Post-lecture Questions II.5 – Interval Validity of Between- and Within-Subject Designs

Study Questions

When you use a between-subjects design, what potential confound are you (in some way) holding constant?

When you use a within-subjects design, what potential confound are you (in some way) holding constant?

What's the main design-specific threat to the internal validity of a between-subjects design? [name and what it means would be best]

What's the main design-specific threat to the internal validity of a within-subjects design? [name and what it means would be best]

What is the goal of random assignment?

What is the standard type of random assignment used in psychology? [name and how you do it]

What is the goal of counter-balancing?

What is the standard type of counter-balancing used in psychology? [name and how to do it] What type of counter-balancing should we be using, instead?

In general, what are the consequences of either a failure of random assignment or a failure to counter-balance all the order effects?

1. Assume a between-subjects experiment with two conditions. If you assign each subject to one of the two conditions by flipping a coin when they arrive at the lab (e.g., heads = Group 1, tails = Group 2), then you are using _____ .
   (A) true random assignment
   (B) blocked random assignment
   (C) dichotomous random assignment
   (D) pseudo-random assignment

2. In general, _____ .
   (A) random assignment and counter-balancing usually succeed and failure doesn't matter much
   (B) random assignment and counter-balancing usually succeed, but failure can be catastrophic
   (C) random assignment and counter-balancing usually fail, but failure doesn't matter much
   (D) random assignment and counter-balancing usually fail and failure can be catastrophic

Answers to Study Questions

When you use a between-subjects design, the order of conditions is (sort of) held constant because every condition is run first. Another way to look at this is in terms of carry-over effects: this is also held constant at "impossible" since only one condition is run on each subject.

When you use a within-subjects design, pre-existing individual differences is (sort of) held constant because the exact same subjects are in every condition.

The main design-specific threat to the internal validity of a between-subjects design is a failure of random assignment. This is when the groups of subjects (assigned to the conditions) were not the same, on average, to start with (i.e., before the actual manipulation was applied). When this happens, you don't know if any difference in the data (between conditions) is due to the conditions, as hoped, or due to the pre-existing differences between subjects, which is the confound.

The main design-specific threat to the internal validity of a within-subjects design is an uncontrolled order effect. This is when one condition is run first more often than the other. When you do this, you don't know if any difference in the data between conditions is due to the conditions, as hoped, or due to the order in which they were run, which is the confound.

The goal of random assignment is the creation of equivalent groups. Note: the goal is not to produce identical groups; the groups only have to be equal on average, which is what we mean by "equivalent groups."

The standard type of random assignment used in psychology is pseudo-random assignment. Each subject (effectively) draws a card from a hat. The hat starts with equal numbers of "condition 1" and "condition 2" cards. You keep running subjects until all cards are gone.

The goal of counter-balancing is to equalize the order effects across conditions. Note: you can't eliminate order effects when you use a within-subjects design; you can only equalize them on average.

The standard type of counter-balancing used in psychology is Latin-square counter-balancing. You create a number of orders equal to the number of conditions under which each condition occurs in each position exactly once. A much better method (that we have no excuse for not using) is balanced Latin-square counter-balancing. This is the same as a plain Latin square but each condition follows each other condition exactly once, as well. This balances carry-over effects, as well. Note: when you only have two conditions, these distinctions are moot, since you just run all possible orders, since there's only two possible orders.

If random assignment fails to produce equivalent groups, then internal validity decreases (a lot). If you fail to counter-balance the orders, then internal validity decreases (a lot).

The answer to the first multiple-choice is A; flipping a coin is true random assignment. The answer to the second question is B; the standard tricks usually work, but when they fail you have a confound and your interval validity is catastrophically reduced.