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Study Questions for
"Improving Descriptions of Single-Subject Experiments
in Research Methods Texts Written for Undergraduates"

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The answers for some questions are on the indicated pages. Other answers can be found by reading the article further. Still others answers are suggested by the article but require thought and knowledge beyond the article.

1.  What is science? 49

2.  In conducting experiments, why do scientists aggregate data? 49

3.  Provide an example of a psychological theory that describes how some event alters the behavior of an individual. 49

    Being originally trained as a social psychologist, I can easily come up with social psychological examples. For example, Festinger and Carlsmith begin their famous "Cognitive Conseqences of Forced Compliance" (http://psychclassics.yorku.ca/Festinger/) like this, "What happens to a person's private opinion if he is forced to do or say something contrary to that opinion?" They then go on to describe the theory of cognitive dissonance which focuses on the cognitions of an individual and the famous experiment in which they average data across individuals.

4.  Describe ways in which psychological experimenters aggregate or average data across individuals. 49

5.  Under what circumstances may measures of behavior aggregated across individuals describe an individual's behavior? 49

6.  What is "individual subject validity" (ISV) ? 49

7.  Why is ISV important? 50

8.  What is a single-subject experiment? 50

9.  According to Campbell and Stanley, what is internal validity?  50

10. According to Campbell and Stanley, what is external validity? 50

11. All data are bound in space and time. By this I mean that all data are collected from particular organisms, at a particular place, and at a particular time. So, when we talk about generality we don't appear to be talking about the data we collected. So what are we talking about when we claim that extension is possible to subject

populations, settings, treatment variables, and outcome variables?  What is being extended?

12. Campbell and Stanley defined external validity as follows: "To what populations, settings, treatment variables, and measurement variables can this effect be generalized? (Campbell & Stanley, 1963, p. 5). This definition assumes that an experiment was conducted and the treatments were found to affect behavior. Provide particular examples of the dimensions of generality that Campbell and Stanley identified. 50

     Note well, that from the standpoint of behavior analysis, an organism is a place where various variables (commonly called genetic, historical, and contemporaneous) come together to determine behavior. If behavior is determined by these factors then we can generalize to an individual to the extent that we can identify these factors, know how they combine to determine an individual's behavior, and know an individuals' status on these factors.

13. What do critics mean when they claim that single-subject experiments have low generality? 50

14. Many students are under the impression, probably from their statistics courses, that psychologists establish the generality of their experiments by randomly sampling along dimensions of generality, for example, people, settings, or time and then aggregating data across the dimensions.  But this is not done. Rather in conducting experiments, psychologists study persons, variables, settings, etc that are quite limited. I discuss this in the second paragraph on Page 51. Provide an example, of such an experiment. 51

15. According to Donald Campbell (1969) how have scientists established the generality of their findings? (I love Campbell's "Nicholson and Carlisle" example! Note how Campbell ridicules the random sampling approach to establishing generality.)  51 – 52

16. So according to Campbell, Dermer, and Thorngate how might psychologists establish the generality of their experimental findings? 52

17. At the bottom of page 52, I link generality to properly interpreting an experiment. How do we know whether an experiment has been properly interpreted? 53

     (As you continue through this course you should be able to relate these concepts-- construct validity, constructive replication, systematic replication--to whether an experiment has been properly interpreted.)

18.  Are single-subject experiments just pilot studies, only useful to prepare for conducting  "true" experiments: multi-subject experiments? 53

19.  Are single-subject experiments unsuitable when treatment effects are gradual or irreversible? If not, what do single-subject researchers do under these circumstances? 54

20. What is a stability criterion? 54

21. What is a steady state? 54

22. How are stability criteria and steady states useful? 54

23. What is a multiple baseline design?  When is it useful? 54

24. Why is it naïve to believe that behavior does not depend on context? 55

25. What strategies might a single-subject experimenter use to address "multiple-treatment interference"?

26. What is the multi-element or alternating treatment design? 55

27. Does randomizing the order of treatments eliminate the effect one treatment might have on responding during a subsequent treatment? 55  What does such randomization do? 55

28. What do experimental psychologists mean by the term "interaction"? 55

I googled the term "interaction" and reproduce relevant text below. (I assume that you can find the original source by googling a string of text) :

Drug-drug interactions are changes in a drug's effects caused by another drug taken during the same time period.

Interactions occur when the effect of one factor on a response depends on the level of another factor(s).

An interaction is a conditional relationship between an independent variable and the dependent variable. Generally, this type of conditional relationship refers to a case where the relationship between X1 and Y, varies according to the value of X2. (X1 and X2 are experimentally manipulated variables and Y is some measure of behavior.)

In a two-way factorial experiment, an interaction exists when the effect of going from one level of Factor B to another level of Factor B depends on the levels of Factor A. Consider this table of mean number of responses:

| Factor B | Factor A | | |
|---|---|---|---|
| | Low | Medium | High |
| High | 100 | 150 | 200 |
| Low | 50 | 100 | 150 |
| Difference | 50 | 50 | 50 |

In the above table the effect of going from one level of Factor B (High) to another level of Factor B (Low) for a given level of Factor A is simply the difference in mean number of responses between the two levels for a given level of Factor A. In the example, that difference is 50 for each level of Factor A.  But in the table below

| Factor B | Factor A | | |
|---|---|---|---|
| | Low | Medium | High |
| High | 100 | 150 | 200 |
| Low | 50 | 75 | 100 |
| Difference | 50 | 75 | 100 |

the differences are not constant. Rather they increase as Factor A increases from Low to High.  The second table illustrates an interaction.

29. Graph the data from the two tables above?  What features of such a graph may suggest an interaction?

30. To what do Sidman's terms "independent verification" and "functional replication"  refer? 56

31.  How are Sidman's terms relevant to the issue of generalization? 56

32. What role do tests of statistical significance play in traditional research? How does the single-subject experimenter avoid using tests of statistical significance? 56

33. Why is experimental control so important to single-subject experimenters? 56

34. Why are single-subjects experimenters highly motivated to monitor data collection? 58

35. What is the role of "tinkering" in single-subject experimentation? 59

36. How might statistical significance testing be detrimental to experimental control and the progress of psychology? 58

37. How can simple functional relations between independent variables and behavior discernable at the level of the single-subject produce between-subject variability? 59, Figure 1

38. Most psychologists doubt that orderly relations between independent variables and behavior can be found at the level of the single subject, so what do they advocate instead? What are the implications of their strategies for aligning psychological research with: psychological theory and psychological practice? 61–62

39. Must you be a behavior analyst to conduct single-subject experiments? 62

40. What are the benefits and costs of conducting single-subject research? 62

## Reference

Dermer, M. L., & Hoch, T. A. (1999). Improving descriptions of single-subject experiments in research methods texts written for undergraduates. *The Psychological Record, 49,* 49-66.