Experimental Design

Behavior analyst certification examination

9 tasks · 13 questions on the exam · BACB Test Content Outline (6th ed.)

This area covers how behavior analysts show that an intervention, and not something else, changed behavior: variables, validity and its threats, the logic and features of single-case designs, how they compare with group designs, the main design types, comparative, component and parametric analyses, and choosing and running a design. Questions give a graph or a study description and ask what it shows, what threatens its conclusion, or which design fits a situation.

You should be able to: Given a study or a graph, you should be able to name the variables, the design and the threats to its validity, judge whether it shows experimental control, and choose the design that best answers a stated question under stated constraints.

Every task: the key point and the trap

D.1 Distinguish between dependent and independent variables.

The dependent variable (DV) is the behavior measured to see whether it changes; in applied work it is the target behavior, defined and measured on its relevant dimension.

Trap: The IV is what the experimenter changes; the DV is what is measured. In applied studies the client's behavior is almost always the DV, even when the client's behavior seems to be doing the changing.

D.2 Distinguish between internal and external validity.

Internal validity is the extent to which a study shows that changes in the DV result from the IV and not from uncontrolled variables; it is established by experimental control.

Trap: Internal validity asks whether the IV caused the change in this study; external validity asks whether the finding holds beyond it. A large effect says nothing about external validity by itself.

D.3 Identify threats to internal validity (e.g., history, maturation).

History: an event outside the study occurs during it (a new medication, a family move) and could account for the change.

Trap: History refers to an outside event that coincides with the phase change; maturation refers to changes within the person that happen with the passage of time.

D.4 Identify the defining features of single-case experimental designs (e.g., individuals serve as their own controls, repeated measures, prediction, verification, replication).

Individuals serve as their own controls: each participant's behavior under the intervention is compared with the same participant's behavior without it, so variability between people is not a confound.

Trap: Verification is the demonstration that the baseline prediction was correct, not the replication of the intervention effect; replication is producing the effect again.

D.5 Identify the relative strengths of single-case experimental designs and group designs.

Single-case designs show the effects of an IV on individuals, the level at which behavior occurs and at which practitioners make decisions; group means can hide that some participants improved and others got worse.

Trap: Single-case designs do not lack generality by nature; generality is built through replication, while group designs trade individual-level analysis for population estimates.

D.6 Critique and interpret data from single-case experimental designs.

First ask whether each condition has enough data points, stable enough, to show a level and trend; a single point or a highly variable phase supports no conclusion.

Trap: A change in behavior after one phase change, with no replication, shows a correlation with the intervention, not a functional relation.

D.7 Distinguish among reversal, multiple-baseline, multielement, and changing-criterion designs.

Reversal (ABAB, withdrawal) designs: baseline, intervention, return to baseline, return to intervention. They show strong control, but they need a reversible behavior and may be inappropriate when withdrawing an effective treatment would be harmful or unacceptable. A DRO or noncontingent reversal compares the IV with a control condition rather than a full return to baseline.

Trap: A multiple-baseline design does not require withdrawing treatment; a multielement design compares conditions by rapid alternation, not by sequential phases.

D.8 Identify rationales for conducting comparative, component, and parametric analyses.

A comparative analysis compares two or more distinct interventions to find which is more effective or efficient for a given behavior or person (for example, comparing two prompting procedures in a multielement design).

Trap: Testing different amounts of one intervention is parametric; testing different parts of a package is component; testing different interventions against each other is comparative.

D.9 Apply single-case experimental designs.

Begin with the question: is the aim to show that one intervention works, to compare several, or to find the effective components or values of one?

Trap: Introducing the IV in the next tier of a multiple baseline before the previous tier has changed, or while baselines are still trending, undermines the logic of the design.

Key terms

Dependent variable: The behavior measured to see whether it changes.

Independent variable: The condition the experimenter manipulates to see whether it changes the dependent variable.

Confounding variable: An uncontrolled factor that could explain changes in the dependent variable.

Internal validity: The extent to which changes in the dependent variable result from the independent variable.

External validity: The extent to which results generalize beyond the study's conditions.

Baseline logic: Prediction, verification and replication, the reasoning by which single-case designs show control.

Reversal design: A design that alternates baseline and intervention phases (ABAB) to show control.

Multiple-baseline design: A design that introduces the IV in staggered sequence across behaviors, settings or participants.

Multielement design: A design that rapidly alternates two or more conditions to compare their effects.

Changing-criterion design: A design that shows control by behavior changing to match stepwise criteria.

Component analysis: An analysis that identifies which parts of a treatment package are responsible for its effect.

Parametric analysis: An analysis that compares different values of the same independent variable.

Multiple treatment interference: The effect of one treatment influenced by exposure to another in the same study.

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