MCPL: A program for describing performance in multiple-cue probability learning

TERRY L. DICKINSON and RAY W. COOKSEY
Colorado State University, Fort Collins, Colorado 80523

MCPL is a program for describing a subject's performance in multiple-cue probability learning. Research on multiple-cue probability learning uses a paradigm based on Brunswik's (1952, 1955, 1956) proposals for investigating cognitive systems. The experimental task requires a subject to utilize multiple cues to make inferences about the values of a learning criterion. On each of several trials, the subject is presented the values of multiple cues, is required to make an inference, and then is shown the value of the criterion.

The multiple-cue equation, originally described by Hursch, Hammond, and Hursch (1964) and subsequently modified by others (Dudycha & Naylor, 1966; Tucker, 1964), provides statistical descriptions of performance in multiple-cue probability learning. This equation is written as:

$$r_a = R_e R_s r_m + C \sqrt{1 - R_e^2} \sqrt{1 - R_s^2},$$

where r_a is the correlation between the subject's inferences and criterion values, R_e is the multiple correlation between the multiple-cue and criterion values, R_s is the multiple correlation between the multiple-cue values and the subject's inferences, r_m is the correlation between the linear predictable variance (based on the multiple cues) in the subject's inferences and that in the criterion values, and finally, C is the correlation between the nonlinear predictable variance in the subject's inferences and that in the criterion values. In summary, the correlational statistics of r_a , R_s , r_m , and C describe various aspects of a subject's performance, and the statistic R_e describes the extent of linear predictability of the criterion based on the multiple cues.

Input. Card input to the program consists of (1) title of the study, (2) task parameters, (3) format for the multiple-cue and criterion values, (4) format for subjects' inferences, (5) multiple-cue and criterion values, and (6) inferences of the subjects. The task parameter card specifies the number of multiple cues, total trials, blocks of trials, and trials within a block.

Output. Output includes (1) title of the study, (2) a list of task parameters, (3) a list of formats, and

(4) correlations (r_a , R_s , r_m , R_e , and C) for each subject for each block of trials as well as across all trials. Fisher Z transformations of the correlations can be obtained as punched output at the user's option.

Computer and Language. The program is written in ANSI FORTRAN IV, is internally documented, and has been run on the CDC 6400 computer under the Scope 3.3 operating system. The program is also functional on the CYBER 172 computer under the NOS 1.4 operating system. No special external functions or library routines are necessary, and modifications for running the program on IBM or other computers should be minimal, if any.

Restrictions. The program can deal with an unlimited number of subjects, but it is restricted to no more than 12 cues, 200 trials, and 12 blocks of trials. However, these restrictions can be modified through minor, internal changes in the program. The core memory required for the program in its present version is 48K on the CDC 6400 computer and 54K on the CYBER 172. This program executes in an average range of 12-20 sec on the CYBER machine (execution times on the 6400 may be slightly longer), depending on the number of subjects.

Availability. A source listing with user's instructions and sample input and output can be obtained free of charge by writing Terry L. Dickinson, Department of Psychology, Colorado State University, Fort Collins, Colorado 80523.

REFERENCES

- BRUNSWIK, E. The conceptual framework of psychology. In *International encyclopedia of unified science* (Vol. 1). Chicago: University of Chicago Press, 1952.
- BRUNSWIK, E. Representative design and probabilistic theory in functional psychology. *Psychological Review*, 1955, **62**, 193-217.
- BRUNSWIK, E. *Perception and the representative design of psychological experiments*. Berkeley: University of California Press, 1956.
- DUDYCHA, L. W., & NAYLOR, J. C. Characteristics of the human inference process in complex choice behavior situations. *Organizational Behavior and Human Performance*, 1966, **1**, 110-126.
- HURSCH, C. J., HAMMOND, K. R., & HURSCH, J. L. Some methodological considerations in multiple-cue probability studies. *Psychological Review*, 1964, **71**, 42-60.
- TUCKER, L. R. A suggested alternative formulation in the developments by Hursch, Hammond, and Hursch, and by Hammond, Hursch, and Todd. *Psychological Review*, 1964, **71**, 528-530.

(Accepted for publication January 20, 1981.)