Software Review

A Review of CMS Software's *Psychology on a Disk*

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Behavior analysts in psychology departments occasionally have the opportunity to teach the undergraduate introductory psychology course. Some might see this as an onerous chore, trying to teach material from fields with alien conceptual systems while maintaining their philosophical integrity as behaviorists. Given that most psychology departments frown on teaching the introductory course from a completely behavioral orientation, often the best the behavior analyst can hope for is to "put a naturalistic spin" on the subject matter, encouraging students to look for nonmystical explanations for behavior. Three well-known researchers in the experimental analysis of behavior (A. C. Catania, B. A. Matthews, and E. Shimoff) have published a software program that will help the instructor with a natural science orientation impart just such a rotation on some key phenomena covered in the typical introductory course.

Format

The program *Psychology on a Disk* is not a tutorial meant to teach introductory psychology via computer. It is a set of 10 simulations and experiments intended for use as supplemental activities (such as lab exercises) in conjunction with virtually any introductory text. The activities are designed to give the individual student direct exposure to important psychological processes through active participation as subject or experimenter in a simulation or experimental exercise.

In most of the exercises, the student participates as the subject in a single sub-

ject experiment in which his or her performance illustrates the phenomenon under study. The data generated by the student's performance are shown to the student and recorded to indicate completion of the exercise and facilitate discussion of questions posed in a student manual.

The manual contains introductions to each of the exercises, explaining the phenomenon and the exercise. The student is instructed to read the introduction before attempting the computer exercise and to be prepared to answer questions and discuss issues raised in the introduction after completing the exercise. I found the manual to be very readable. The discussions of the exercises are quite stimulating. The writing style is informal, and it manages to convey a sense of adventure about experimentation.

Theoretical Orientation

With the exception of the exercise on shaping, the introductions to the activities in the student manual contain no behavior analytic theory per se. In fact, the subject matter is presented without discussion of any particular explanatory system. This may seem surprising or even disappointing to the behavioral instructor, but the authors are wisely trying to market this software as widely as possible to instructors of many orientations. The content is discussed in such a way that instructors can easily add their favorite theoretical explanations (behavioral or otherwise) to class discussions of the phenomena.

The absence of explicit theoretical or philosophical discussion does not mean that the subject matter is presented devoid of any theoretical orientation, how-

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ever. The authors consistently introduce the psychological phenomena with objective descriptions of the behavior and the factors that influence it. Field-specific jargon is kept to a minimum. Discussion questions posed in the manual encourage the students to focus on how different procedures might have influenced the behavior, or on methodological issues central to good experimentation. This "naturalistic" orientation permeates the text-based discussion and extends even to the design of the computer exercises. For the most part, the focus of the exercises is on the behavior of the individual over time as a function of experience with previous conditions. The student is thus exposed to a naturalistic mode of description and experimentation entirely compatible with a behavior analytic orientation, or any similar conceptual framework. The behavioral instructor may especially appreciate this as welcome relief from the mentalistic accounts found in many introductory textbooks.

Content

The 10 activities cover a wide range of topics. All of these exercises are challenging, and most of them are actually fun to carry out. Each exercise takes about ½ hour to complete.

Horizontal-vertical illusion. This activity lets students experience an optical illusion (misjudging vertical line length relative to a horizontal line), and then examine how it might be overcome. The students proceed through a series of trials adjusting vertical lines on the screen relative to a comparison horizontal line with and without feedback on their judgments. Students are shown their complete performance data after the last trial, and asked to be prepared to answer questions about how feedback affected the illusion. Additional discussion questions encourage students to consider how other factors (e.g., the order of trials) would have affected performance. This exercise illustrates the ability of a computer to provide a demonstration of the dynamics of an optical illusion superior to any static presentation in a textbook.

Guilt detection. The student plays a criminal who is trying not to reveal his or her knowledge of a crime, thus admitting guilt. The student first reads the details of a crime he or she supposedly has committed, and then is asked to complete a word association task in which some stimulus words are related to the crime and others are neutral. The program records the latency to respond to the stimulus word and what the answers were. This was most entertaining, and it was extremely difficult to avoid incrimination by responding with a word associated with the crime, or by waiting too long to answer. The exercise also provides an excellent forum for the discussion of the necessity of experimental controls (such as controlling for the familiarity with stimulus words) in analyzing data of this type.

Shaping. In this simulation, the student tries to shape an increasing force of a graphic rat's bar-press. This seems to be a popular computer exercise for illustrating shaping (cf. Graf, 1988), and this one is quite good as they go. The student can choose from four levels of difficulty in shaping. The levels determine how sensitive the rat is to satiation and extinction effects for too many or too few food pellets respectively. The force of the bar-press as well as the frequency of responding varies in a complex and realistic manner depending on how skillfully you reinforce approximations to the target force requirement.

Although this simulation is more than adequate, I believe that the complexities of shaping could be better illustrated with a task requiring the student to shape more elaborate behavior, such as the rat's approach to the lever from across the chamber and the acquisition of the response. These are the most difficult parts of the shaping process in rats or pigeons, and their inclusion would make a shaping simulation more challenging and realistic. Unfortunately, it is also considerably more difficult to program a simulation of three-dimensional movement, so it is understandable why the authors stayed with shaping a single dimension of bar-pressing as the task. A minor flaw I noticed

was the use of grams as a measure of the force of the bar-press. The correct unit of force is the newton.

Memory span. The introduction to this exercise in the student manual is an especially good example of naturalistic discussion of a process usually described in mentalistic terms. The computer activity tests the student's ability to remember shorter and longer lists of either single letters or three-letter words. The purpose of the activity is to demonstrate the familiar "7 plus or minus 2" rule and the effects on immediate memory of chunking stimulus letters. The introduction skillfully avoids reference to cognitive apparatus, instead focusing on describing those aspects of the student's interaction with the stimuli that affect the ability to remember them. The text also encourages students to consider experimenting with other variables that might influence memory skills. In fact, the program allows students to adjust the presentation time of the stimuli to see how that variable affects remembering.

Problem solving. This exercise allows students to see how a particular pattern of problem solving can develop and interfere with the development of more efficient solutions to the classic problem of filling water jars with the correct amount of water in the fewest moves. The pattern of problem solving that becomes inefficient is called a "negative set" in this field, and the task lets students see how the negative set can be broken by a problem for which the old pattern won't work.

The strategy of remaining theory-neutral was obvious here, for it must have been very difficult for the authors to resist giving the obvious behavioral explanation for the development and maintenance of the "negative set." I know it was very difficult for me to resist scrawling something about reinforcement in big letters on the pages in the manual's discussion of this section, but that analysis is best left out of the manual and up to the individual instructor if the software is to be received well by a wide (and mostly cognitive) audience. Despite that, it would have been nice if the authors could have sneaked in a hint somehow

that behavioral principles can be applied to understanding this phenomenon.

Personality evaluation. This exercise uses deception to make the point that the kind of personality assessments used by astrologers and other mystics are a sham. The manual is careful to distinguish this kind of "tabloid psychology" from legitimate personality inventories used by psychologists. The computer exercise has the student answer a battery of questions which the computer supposedly analyzes to produce a unique personality description that in fact is fairly general and identical for everyone. The student is asked to rate how accurate it is in describing him or her, and how unique the description is. Many students will fail to see that it is in fact a fairly generic description of someone. After the ratings, the computer informs the student of the hoax. The student is referred to a good discussion of the pitfalls of such unscientific personality tests in an appendix.

Many instructors have used some form of this exercise to teach their students to be wary of pseudoscience. They are always fun and generate much discussion. However, such exercises often have little effect on students' attitudes about horoscopes or fortune-telling and the like. Those who believe in such mysticism continue to believe even in the face of considerable negative evidence. Instructors I have spoken to who thought they had provided a convincing demonstration of the absurdity of such personality tests were surprised to find out that students continued to secretly believe in them. In light of this, it would be helpful for the authors to bolster their discussion of this phenomenon in this section. In particular, because people tend to find supporting evidence for their beliefs in the few "hits" that an astrologer or psychic makes in predictions, a simplified discussion of signal detection analysis might aid students to focus on the high frequency of inaccurate descriptions and predictions made and thus destroy the credibility of such mystics.

Social perception. The purpose of this exercise is to let students discover whether they attribute stereotypical character-

istics to men and women without being aware of it. Men and women are described in terms of pairs of adjectives, some of which are gender-neutral and some of which are stereotypical adjectives used to describe males or females. The student reads these descriptions and then is asked to determine whether each adjective used in the descriptions described males more often, females more often, or both males and females equally often. The computer program used each adjective equally often for males and females, but some students will undoubtedly think that the "masculine" adjectives were used more often for men and the "feminine" adjectives for women. An appendix in the manual contains an extended discussion of the factors that might maintain stereotyping behavior.

Goal setting. This was the weakest of the 10 exercises. Frankly, I didn't think the topic ranked equal in magnitude to some of the other phenomena in the program which might have entire chapters devoted to them in an introductory textbook. The student's task is to set ever-increasing goals for an imaginary student trying to increase his studying time. The exercise is much too similar to the shaping exercise described above, without the real-time graphics of the rat pressing the bar. You simply are told whether the student made the goal you set or not, and whether he continued to study or quit. The study time becomes harder to increase the nearer the imaginary student is to the goal of 120 minutes per day.

I think the manual's discussion of study habits and goal setting is excellent, and indeed the authors may be trying to make the point that goal setting is like shaping, but I found the activity boring and even frustrating. Students may learn more from the text discussion than from the computer activity. Perhaps a graphic simulation of setting performance goals for a track athlete would make this exercise more interesting.

Cooperation and competition. This exercise pits the student against four computerized opponents in a version of the Prisoner's Dilemma Game (PDG). The student must choose to either give 3

points to the opponent (hoping for cooperative reciprocity) or take 1 point first (hoping to maximize his or her score through competition). The four opponents are each programmed to "behave" according to different competitive or cooperative strategies, which the student can discover during the trials only by varying his or her choices. After playing each opponent, the student is shown the total points earned by each player and the number of trials on which mutual cooperation occurred. I think the authors could improve the data presentation if they displayed graphically the choices of the student and the opponent trial by trial. This would let the student see how the opponent's behavior affected his or her behavior over time, highlighting the interaction as a controlling variable.

The Prisoner's Dilemma Game is always challenging to play, but its ability to tell us about cooperation and competition always suffers from the absence of important variables that affect the choice to compete or cooperate, such as relative response efforts or costs associated with competing and cooperating (Hake, Olvera, & Bell, 1975; Olvera & Hake, 1976). Despite those limitations, the PDG is widely discussed in textbooks, and this exercise provides a good simulation.

Prejudice. The purpose of this exercise is to show how the cumulative effects of even mild prejudice against members of one group can lead to severe segregation. The simulation takes place in a classroom setting. The student plays the role of a teacher trying to seat students from one group away from students from another group they don't like. As the student accommodates the wishes of each student not to sit too near a member from the other group, the increasing segregation becomes evident in the graphic representation of the classroom. The program also permits the student to adjust the level of prejudice and the number of students in each group in the classroom to examine how those variables affect the seating distribution. The simulation is quite dramatic, but it merely illustrates the effects of prejudice. A better exercise

might be one in which students discover the factors that cause prejudicial behavior in the first place.

Program Utility

The program is very easy to operate; it requires no special knowledge about computer operation. The program disk boots without DOS, so all the student has to do is insert the disk and turn on the computer to get to the main menu. All further operations are prompted on screen. The student can always terminate an exercise and escape back to the main menu by pressing "ctrl-break." I found no bugs in completing the exercises, and directions were clear enough that I think that students would have very few problems, if any, using the software.

The authors have also taken care to make the instructor's job of managing student performance easy. In addition to the 10 exercises on the student's disk, a progress report file keeps a record of whether the student has completed the exercises. The student can always view this record and print it out to turn in to the instructor. Code numbers make the printouts difficult to forge. Optionally, the student can simply turn in the student disk. The instructor has a disk which contains a utility program to print out performance records of all of the students. The instructor disk also has a utility to make extra copies of the student disk in case some students lose or damage their disks.

The program is available on 5¼- or 3½-in. disks for IBM-compatible machines. The only hardware requirements are that the computer must have a CGA (color graphics adapter) card installed or the software will not run. The program runs best with a color monitor, but it will run properly on a monochrome monitor as long as it is being driven by a CGA card. A printer is not required to complete the exercises; thus, the software is easily used in large microcomputer centers on campus that have many machines but few printers.

The software is not sold to individual users or site licensed to departments. The

TABLE 1

Software description

Program Name: <i>Psychology on a Disk</i>
Publisher: CMS Software, P.O. Box 729, Ellicott City, MD 21043
Required Equipment:
Hardware: IBM PC or compatible computer.
Only one floppy disk drive is required.
Software: The program comes on one 5¼- or 3½-in. diskette.
Peripherals: CGA card required, but color monitor is optional.
Package Materials: Student manual and disk, instructor manual and instructor disk
Availability: Sold only through college bookstores to students as part of a regular college course. Not sold to individual users or site licensed.
Unit Price: \$12 plus bookstore markup per student package
Subject Area: Introductory psychology. The program is designed as an adjunct to virtually any introductory text.
Topics: Optical illusions, guilt detection, shaping, memory span, problem solving, personality evaluation, social perception, goal setting, cooperation and competition, and prejudice
Target Audience: College students
Mode of Interaction: Interactive simulation and self-experimentation
Program Description: The program illustrates psychological phenomena through simulation exercises and experiments in which the student participates as subject. Each exercise provides data on the student's performance. Introductory material is contained in the student manual, which also encourages students to consider the possible effect of other variables. Many of the exercises permit such additional experimentation. The materials are presented without extensive theoretical discussion to allow instructors of varying orientations to discuss the topics from their particular conceptual frameworks. However, the strong naturalistic mode of description is especially compatible with behavior analytic forms of explanation.

program may not be installed on a network or any software sharing system. It is sold only to bookstores as part of the required materials for a regular course. The price is \$12 plus bookstore markup for each student disk and manual. The instructor is issued the instructor disk plus instructor manual which contains a copy of the student manual and supplemental information regarding the exercises. An excellent demonstration disk showing samples of each exercise is available for instructor preview by requesting a copy

on department letterhead from CMS Software (see Table 1).

Final Comments

I think CMS Software has produced a useful product that is acceptable to both behavior analysts and psychologists of other orientations—a skillful feat indeed. The highly interactive nature of the experiments and simulations is certain to get students involved in the subject matter. The experimental orientation of the authors clearly shows in the constant encouragement to students to manipulate additional variables to find out more about the controlling relations.

In fact, the authors seem to have heeded the conclusions of some of their own research on rule-governed behavior in constructing the entire package. Instead of merely instructing students what the controlling variables are for a given kind of behavior, the authors arrange for the student to discover them through experimentation. Thus, any rules the student acquires regarding controlling relations are contingency-shaped rather than in-

structed. Loosely interpreting the experimental findings of Matthews, Shimoff, Catania, & Sagvolden (1977), we may expect the student's contingency-shaped conceptual behavior to be more sensitive to changes in the contingencies (such as new experimental evidence) than conceptual behavior that is merely instructed. And that may be the most important benefit of using this software.

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