Pretest-Posttest Designs

For many true experimental designs [1], pretest-posttest designs are the preferred method to compare participant groups and measure the degree of change occurring as a result of treatments or interventions.

Pretest-posttest designs grew from the simpler posttest only designs, and address some of the issues arising with assignment bias and the allocation [2] of participants to groups.

One example is education, where researchers want to monitor the effect of a new teaching method upon groups of children. Other areas include evaluating the effects of counseling, testing medical treatments, and measuring psychological constructs. The only stipulation is that the subjects must be randomly [3] assigned to groups, in a true experimental design, to properly isolate and nullify any nuisance or confounding variables [4].

The Posttest Only Design With Non-Equivalent Control Groups

Pretest-posttest designs [5] are an expansion of the posttest only design with nonequivalent groups, one of the simplest methods of testing [6] the effectiveness of an intervention.

In this design, which uses two groups, one group is given the treatment and the results are gathered at the end. The control group [7] receives no treatment, over the same period of time, but undergoes exactly the same tests.

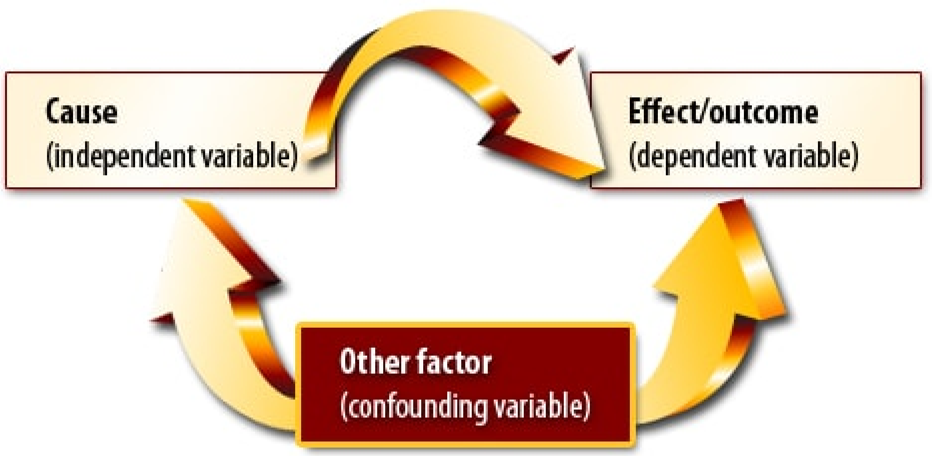
Statistical analysis can then determine if the intervention had a significant effect [8]. One common example of this is in medicine; one group is given a medicine, whereas the control group is given none, and this allows the researchers to determine if the drug really works. This type of design, whilst commonly using two groups, can be slightly more complex. For example, if different dosages of a medicine are tested, the design can be based around multiple groups.

Whilst this posttest only design does find many uses, it is limited in scope and contains many threats to validity [9]. It is very poor at guarding against assignment bias [10], because the researcher knows nothing about the individual differences within the control group and how they may have affected the outcome. Even with randomization of the initial groups, this failure to address assignment bias means that the statistical power [11] is weak.

The results [12] of such a study will always be limited in scope and, resources permitting; most researchers use a more robust design, of which pretest-posttest designs are one. The posttest only design with non-equivalent groups is usually reserved for experiments [13] performed after the fact, such as a medical researcher wishing to observe the effect of a medicine that has already been administered.

The Two Group Control Group Design

This is, by far, the simplest and most common of the pretest-posttest designs, and is a useful way of ensuring that an experiment has a strong level of internal validity [14]. The principle behind this design is relatively simple, and involves randomly assigning subjects between two groups, a test group and a control [7]. Both groups are pre-tested, and both are post-tested, the ultimate difference being that one group was administered the treatment.



This test allows a number of distinct analyses, giving researchers the tools to filter out experimental noise and confounding variables [4]. The internal validity of this design is strong, because the pretest ensures that the groups are equivalent. The various analyses that can be performed upon a two-group control group pretest-posttest designs are (Fig 1):

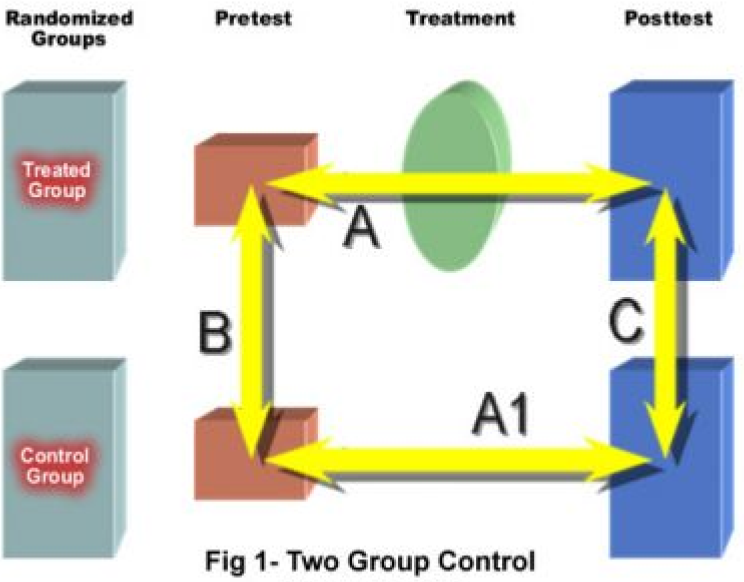


Fig 1- Two Group Control Group Design

1. This design allows researchers to compare the final posttest results between the two groups, giving them an idea of the overall effectiveness of the intervention or treatment. (C)
2. The researcher can see how both groups changed from pretest to posttest, whether one, both or neither improved over time. If the control group also showed a significant improvement, then the researcher must attempt to uncover the reasons behind this. (A and A1)
3. The researchers can compare the scores in the two pretest groups, to ensure that the randomization [3] process was effective. (B)

These checks evaluate the efficiency of the randomization process and also determine whether the group given the treatment showed a significant difference.

Problems With Pretest-Posttest Designs

The main problem with this design is that it improves internal validity [14] but sacrifices external validity [15] to do so. There is no way of judging whether the process of pre-testing actually influenced the results because there is no baseline measurement against groups that remained completely untreated. For example, children given an educational pretest may be inspired to try a little harder in their lessons, and both groups would outperform children not given a pretest, so it becomes difficult to generalize [16] the results to encompass all children.

The other major problem, which afflicts many sociological and educational research programs, is that it is impossible and unethical to isolate all of the participants completely. If two groups of children attend the same school, it is reasonable to assume that they mix outside of lessons and share ideas, potentially contaminating the results. On the other hand, if the children are drawn from different schools to prevent this, the chance of selection bias [10] arises, because randomization is not possible.

The two-group control group design is an exceptionally useful research method, as long as its limitations are fully understood. For extensive and particularly important research, many researchers use the Solomon four group method [17], a design that is more costly, but avoids many weaknesses of the simple pretest-posttest designs.

Source URL: https://explorable.com/pretest-posttest-designs

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