Experimental design:

<table>
<thead>
<tr>
<th>Group</th>
<th>Relief</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>Complete relief &amp; permanent relief</td>
<td></td>
</tr>
<tr>
<td>Group 2</td>
<td>Not so</td>
<td></td>
</tr>
</tbody>
</table>

Mean 0% \( \frac{30}{31} \times 100\% = 97\% \)

Not separate Groups

A better outcome:

How much relief each person got:

- 0%
- None
- Some
- Most
- All

Quant cont. ratio:

<table>
<thead>
<tr>
<th>0</th>
<th>65</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Discussion

Section week of 21-25 Oct 19

Form for each person with spinal puncture

Relief: response or outcome variable
This is a repeated-measures design (class 2).

Q: Did acupuncture cause the difference between 97% and 63% relief rates?

Def. If when I goes up, Y tends to go up or down on average, then X and Y are associated

(there is an association between X and Y)

Q: I (outcome), if relief is... 

A: Yes
Dr. Lois is right. Also, about 97% of stat studies are another acupuncture study (like this). My current goal is to make your prediction of how much time it takes. I know it takes 97% of the time, and so.

1. If you think to use 97% of the time, it takes 97% of time. It is false.

\[ \frac{\text{association}}{\text{causation}} \]

If I am here to trick you at all, then we are in a causation.

I just because I am associated.
The replication of results demonstrates generalizability. The devil's advocate points out:

1. Population: How related are patients from spinal punctures to all headache patients? Not at random.
2. Placebo effect: Needles in right places have no effect according to Chinese medical theory.

Additional notes:
- PLAN AHEAD
4(c) survival

\[ \begin{array}{c}
0.5 \\
0.5 \\
0.2 \\
0.3 \\
0.0 \\
\end{array} \]

mean 98%

group 1 survival: 100

group 2 survival: 68%

not RCT

obs. study: RCTs are

\[ \frac{25}{45} \]

Dr. Ullers data

1 row for each of patients

hir
### 1. Background Information

1-5 acu. treatments

Mean 0% 30/97% possible ways

She measured her outcome var.

- Frequency of severe headaches
- Intensity of headache

### 2. Variables

- **Y** = outcome variable
- **X** = treatment (supposedly causal factor)

### 3. Complete Relief

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

### 4. How Much Relief Have You Received?

- None
- Some
- Most
- All

<table>
<thead>
<tr>
<th>0</th>
<th>80</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>none</td>
<td>partial</td>
<td>complete</td>
</tr>
</tbody>
</table>
This is a repeated-measures design (each patient serves as her/his/their own control)

\[ E = \text{potential confounding factors (PCFs)} \]

If \( E \uparrow \) or \( \downarrow \), on average \( E \) and \( Y \) are associated (there is an association between \( E \) and \( Y \))

\[ \text{def. } Y = \text{treatment} \]

\[ \text{outcome} \]

\[ X = \text{ach. vs. cont.} \]

0

1 relief

(0 else)

How to defeat a PCC:

Hold it constant

A: yes. How to establish an assoc. between her \( E \) & her \( Y \)?
Im not sure.

Q: \((X - Y) \rightarrow Z\) → \(X \rightarrow Z\)?

A: Unfortunately, no.

association ≠ causation

\(\leq\) is weaker than or equivalent to
devils advocate

randomized controlled trial (RCT): simplest valid design for concluding causality correctly

population

we want to generalize here \((N >> 2n)\)

\(\frac{\text{like}}{\text{at random}}\)

2n

completely randomized design

\(T \quad C\)

\(C \quad C\)

study subjects

\(n \geq 31\)

covr. eq.

threat to validity:

possible lack of generalizability

placebo effect: \)
5. \[ x = \begin{cases} 1 & \text{eating cottage cheese} \\ 0 & \text{not} \end{cases} \]

\[ \begin{align*}
I & \rightarrow \neg \quad \neg \quad \neg \\
I & \rightarrow 0 \quad \neg \quad \neg
\end{align*} \]

Is it possible that \( x \rightarrow \neg x \)?

Yes.

\[ \neg x \rightarrow x \quad \text{is it possible} \]

\[ \neg x + \neg \rightarrow \neg x \]

Suppose \( x \).

\[ \neg x \quad \text{is more plausible} \]

\[ \neg x \quad \text{more plausible} \]