

## **BRIEF REPORT**

### *PsyScope: AN EASY-TO-USE GRAPHIC-ORIENTED APPLICATION FOR DESIGNING AND CONTROLLING COMPUTER-BASED RESEARCH ON RELATIONAL RESPONDING*

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In our research we have always employed micro-computers for the design and control of experiments on relational responding. At the outset, all computer programs were written in *BBC Basic* and controlled on BBC micro-computers. Later our BBC programs were run on Macintosh™ computers using an application called *BBC Basic for the Macintosh*.™ However, writing complex text-based computer code in the design of relational responding experiments proved to be a highly time consuming endeavor. The need to write programs in computer code prohibited quick movement from experimental concepts to implementation. In our research, therefore, we have begun to explore the potentials of *PsyScope* - a graphic-oriented environment for experiment design.

*PsyScope* (Cohen, MacWhinney, Flatt, & Provost, 1993) is a user-friendly freeware Macintosh<sup>1</sup> application which undergoes ongoing development based at Carnegie Mellon University. *PsyScope* allows students and researchers to design complex psychology experiments without the need for programming skills. Specifically, as the user constructs spider diagrams in a graphic interface using a limited number of graphic tools, *PsyScope* writes a scripting file which can be accessed directly by users familiar with scripting. Figure 1 shows the graphic experiment script for a relational frame training phase. This script works by following simple sets of instructions contained within the graphic icons. *PsyScope* proceeds through the experiment by accessing instructions in the order specified by the hierarchy in which icons are arranged (i.e., from top to bottom). The instructions for an icon can be seen simply by double-clicking it. The instructions for "training block" in Figure 1, for instance, specify that the 4 task blocks connected to it (i.e., beneath) should be run 10 times over in a quasi-random order (the parameters of randomness can also be specified by choosing options from a menu). The instructions for each of the four task blocks simply state that *PsyScope* should choose rand-

<sup>1</sup>PST, a small business in Pittsburgh which developed the widely used DOS program called MEL, has developed a commercial multi-platform successor to *PsyScope* called E-Prime.

only from the two tasks contained within it (i.e., beneath). In effect, this random choice occurs each of the ten times that the task block is run (i.e., in our case these two tasks represent the same relational training task but with different comparison locations).

Specifying the sequence of events that constitute a task is remarkably easy. A task is first created by dragging the task icon from the graphic menu and connecting it to the desired phase of the experiment. The sequence of events that constitute the task are then specified in a mini-graphic environment entered by double clicking on the task icon (see Figure 2). The task instructions shown in Figure 2 (represented graphically) specify that a contextual cue (!!!!!) should be presented at the top of the screen, one second later a sample (BAL) should appear in the middle of the screen and one second later two comparisons should appear at the bottom of the screen (VEK, PAF). To create this sequence a graphic icon representing typed text (i.e., the letter A) is selected from the graphic menu. Double clicking on this icon allows the experimenter to type in the appropriate text stimulus as a contextual cue, specify its location by dragging it to the appropriate location on the computer screen, specify its onset time from the start of the trial in milliseconds, and finally specify its font, size, and color. This procedure is then repeated for the additional stimuli. Graphic files saved in *Pict* format, sounds saved in *SoundEdit*™ format, and *Quick-Time*™ movie files may also be presented in this way by first selecting the relevant graphic icon and specifying the relevant file's location on the hard drive of the computer. Alternatively, stimulus lists may be created from which *PsyScope* will choose randomly on relevant trials (e.g., in classical conditioning preparations *PsyScope* can pick randomly from a list of unconditioned stimuli following the presentation of a CS).

Double clicking on text, picture, sound, and movie stimulus icons allows the experimenter to specify the duration of stimulus presentation. This can be for a specified time period (i.e., a duration), or until the subject presses a particular keyboard button/s, or uses the mouse to click in a specified screen location/s (i.e., a

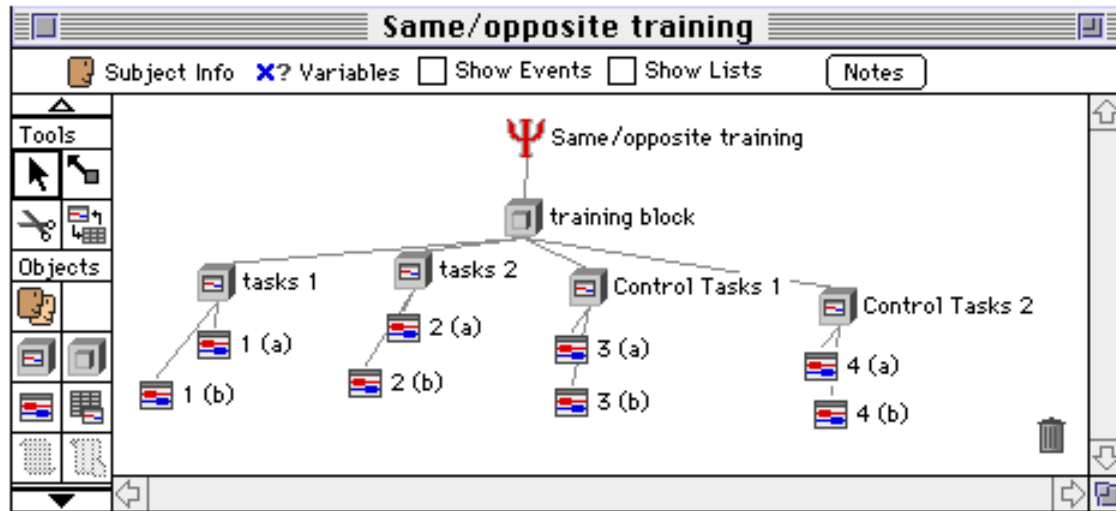


Figure 1

condition), or responds on an external button box. This stimulus terminating action can then be set to trigger the recording of data according to any label specified by the experimenter (e.g., "Same/A1-B1 correct"). In addition it can trigger the presentation of another piece of text on the screen (e.g., CORRECT) for a specified period, or a sound (e.g., the spoken word "correct"). At the end of this chain of events PsyScope proceeds to the next task in the order specified in the main experiment block. All of this "programming" can be achieved in minutes without ever leaving the graphic interface.

PsyScope also allows response variables to trigger actions. For instance, it is possible to tell PsyScope to administer tasks (e.g., testing tasks) only when a subject has produced a specified number of consecutively correct responses. This however is a slightly more complex endeavor and may involve leaving the graphic interface and writing the script directly in the text script file.

PsyScope records a host of response dimensions including response latency. All data are saved to a basic text file that can be read by any word processor or pasted directly into a spreadsheet. An ever-growing body of PsyScope extensions are also becoming available that increase the power and flexibility of PsyScope as a psychological research tool. PsyScope is not without its problems, however. On older computers, it is often slow to use and may lead to system crashes during design (but seemingly not during running). The advantages offered by PsyScope, however, should be of interest to many behavior analysts as so much human research is now conducted with computers. Learning the basic skills for the mastery of this application is well worth the investment because the PsyScope format likely

represents that face of computer controlled experiments in the future.

Many experiment generating tools have now been developed for computers. None, however, appear to offer the ease of use and flexibility of PsyScope. Moreover, PsyScope appears particularly suited for research on relational responding. An additional feature of PsyScope for laboratories with outdated equipment is that PsyScope will run on System 6 Macintosh computers (i.e., up to ten years old!). These computers readily handle the sound and graphics of today's Apple™ computers although older machines may not display color. Readers can evaluate the utility of PsyScope for relational responding experiments by receiving from the first author a basic two three-member stimulus equivalence training and testing program designed in the PsyScope format. The equivalence program is ready to run and is accompanied by help files and a precise description of the training and testing sequence. The program may be of some use in teaching but interested parties will obtain the greatest benefit from this program if they intend to use it as a modifiable base for creating their own, more complex experiments. A series of relational pretraining and testing programs will also be included (i.e., for establishing *Same* and *Opposite* functions) as well programs for arbitrary relational frame training and testing. These programs will also serve as a modifiable base for creating unique relational networks.

To obtain a copy of the above programs send five US dollars or its equivalent (to cover post and packaging) with your name and address to the first author at the Department of Psychology, National University of Ireland, Maynooth, Co. Kildare, Ireland. Two 3.5" floppy diskettes will be sent by first class post.

The PsyScope 1.2.5 application will also be sent but is available for free download on the internet at <http://psyscope.psy.cmu.edu/>.

Cohen J. D., MacWhinney B., Flatt M., & Provost J. (1993). PsyScope: A new graphic interactive environment for designing psychology experiments. *Behavioral Research Methods, Instruments and Computers*, 25, 257-271.

REFERENCES

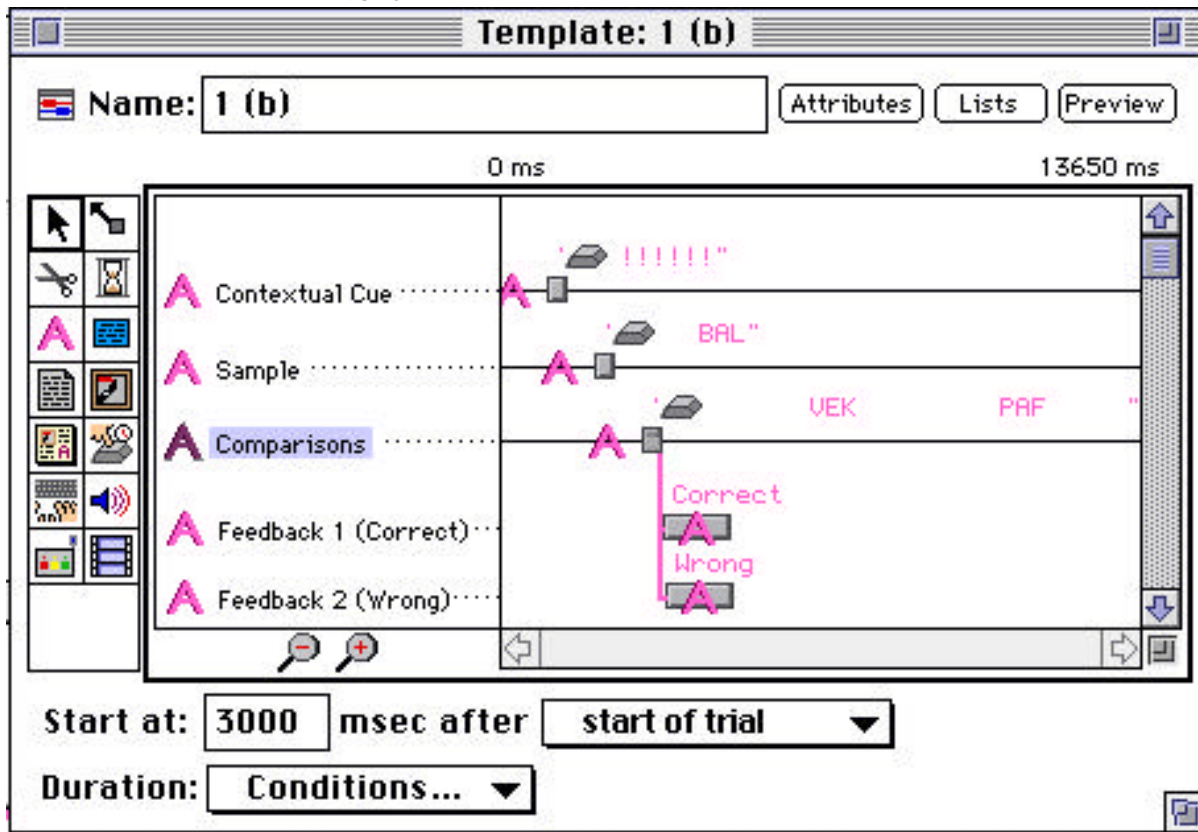


Figure 2