METHOD

Subjects and Procedure

In this study, 24 male albino rats of the Wistar strain were divided randomly into two groups. Group I received a 1-kHz tone 10 sec prior to shock onset, while Group II received no tone. Procedurally, this study and Experiment 2 were identical with one exception: the front wall was retracted and returned by hand, which greatly reduced the auditory and tactual cues.

RESULTS AND DISCUSSION

The mean number of avoidance responses emitted by the tone group was 13.25 (± 5.96), while the no-tone group emitted on the average only 4.50 (± 3.68) avoidance responses. The difference between the means was statistically significant ($t = 3.11$, $df = 22$, $p < .01$). In comparing the results of Experiments 2 and 3, it appears that cues provided by the motor retracting the wall masks any enhancement effects provided by a tone CS. This confounding could obscure the effects of certain independent variables on one-way avoidance acquisition. Ackil and Mellgren (1968), for example, report that rats given tone exposure do not do as well as control animals on subsequent shuttlebox avoidance acquisition. This effect would not have appeared if the Lafayette Instrument Co. one-way avoidance chamber had been used. The cue provided by the motor retracting the door would make the tone CS superfluous in the acquisition of the avoidance response.

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Clarity of Haidinger's brushes as a function of luminance*

STANLEY COREN

and

CLARE P. KAPLAN

Graduate Faculty

The New School for Social Research
New York, New York 10011

In a recent article, Coren (1971)

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Fig. 1. The estimated clarity of the Haidinger brush target plotted against luminance of the field.

suggested a simple and inexpensive method to produce the entoptic phenomenon of Haidinger's brushes for use as a stabilized retinal image target. Essentially, this technique involves viewing a bright surface through a blue filter and a rotating Polaroid sheet. The Haidinger's brushes appear as a rotating black propeller on a blue field when created in this fashion. Coren (1971) has shown that the data produced with the Haidinger brush target is comparable to that of stabilized images produced by other methods. A major factor influencing the visibility of the brush pattern is the speed of rotation of the plane of polarization of the light. A speed of around 360 deg/sec yields images of optimal clarity. Recently, we have observed that the clarity of the image also depends upon the luminance of the field. Very bright or very dim fields yield somewhat degraded images. In order to facilitate the use of Haidinger's brushes as a stabilized image by other workers, it seemed advisable to systematically explore the relationship between target clarity and field illumination.

The target used in this experiment was produced in the same manner as that described in Coren (1971). Ss viewed a variable brightness field through a Wratten No. 47 (blue) filter and a rotating sheet of Polaroid (No. 328) that was driven by a motor rotating it at a constant speed of 360 deg/sec. Six luminance levels, 0.08, 1.18, 1.47, 1.85, 2.04, and 2.30 log fL, were rear projected upon a sheet of flashed opal glass by means of a slide projector. This procedure

provided a uniform circular field of view, 25 deg in diam. Ten Ss viewed the Haidinger's brushes twice under each light level, presented in random order. Estimates of the clarity of the target were taken by means of a magnitude estimation task where each S was required to assign a number proportional to the clarity of the target (Stevens, 1956).

The data are shown in Fig. 1. It is clear from this figure that the brush pattern is best seen in the intermediate luminance range. The clarity of the target rises to peak around 1.5 log fL and gradually trails off for higher luminances. The obtained quadratic trend is significant with $F = 17.45$, $df = 1/45$, $p < .01$.

These data provide a basis for choosing a luminance level to provide a Haidinger's brush target of any specified clarity for use as a stabilized retinal image target. The optimal luminance level for maximum visibility seems to be in the intermediate range of luminance, peaking around 1.5 log fL. Raising or lowering the luminance of the field results in a decrease in the clarity of the entoptic image.

The reasons for the quadratic variation of the clarity of the target are not fully known. It seems likely, however, that the initial increase in visibility reflects the increase of visual acuity frequently observed with increasing luminance (Pirenne & Marriott, 1962). The decrease in clarity is more difficult to deal with. It may reflect some sort of masking of the brush pattern by the increased quantity of nonpolarized light which

passes through the Polaroid filter, or some alteration of the dichroism of the macular pigment molecules under intense light. Certainly this experiment gives no clue as to the process causing the obtained quadratic trend; rather, it indicates that intermediate light levels appear to produce the entopic Haidinger's brush target with maximal clarity.

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An approach to operating systems for computer-controlled behavioral research

DENNIS O. KUCH
McMaster University
Hamilton, Ontario, Canada

Strategies for controlling psychological experiments with computers have ranged from unique programs written for each new experiment to the use of high-level compiler languages requiring very little interaction with the E and little or no knowledge of the working of the machine. An alternative strategy which

has rarely been implemented involves the machine language programming of a few short subroutines into an operating system which controls S-environment interactions and handles all general data accumulating and processing functions.

An example of the application of this strategy is provided by OSCAR, an Operating System for Computerized Animal Research (Kuch & Platt, 1972; available from the Digital Equipment Computer User's Society, Maynard, Massachusetts, DECUS No. 8-529) for use with Digital Equipment Corporation PDP/8 computers. OSCAR monitors experimental stations, stores and outputs data, and interacts with the operator through the computer terminal. The E must supply four machine language subroutines: (1) to get the experimental variables from the operator, (2) to initialize the station and start the experiment, (3) to run the experiment, and (4) to output stored data at the command of the operator. These routines may be of any size for a particular experiment, up to 17 computer pages total in a 4K system, but generally range from 2 to 5 pages.

This approach to the programming of psychological experiments has obvious savings in time and effort over the unique program strategy. Relatively little programming is required, and all general functions are already preprogrammed. On the other hand, a system like OSCAR is a great deal more flexible than many of the

compiler languages currently available for psychological research. For example, three of the popular compilers are based on a finite state transition model of psychological experimentation. Paradigms that do not readily fit the finite state model cannot be easily implemented with these compilers. As a specific case in point, experiments using historic contingencies of reinforcement [e.g., a percentile reinforcement schedule where a record of the S's most recent behavior must be stored and continually updated (Alleman & Platt, in press)] would require vastly inefficient programming or a major modification of the compiler. OSCAR can handle this complex paradigm or, with only three pages of user programming, can duplicate most of the functions of a finite state compiler. The compiler does have the advantage of not requiring knowledge of machine language programming; so the E must decide whether the generality and flexibility of the operating system approach warrants the greater expenditure in programming.

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