

# Single – subject designs

Psychology



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A major goal of psychology is to understand human and animal behaviour. Understanding a particular behaviour means knowing what variables influence the behaviour and what functional relationships exist between these variables and behaviours. Psychology's beginnings as an experimental discipline began in the latter half of the 19th century. Early researchers recognized the problems created by apparently random variations in the behaviour of their subject. One solution to these problems was to repeat the observations many times under a given set of conditions.

The focus on individual behaviour naturally led investigators to adopt a type of within-subjects approach. This approach worked despite if the intersubject variability. Certain problems could not be attacked with this approach. These problems involved treatments that produced irreversible changes in subject behaviour. The application of statistical techniques to the study of individual differences was pioneered by Sir Francis Galton in the late 1800's. The first correlational statistics was developed by Karl Pearson. The development of inferential statistics to provide some of the first statistical tests by Sir Ronald Fisher in 1920's and 1930's. Some die hard researchers persisted in using the old nonstatistical, single-subject approach like B. F. Skinner. In 1968, the publisher of JEAB launched a second journal, the Journal of Applied Behavior Analysis (JABA) to publish single - subject research on applied problems.

#### Baseline, Dynamic and Discrete Trial Designs

When researchers refer to " single-subject designs", they usually mean baseline designs. It was developed by B. F. Skinner and his followers. Dynamic designs which are closely related to baseline designs, are less common but becoming more popular as researchers focus on understanding

the dynamics. Discrete trials designs are still in use especially areas such as psychophysics, in which the emphasis continues to be on the performance of individual subjects. Baseline Designs

In contrast to group-based designs, baseline designs do not rely on averaging to deal with uncontrolled variability. They focus instead in the behaviour of a single subject both within and across the experimental treatments. The behavioural baseline is created when the behaviour of interest is sampled repeatedly over time. Stability criterion imposes an objective rule for deciding that the baseline has stabilized. Two conditions in exposing the subjects:

Baseline phase to assess behaviour in the absence of the treatment  
Intervention phase to assess behaviour during the application of the treatment. ABAB Designs- when the subjects were exposed to each phase twice. Reversal strategy- return to previous phase.

Issues surrounding the use of baseline designs  
Choosing a Stability Criterion  
- If your stability criterion is too stringent, your baseline may never achieve it, and you will not be able to proceed to the next phase. Yet if your stability criterion is too lax, you may proceed to the next phase before your subject's performance has actually stabilized. Transitional Behavior and the Stability Criterion - By imposing a stability criterion, the single-subject baseline approach removes transitional data from the analysis. Stability Criterion versus fixed Time or Trials - The group approach encourages you to design experiments in which all subjects receive the same amount of exposure to the treatment. Dealing with Uncontrollable Variability

It is handles by tight experimental control. It can only be reduced if you can identify its sources. The single subject researcher make an effort to identify the possible sources of variability using different steps. Determine the Generality of Findings Single subject baseline designs use intersubject replication but it does not always succeed. Dealing with Problem Baselines Drifting Baselines - in some cases, it may prove impossible to stabilize a baseline against slow, systematic changes. Unrecoverable Baselines - These changes are considered carryover effects if baseline level of performance cannot be recovered. Unequal Baselines between Subjects - In some cases, the baselines of different subject in an experiment level off at very different values, even though the conditions imposed on the subjects are nominally identical. Inappropriate Baseline levels - A low baseline is desirable if you expect the treatment to increase the level of responding. Types of Single Subject Baseline Design

Single- Factor Designs - ABAB designs offers a complete intrasubject replication of the baseline and intervention phase of the experiment. AB and ABA experiments are also used. Multifactor Designs- Single-subject designs can include more than one independent variable. Multiple Baseline Designs - It provides one solution.

Dynamic Designs Dynamic Designs are designs that include a continuously varying independent variable. It was used in "compensatory tracking" experiment. Discrete Trials Design It focuses on the behaviour of the individual participant rather than on group behaviour. Characteristics of the Discrete Trials Design The discrete trials design does not produce a continuous within - treatment baseline that can be adjusted and fine-tunes.

If feasible, the order of presenting the treatments is randomized to control order effects. The behaviour of individual subjects undergoing the same treatment may be compared to provide intersubject replication. Inferential Statistics and Single-Subject Designs

Those who advocate the application of inferential statistics to data from single-subject designs would not want to use them as a substitute for control over variables and replication, Advantages and Disadvantages of the Single-Subject Approach The main advantage of the single - subject approach is its focus on controlling error variance. The disadvantage of single subject approach is that the design is inappropriate for many research applications.