Post-lecture Questions II.2 – Experimental Control

Study Questions

What is an extraneous variable?

When is an extraneous variable called a confound?

What is the preferred way (at least from an internal-validity [and statistical] point-of-view) of preventing an extraneous variable from becoming a confound?

If the first option isn't possible, what's the second-best way to prevent an extraneous variable from becoming a confound?

If you can't use either of the first two options, then what's the next option?

Under what conditions can the third option **not** be used?

What do you have to do when the third option isn't possible?

Example multiple-choice questions (new):

1. What is the best was of preventing an extraneous variable from becoming a confound?
   (A) Measure it and remove its effects from the data.
   (B) Make sure that it's equal on average across all conditions.
   (C) Hold it constant across all conditions.
   (D) Run a control experiment to show that it doesn't actually affect the data variable.

2. In order to be used a the independent variable in an experiment, the variable _______ .
   (A) must be under the complete control of the experimenter
   (B) must be at least 50% under the control of the experimenter
   (C) must be at least 5% under the control of the experimenter
   (D) must be completely determined by the subject

Answers to Study Questions

An extraneous variable is anything (other than the independent variable) that could have an effect on the dependent variable.

An EV becomes a confound when it changes in parallel with (e.g., is correlated with) the IV. Note the following: the combination of these two answers creates a separate, second link or pathway between the conditions of the experiment and the data. The correlation between the IV and the EV effectively pairs the EV with the conditions, since the conditions are levels of the IV. The possibility that the EV can influence the DV also pairs the EV with the data. The combination of the two creates the second pathway from condition to data: condition-to-EV then EV-to-data. That's how confounds create alternative explanations for the results from an experiment.

Hold the EV constant across all conditions. Do not let it vary at all. If it isn't a variable, then it can't be correlated with anything, so it can't be a confound.

If you can't hold it constant, at least make it equal on average across the conditions. This, too, will prevent the EV from being correlated with the IV, so it can't be a confound.

Measure the EV and remove its effect on the DV statistically (via the "magic" of covariance analysis).

If the EV is highly correlated with the IV, then you can't use the "measure and remove" approach (because you will always end of removing everything, even when the IV does have an effect). In general, squared correlations above .50 (50%) make the covariance approach impossible.

When the EV is highly correlated with the IV, you have to run a control experiment, instead. A control experiment tests for the effect of the original EV on the DV while now holding the original IV constant (or equal on average). In other words, it's an experiment that looks directly at the possible effect of the EV, instead of looking at the DV. If the original EV has little or no effect in the control experiment, then you can argue that it couldn't have caused the results in the original experiment. On the other hand, if the EV has a large effect in the control experiment, it could well be responsible for the effect that was found in the original experiment, so you'd have no clear evidence that the original IV did anything to the DV. Note that the fact that our analyses always boil down to being something like correlations is critical here. You can only make this comparison between the control experiment and the original main experiment because the influences on the DV are expressed in terms that do not have units. Thus, this approach works regardless of whether the EV has the same or different units from the IV. Example: you can't hold diversity constant when manipulating the number of witnesses (and looking at helping behavior), but you can hold number of witnesses constant and manipulate diversity. So, to see if number of witnesses really has an effect when diversity is removed, you run a control experiment on diversity and get (for example) the r^2. Then you subtract this from the results in the main experiment, where number of witnesses was manipulated. Whatever is left, is the effect of witness numerosity.

The answer to the first question is C since the order of preference is C, B, A, than D. The answer to the second question is A; in order to be an IV, the variable must be completely controlled by (or set by) the experimenter.