.

Informal Analysis

*(Drug*Acupuncture)*
  * Codeine*Active: 1.7875
  * Codeine*Inactive: 1.0625
  * Placebo*Active: 1.1750
  * Placebo*Inactive: 0.6000

Comment

* All treatments provide some relief.
  * Codeine and Active sites produce the most relief, on average.
  * Placebo and Inactive sites produce the least relief, on average.
Lecture 28: Dental Pain Experiment

Estimated Effects

*Overall mean: 1.15625
*Drug
  *Codeine: +0.26875
  *Placebo: –0.26875

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Estimated Effects

*Overall mean: 1.15625
*Acupuncture
  *Active: +0.325
  *Inactive: –0.325

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Estimated Effects

*Overall mean: 1.15625
*Treatment (Drug*Acupuncture)
  *Codeine*Active: +0.63125
  *Codeine*Inactive: –0.09375
  *Placebo*Active: +0.01875
  *Placebo*Inactive: –0.55625

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Interaction Plot

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Comment

*There appears to be little or no interaction between Drug and Acupuncture.
*The effect of Drug appears to be the same whether Acupuncture is at active or inactive sites.

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JMP Data Table

<table>
<thead>
<tr>
<th>Block</th>
<th>Drug</th>
<th>Acupuncture</th>
<th>Relief</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Codeine</td>
<td>Active</td>
<td>1.2</td>
</tr>
<tr>
<td>1</td>
<td>Codeine</td>
<td>Inactive</td>
<td>0.5</td>
</tr>
<tr>
<td>1</td>
<td>Placebo</td>
<td>Active</td>
<td>0.6</td>
</tr>
<tr>
<td>1</td>
<td>Placebo</td>
<td>Inactive</td>
<td>0.0</td>
</tr>
<tr>
<td>8</td>
<td>Placebo</td>
<td>Active</td>
<td>1.6</td>
</tr>
<tr>
<td>8</td>
<td>Placebo</td>
<td>Inactive</td>
<td>1.2</td>
</tr>
</tbody>
</table>

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