Multiple-Group Research Designs

• Limitations of 2-group designs
• “Kinds” of Treatment & Control conditions
• Kinds of Causal Hypotheses
• k-group ANOVA & Pairwise Comparisons

Limitations of 2-cond Designs

• 2-cond designs work well to conduct basic treatment evaluations
  – they allow us to investigate whether or not a specific treatment has “an effect”
  – usually by comparing it to a “no treatment” control
  – e.g., does a new treatment program work to help socially anxious clients (compared to no treatment)?
• However as research questions/hypotheses become more sophisticated and specific, we often require designs that have multiple IV conditions

“Kinds” of Conditions to Include in Research Designs

Tx Conditions

• Ways treatment conditions differ
  – amount of treatment
    • receiving therapy once vs. twice each week
    • getting 0, 1, 5 or 10 practice trials before testing
  – kind of treatment
    • receiving Cognitive vs. Gestalt clinical therapy
    • whether or not there is feedback on practice trials
  – combinations of treatment components
    • receiving both “talk” therapy vs. “combined drug & talk” therapy
    • receiving “10 practices without feedback” vs. “2 practices with feedback”

The “Secret” is to be sure the selection of conditions matches the research hypotheses you started with !!!
Different Kinds of “Control” Conditions

- **“No Treatment” control**
  – Asks if the Tx works “better than nothing”
- **“Standard Tx” control**
  – Asks if the Tx works “better than usual”
- **“Best Practice” Control**
  – Asks if the Tx works “better than the best known”
- **“Pseudo Tx” Control**
  – Asks if TX works “without a specific component”

The “Secret” is to be sure the selection of conditions matches the research hypotheses you started with !!!

An important point to remember...

Not every design needs a “no treatment control” group !!!!

Remember, a design needs to provide “an comparison of appropriate conditions” to provide a test of the research hypothesis !!!

What would be the appropriate “control group” to answer each of the following ?

- My new Tx works better than the currently used behavioral therapy technique
  Group receiving the behavioral therapy.
- My new Tx works better than “no treatment”
  Group receiving no treatment.
- My new Tx works because of the combo of the usual and new behavioral components
  Pseudo-Tx group
- My new TX works better when given by a Ph.D. than by a Masters-level clinician
  Groups receiving the Tx from the two types of clinicians.

The “Secret” is to be sure the selection of conditions matches the research hypotheses you started with !!!

Causal Hypotheses for Multiple Condition Designs

Sometimes there is more than one component to a “treatment,” and so, there are multiple differences between the IV conditions. When this happens, you must distinguish..

Causal Hypotheses about “treatment comparisons”
-- hypothesis that the difference between the DV means of the IV conditions is caused by the combination of treatment component differences

Causal Hypotheses about “identification of causal elements”
-- hypothesis that the difference between the DV means of the IV conditions is caused by a specific (out of two or more) treatment component difference (good use of pseudo-Tx controls)

The “Secret” is to be sure the condition comparison matches the specific type of causal research hypotheses !!!!
For example… I created a new treatment for social anxiety that uses a combination of group therapy (requiring clients to get used to talking with other folks) and cognitive self-appraisal (getting clients to notice when they are and are not socially anxious). Volunteer participants were randomly assigned to the treatment condition or a no-treatment control. I personally conducted all the treatment conditions to assure treatment integrity. Here are my results using a DV that measures “social context tolerance” (larger scores are better).

\[ F(1, 38) = 9.28, p = .001, \text{Mse} = 17.3 \]

<table>
<thead>
<tr>
<th>Group therapy &amp; self-appraisal</th>
<th>Cx</th>
</tr>
</thead>
<tbody>
<tr>
<td>52</td>
<td>25</td>
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</tbody>
</table>

Which of the following statements will these results support?

- “Here is evidence that the combination of group therapy & cognitive self-appraisal increases social context tolerance.”
- “You can see that the treatment works because of the cognitive self-appraisal; the group therapy doesn’t really contribute anything.”

- Yep -- treatment comparison causal statement
- Nope -- identification of causal element statement & we can’t separate the role of group therapy & self-appraisal

Let’s keep going …

Here’s the design we decided upon. Assuming the results from the earlier study replicate, we’d expect to get the means shown below.

<table>
<thead>
<tr>
<th>Group therapy &amp; self-appraisal</th>
<th>Group therapy</th>
<th>Self-appraisal</th>
<th>No-treatment control</th>
</tr>
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<tbody>
<tr>
<td>52</td>
<td>25</td>
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<td>25</td>
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</table>

What means for the other two conditions would provide support for the RH:

- The treatment works because of the cognitive self-appraisal; the group therapy doesn’t really contribute anything.”
Another example... The new on-line homework I’ve been using provides immediate feedback for a set of 20 problems. To assess this new homework I compared it with the online homework I used last semester which 10 problems but no feedback. I randomly assigned who received which homework and made sure each did the correct type. The DV was the % score on a quiz given the day the homework was due. Here are the results ...

\[
F(1,42) = 6.54, \ p = .001, \ Mse = 11.12
\]

\[
\begin{array}{cccc}
\text{Old Hw} & \text{New Hw} \\
72 & 91 \\
\end{array}
\]

Which of the following statements will these results support?

“Here is evidence that the new homework is more effective because it provides immediate feedback!”

Nope -- identification of causal element statement -- with this design we can’t separate the role of feedback and number of problems

“The new homework seems to produce better learning!”

Yep -- treatment comparison causal statement

Same story... The new on-line homework I’ve been using provides immediate feedback for a set of 20 problems. To assess this new homework I compared it with the online homework I used last semester which 10 problems but no feedback. I randomly assigned who received which homework and made sure each did the correct type.

What conditions would we need to add to the design to directly test the second of these causal hypotheses...

“Here is evidence that the new homework is more effective because it provides immediate feedback!”

Hint: Start by asking what are the “differences” between the “new” and “old” homewons -- what are the “components” of each treatment???

What means for the other two conditions would provide support for the RH:

\[
\begin{array}{cccc}
\text{“New Hw”} & 20 \text{ problems w/o feedback} & 20 \text{ problems w/ feedback} & \text{“Old Hw”} \\
91 & 75 & \text{10 problems w/ feedback} & \text{10 problems w/o feedback} \\
89 & 72 & \text{10 problems w/o feedback} & \text{10 problems w/ feedback} \\
\end{array}
\]

Let’s keep going …

Here’s the design we decided upon. Assuming the results from the earlier study replicate, we’d expect to get the means shown below.

“Here is evidence that the new homework is more effective because it provides immediate feedback!”

“New Hw”
20 problems
w/ feedback

“Old Hw”
10 problems
w/ feedback

91 75 89 72