

Two Behaviorology Measurement Projects for Behaviorology Graduate Students

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Introduction

For many years during my university teaching career I taught a behaviorology course in behavior measurement to graduate students. One objective of that course was to teach students to measure behavior in ways that permitted them to detect and reveal subtle changes in behavior. This article presents a two-project sequence that I designed for the students in that course. The first is a group project during which students could effectively help each other learn how to approach such measuring tasks. The second project was then pursued individually. These projects demanded a substantial amount of creative engineering with respect to the technology of behavior measuring, because the development of appropriate measures and measuring techniques was left to the students as an important aspect of these projects. I have also included the evaluation arrangements with which I graded student performance on each of these projects.

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I. Group Project:

Multiple Dimensions of Behavior

Behavior has several dimensions that can be measured. When behavior changes, the change occurs in one or more of those dimensions. The dimensions of a behavior need to be measured independently, and each dimension must be examined separately for change, because one cannot be sure in advance which dimensions of a behavior are going to change, nor by how much. When the contingencies that control a behavior are altered (or the behaving organism is changed, as in fatigue), the question is not whether the behavior will change (it will) but which dimensions or properties of the behavior are going to change.

Below is a list of some dimensions of behavior that can be measured:

1. Topography or form of a movement.
2. Intensity or amount of force of movement.
3. Extensity or amount of distance covered by a movement (its geometrical dimensions).
4. Latency or delay between the onset of the opportunity for a movement to occur and the time that that movement begins.
5. Duration of a movement, or “how long a movement lasts.”
6. Number of movements that occur; number of repetitions of a behavior; number of cycles; (the amount of behavior that occurs).
7. Rate of behavior; quantity represented by the quotient when number of movements is divided by the time across which the count was made; ratio of cycles to time elapsed while the cycles were counted. [Note that Johnston & Pennypacker (1980) defined rate differently. In their rate measure the time interval in the denominator was decreased by the sum of the durations so that rate becomes the ratio of the cycles to the total time during which behavior was *not* occurring.]
8. Celeration; the rate of change in the rate of a movement.

Assignment

Overview. The class, acting as a team, will select a behavior and plan how to measure each of the above dimensions of that behavior. A naive subject will then be put under contingencies to emit the selected behavior, all dimensions of which will then be measured. The contingencies on the subject will then be altered in such a way as to produce a gradual change in the behavior, and the exact nature of the resulting change will be revealed and analyzed by developing a multidimensional profile of the change. The shift in the contingencies on the behavior may be continuous or incremental.

Note: The behavior change should be a small effect; a *subtle* change in behavior is to be produced and measured in this project.

Specific steps.

1. Read and think about the project assignment. Consider possible behaviors that might be suited to your measurement capabilities.
2. Meet as a group, choose a coordinator, and exchange ideas about the project. Goals for this meeting: (A) Select

a behavior and determine, at least in a general way, the nature of the contingencies to be applied in producing the behavior and making it change. (B) Develop plans for measuring each of the dimensions of that behavior.

You might need to arrange for pilot tests of potential measurement practices to test their feasibility.

It may be necessary to construct special pieces of apparatus.

General ideas may have to be refined and recast in more detail.

These and other such tasks might have to be assigned to individuals or subgroups to be addressed prior to the next meeting of the group.

3. Meet again as a group and continue the preparations for collecting the behavior data. Recruit and schedule the participation of a naive subject.
4. Meet again for the third time as a group and make final preparations. Be sure that all measurement practices have been tested and will reliably provide the necessary behavioral data. Be sure that the planned contingencies on the subject and planned changes in those contingencies are likely to produce the kinds of behavior and behavioral changes that you can accommodate with your measurement techniques. *[Throughout these preparatory activities do not expose your experimental subject to the experimental conditions. The subject must remain naive with respect to the contingencies to which he or she is to be subjected. If pilot studies are needed, use someone else.]* Divide the tasks to be undertaken during the data collection session so that all members of the team know just what to do.
5. Conduct the data collection session. Make all measurements and record the data.
6. Prepare an illustrated report showing what was done and what happened. Emphasize the nature of the contingencies to which the subject was exposed and how those contingencies changed. Describe the initial behavior and how it changed as the contingencies were altered, and provide those descriptions in terms of the various dimensions of the behavior. Make clear which dimensions changed and by how much, and identify any dimensions that did not change. Provide a discussion and conclusion section. Cycle the drafts among the team members for editing (divide the task of preparing the initial draft in whatever way seems best to the group).

7. Submit the completed report to the instructor.

The Project Grade (for each team member)

1. Quality of individual participation in the project 25%
2. Quality of the group report 75%

II. Individual Project: Properties, Dimensional Quantities, & Units of Behavior Measurements (PDQUBM)

Consult course calendar for timetable on the steps in this project.

Preparation:

Study the following sources:

- ✂ Springer, B., et al. Current measurement in applied behavior analysis. *The Behavior Analyst*, 4 (1), 1981 (Spring), pp. 19-31.
- ✂ Johnston, J., & Pennypacker, H. (1980) *Strategies And Tactics of Human Behavioral Research*. Hillsdale, NJ: Lawrence Erlbaum. *(Study Chapter 7 in its entirety. Examine with special care pages 126-131, including Table 7.1. Also, learn to discriminate among the dimensional quantities discussed on pages 132-139.)*

In-Class Teaching Assignment

Each member of the class will be assigned one of the dimensional quantities used to measure behavior (listed in Table 7.1 and discussed separately on pages 132-139). Prepare a short in-class presentation intended to teach about that quantity. Use visuals as necessary or helpful to define your assigned quantity, to illustrate it, and to clarify its concept. Show how it differs from the others. Answer any questions pertinent to your assigned quantity that are asked by class members. These presentation/discussion sessions should range from about 10 to 15 minutes each.

Individual Out-of-Class Project

Working alone, select for study a simple behavior of interest. A typical response in the selected operant should consist of a very few clearly visible elements. Identify various relevant dimensions of a typical response in the selected operant (*see middle column of Table 7.1 in Johnston & Pennypacker, p. 128*). If the responses have separate behavioral elements, you can do a finer grained analysis by performing the dimensional analysis for each element.

Determine how to measure each dimension that you deem important to a typical response. If you are dealing with separate elements of the response, determine how you will measure each behavioral element in the responses.

Get two or three human subjects and have each of them perform the behavior under circumstances as identical as possible. Measure independently each of the separate dimensions of behavior that you have determined to be important to the task, and, if you are analyzing separate elements of the responses, do that for each element of the responses. Considering the elements of a response separately would be important in certain cases—for example, when the behavior would be improved by a shift in the relative durations or order of the behavioral elements within a typical response. Independent measures of the components of the responses would then be necessary to detect changes in those component properties. (*See note on the experimental station, below.*)

After baseline conditions have been run, make at least one change in the prevailing contingencies (do this in the same manner for each subject). The events designated by “E” in Figures 7.3 and 7.5 (Johnston & Pennypacker [J&P]) might function so as to change the contingencies on the subject. The introduced change in the contingencies should be minor so as to produce only a small or subtle change in the behavior of concern. Continue the measurements through that phase. (Optional: You may vary or enhance this simple AB design if doing so seems appropriate, perhaps by returning to baseline conditions, or whatever, but that is not strictly required in this project.)

Develop an appropriate data display to make obvious any detected variation in each dimension of behavior. Do this for each component of the responses (or for the whole response) for each subject. Figures like those numbered 7.1-7.5 can be employed (see J&P, pp. 132-136). Provide additional displays as appropriate to show differences among the subjects used in your project. Relate changes in one dimension of behavior to changes (or lack of changes) in other dimensions. Show how changes in the prevailing contingencies affected the various dimensions of the behavior. Deal with computed dimensional quantities as well as with the single factor dimensions that you directly measure. (Note: Celeration cannot be very meaningful if only two data points are available with which to determine it; simply make note of this fact in your presentations and reports.)

NOTE ON EXPERIMENTAL STATION: For the purposes of experimental control and the collection of useful data, an experimental station will be available for your use. At this station you can make a videotape of each subject's behavior. Visible in the setting you can arrange a clock with sweep second hand, a digital timer, etc. When reviewing the tape, you can make the necessary measurements that you might not have been able to perform during the session. Do not neglect the possibility of choosing a behavior that is wholly, or partly, self-timing and/or self-counting. If you attempt to measure a response by visual observation and a

hand-held timer, select a target behavior that is sufficiently slow in occurring to be measured in that manner.

Assignment on Presentation of Results

1. Prepare a written report with illustrative figures. Explain what was measured in terms of “properties” and “dimensional quantities” (see J&P, Table 7.1, p. 128). Present and discuss the results. Explain difficulties encountered and include recommendations for subsequent projects (How would you do it next time?).

In a separate section of your written report (appropriately subtitled) provide a behavioral analysis of the J&P omission of durations from the time used in the denominator when calculating rates. What are the differences in “meaning” between the traditional rate and the J&P rate? What differences can be expected in the behavior of the users of these different rate values? Explore implications. Is the J&P version really any better? If so, why? ...and how so? (See p. 138, lines 7-22.)

2. Make an in-class presentation of your project, including visuals as appropriate. Tell what you did, how you did it, and what you learned. These presentations can last up to half an hour. Consult the instructor in advance for your time allowance.

Grading on this Project

Three category grades are attached to this project, each with its own criteria to which “intra-category” credit is attached. The relative weighting of the grades on these parts is indicated below:

- A. In-class teaching assignment 10%
- B. In-class presentation of project 20%
- C. Written report of project 70%

Below are the instructor's grading forms by which your performance on each of the above categories will be evaluated separately:

<u>A. Criteria for in-class teaching assignment</u>	<u>Points</u>
1. length of presentation: acceptable / short / long	2
2. effectiveness of personal style	2
3. overall clarity of explanation	6
4. comparisons made with other dimensions	4
5. effectively answering questions / leading discussion; getting class involved	5
6. quality/effectiveness of visuals (figures, graphs, etc.)	5
	24

In-Class Teaching Grading Scale:

- 20-24: A 18-19: B 16-17: C 15: D 0-14: F

- B. Criteria for in-class presentation of completed project:
1. length of presentation: acceptable / short / long 2
 2. effectiveness of personal style 2
 3. effectively answering questions / leading discussion; getting class involved 5
 4. quality / effectiveness of visuals (including sufficiency) 6
 5. choice of behavior for study 4
 6. overall clarity of explanation; making clear what you did, how you did it, and what resulted 6
- 25

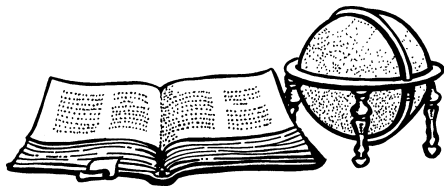
In-Class Presentation Grading Scale:

21-25: A 19-20: B 17-18: C 15-16: D 0-14: F

- C. Criteria for the written report:
1. form and style 3
 2. suitability of chosen behavior 4
 3. adequacy of set of dimensions selected to be measured 5
 4. quality of measurements 5
 5. demonstrating a change in contingencies from behavioral effects 4
 6. clarity of explanation: what you did; methods; results 6
 7. Adequacy/sufficiency of graphics 6
 8. Analysis of implications of different concepts of rate 5
 9. Summary/conclusions/discussion: adequacy, validity, significance 6
- 44

Written Report Grading Scale:

40-44: A 37-39: B 34-36: C 31-33: D 0-30: F ✻



Endnotes

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