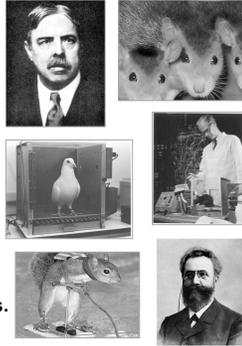


Small-N Designs

- What are Small-N Designs?
- History of Small-N Designs.
- Baseline (ABA) Designs.
- Multiple-Baseline Designs.
- Changing-Criterion Designs.
- Discrete-Trials Designs.
- When to use small-N designs.



Lab: (a) Review Exam 3; (b) Go over Final Paper drafts; (c) Workshop on presentations (Dec. 4) & papers (due Dec. 6 @ 5pm).

What are Small-N Designs?

- Large-N Designs.**
 - Large numbers of subjects tested (the more the better).
 - Subjects randomly distributed into groups (to deal with EVs).
 - Experiments are relatively brief.
 - Data from different subjects combined to create means.
 - Data analyzed with inferential statistics.
- Small-N Designs.**
 - One or only a few subjects tested ("single-subject designs").
 - Subjects *not* put into groups, but run as individuals.
 - Expts are long, allowing performance to stabilize over time.
 - Data from Ss usually not combined but considered separately.
 - Data analyzed visually with minimal use of inferential stats.

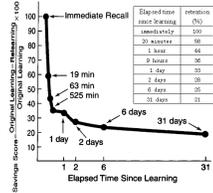
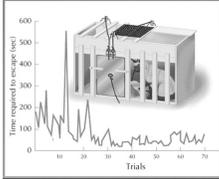
Questions About Small-N Designs

- What kinds of research issues are best addressed with small-N designs?
- Relative to large-N (group) designs, what are the main advantages & disadvantages of small-N designs?
- Should small-N designs be used more or less frequently in experimental psychology?
- What factors determine whether a small-N design has acceptable levels of internal & external validity?

History of Small-N Designs

□ Psychology as a science began with small-N designs.

- Weber & Fechner's study of psychophysics.
- Gestalt studies of perception.
- Titchener's introspective studies.
- Ebbinghaus' studies of memory.
- Thorndike's studies of learning.



- Developmental & Clinical Studies.

History of Small-N Designs

□ Why did some move away from small-N designs?

1. Acknowledged problems with small-N designs.
 - Performance differs across subjects (inter-subject variability).
 - Progressive error (all small-N designs are within-subject designs).
 - Extraneous variables > low internal validity. [cf. w/i-S replications].
 - Difficult to study & observe small or weak effects.
 - Difficult to study & observe interactions.
 - Low external validity. [cf. across S replications].
2. The development of inferential statistics.
 - Sir Francis Galton's development of correlations (to study IQ).
 - Sir Ronald Fisher's development of ANOVA (to study agriculture).

History of Small-N Designs

□ If small-N designs have so many problems, why was early small-N research so successful?

- Large number of observations.
- Rigid control of the experimental situation (extraneous vars.).
- Focus on powerful IVs.
- Effects replicated in different subjects & different labs.

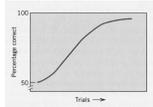
□ If small-N designs have so many problems, why are they still used today?

1. Acknowledged problems with large-N designs.
 - Pooling data can obscure the performance of any one S.
 - Pooling data can fail to capture subject-by-condition interactions.
2. Small-N designs encourage researchers to gain full control over the (sometimes extraneous) variables that drive behavior.
3. Necessity: Some issues can only be studied with small-Ns.

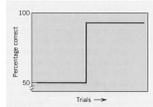
History of Small-N Designs

❑ Problems with Large-N Designs?

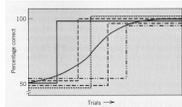
1. Pooling data can obscure the performance of any one S.
 - The case of Concept Learning.



Continuous Learning



Discrete ('ah-ha') Learning



The effect of averaging

2. Pooling data can fail to capture S-by-condition interactions.
 - Berry & Geller's (1991) seat-belt use study (N=13).
 - investigated ways to increase seat-belt use (e.g., a 2nd signal).
 - 6 always used belt, 3 never used belt, & 3 used in rsp to signal.

History of Small-N Designs

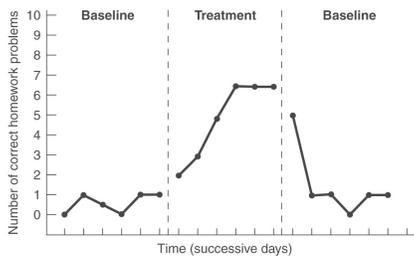
❑ Modern use of small-N designs

1. Journals of Experimental Analysis of Behavior (JEAB) and Applied Behavioral Analysis (JABA).
2. Clinical studies (addiction, autism, ADHD, therapies, etc.).
3. Education & Training (cf. Behavior Modification).
4. Animal learning, categorization, etc.; Animal Training.
5. Human Perception, Motor Behavior, Judgment & Decision Making (Discrete-Trials Designs).

Baseline Designs

(aka. ABA Designs; Reversal Designs; Withdrawal Designs)

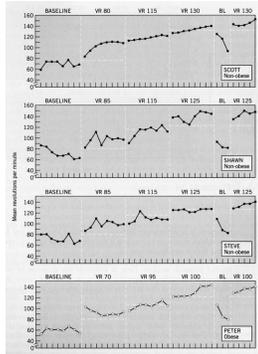
The basic idea behind ABA designs is that a baseline of performance is established (A), then the treatment is applied (B), then the treatment is withdrawn and the baseline is reestablished (A).



The effect of the IV (treatment) is assessed by visual inspection of the data.

Changing Criterion Designs

- ❑ These Designs are employed when (a) the IV (treatment) has non-reversible effects; or (b) one is trying to establish a behavior that must be gradually "shaped".
- ❑ Data are a subset of subjects from DeLuca & Holborn (1992) in which obese & non-obese kids were given token rewards to increase exercise on a stationary bike.
- ❑ Note individual baselines and individually set treatments (VR rates) and treatment goals (white lines).
- ❑ Very useful in therapeutic & behavioral mod situations.



Discrete Trials Designs

- ❑ Discrete-Trial Designs are primarily used to study "invariant" phenomenon (those that are highly consistent both within & between subjects) in the areas of perception & psychophysics, motor behavior, and some forms of judgment & decision making (e.g., signal-detection).
- ❑ In these experiments, there is no baseline per se. Instead, Ss respond to many (e.g., hundreds) of "discrete" (individual trial) events of different types. These trial types may then be compared or averaged to determine, e.g., thresholds or response biases.
- ❑ Discrete-Trial experiments are not necessarily "behavioral" but are considered Small-N designs for three reasons:
 - Few people are required because the phenomena under study is very similar across people (invariant; low inter-subject variability).
 - By their very nature, the phenomena under study require within-S designs; also, the trials are usual very short, allowing many trials.
 - The phenomena under study require a highly controlled lab environment (like most small-N studies). [cf. Skinner].

When Should You Use Small-N Designs?

- ❑ When you are interested in the minute details of individual performance or behavioral change.
- ❑ When your interest is in a particular subject, condition, or treatment (phobias, autism, ADHA, obesity, etc.).
- ❑ When your interest is in invariant perceptual, motor, or JDM-related behaviors.
- ❑ When few subjects are available, or experimentation is difficult or expensive.
