

1.5: Common Quasi-Experimental Designs

Recall that when participants in a between-subjects designs are randomly assigned to treatment conditions, the resulting groups are likely to be quite similar. In fact, researchers consider them to be equivalent. When participants are not randomly assigned to conditions, however, the resulting groups are likely to be dissimilar in some ways. For this reason, researchers consider them to be non-equivalent. A **non-equivalent comparison group design**, then, is a between-subjects design in which participants have not been randomly assigned to conditions. There are several types of nonequivalent groups designs we will consider.

Posttest Only Non-equivalent Comparison Group Design

The first non-equivalent groups design we will consider is the **posttest only non-equivalent comparison group design**. In this design, participants in one group are exposed to a treatment, a nonequivalent group is not exposed to the treatment, and then the two groups are compared. Imagine, for example, a researcher who wants to evaluate a new method of teaching fractions to third graders. One way would be to conduct a study with a treatment group consisting of one class of third-grade students and a comparison group consisting of another class of third-grade students. This design would be a nonequivalent groups design because the students are not randomly assigned to classes by the researcher, which means there could be important differences between them. For example, the parents of higher achieving or more motivated students might have been more likely to request that their children be assigned to Ms. Williams's class. Or the principal might have assigned the "troublemakers" to Mr. Jones's class because he is a stronger disciplinarian. Of course, the teachers' styles, and even the classroom environments might be very different and might cause different levels of achievement or motivation among the students. If at the end of the study there was a difference in the two classes' knowledge of fractions, it might have been caused by the difference between the teaching methods—but it might have been caused by any of these confounding variables.

Of course, researchers using a posttest only nonequivalent groups design can take steps to ensure that their groups are as similar as possible. In the present example, the researcher could try to select two classes at the same school, where the students in the two classes have similar scores on a standardized math test and the teachers are the same sex, are close in age, and have similar teaching styles. Taking such steps would increase the internal validity of the study because it would eliminate some of the most important confounding variables. But without true random assignment of the students to conditions, there remains the possibility of other important confounding variables that the researcher was not able to control.

Pretest-Posttest Non-equivalent Comparison Group Design

Another way to improve upon the posttest only nonequivalent groups design is to add a pretest. In the **pretest-posttest non-equivalent comparison group design**, there is a treatment group that is given a pretest, receives a treatment, and then is given a posttest. But at the same time there is a non-equivalent comparison group that is given a pretest, does not receive the treatment, and then is given a posttest. The question, then, is not simply whether participants who receive the treatment improve, but whether they change *more* than participants who do not receive the treatment.

Imagine, for example, that students in one school are given a pretest on their attitudes toward drugs, then are exposed to an anti-drug program, and finally, are given a posttest. Students in a similar school are given the pretest, not exposed to an anti-drug program, and finally, are given a posttest. Again, if students in the treatment condition become more negative toward drugs, this change in attitude could be an effect of the treatment, but it could also be a matter of history or maturation. If it really is an effect of the treatment, then students in the treatment condition should become more negative than students in the comparison condition. But if it is a matter of history (e.g., news of a celebrity drug overdose) or maturation (e.g., improved reasoning), then students in the two conditions would be likely to show similar amounts of change. This type of design does not completely eliminate the possibility of confounding variables, however. Something could occur at one of the schools but not the other (e.g., a student drug overdose), so students at the first school would be affected by it while students at the other school would not.

Returning to the example of evaluating a new measure of teaching third graders, this study could be improved by adding a pretest of students' knowledge of fractions. The changes in scores from pretest to posttest would then be evaluated and compared across conditions to determine whether one group demonstrated a bigger improvement in knowledge of fractions than another. Of course, the teachers' styles, and even the classroom environments might still be very different and might cause different levels of achievement or motivation among the students that are independent of the teaching intervention. Once again, differential history also represents a potential threat to internal validity. If extremely high level of radon is found in one of the schools causing it to be shut down for a month, then this interruption in teaching could produce differences across groups on posttest scores.

Pretest-Posttest Design With Switching Replication

Some of these non-equivalent comparison group designs can be further improved by adding a switching replication. Using a **pretest-posttest design with switching replication design**, non-equivalent comparison groups are administered a pretest of the dependent variable, then one group receives a treatment while a nonequivalent comparison group does not receive a treatment, the dependent variable is assessed again, and then the treatment is added to the control group, and finally the dependent variable is assessed one last time.

As a concrete example, let's say we wanted to introduce an exercise intervention for the treatment of depression. We recruit one group of patients experiencing depression and a nonequivalent control group of students experiencing depression. We first measure depression levels in both groups, and then we introduce the exercise intervention to the patients experiencing depression, but we hold off on introducing the treatment to the students. We then measure depression levels in both groups. If the treatment is effective we should see a reduction in the depression levels of the patients (who received the treatment) but not in the students (who have not yet received the treatment). Finally, while the group of patients continues to engage in the treatment, we would introduce the treatment to the students with depression. Now and only now should we see the students' levels of depression decrease.

One of the strengths of this design is that it includes a built in replication. In the example given, we would get evidence for the efficacy of the treatment in two different samples (patients and students). Another strength of this design is that it provides more control over history effects. It becomes rather unlikely that some outside event would perfectly coincide with the introduction of the treatment in the first group and with the delayed introduction of the treatment in the second group. For instance, if a change in the weather occurred when we first introduced the treatment to the patients, and this explained their reductions in depression the second time that depression was measured, then we would see depression levels decrease in both the groups. Similarly, the switching replication helps to control for maturation and instrumentation. Both groups would be expected to show the same rates of spontaneous remission of depression and if the instrument for assessing depression happened to change at some point in the study the change would be consistent across both of the groups.

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