The application of computer systems to research in experimental social psychology

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The application of a laboratory computer system to research in experimental social psychology is discussed. An experiment designed to study the nonverbal communication patterns in humans is discussed with special emphasis on the automation of data collecting and data scoring procedures through the utilization of programs written for an Apple II computer system.

Within social psychology, the study of nonverbal communication has figured significantly in theories of interpersonal communication, person perception, and emotional expression. On an applied level, it has provided fields such as psychotherapy and intergroup relations with an empirical base from which to develop (Weitz, 1979). The behaviors that have served as the focus of study and have been implicated as fundamental to the communication process include facial expressions, eye gaze, proximity, body movement, gesturing, and paralinguistics, among others. These categories have further been reduced to include such specific behaviors as smiling, frowning, mutual gaze, gaze aversion, touching, forward and backward leaning, head, hand, and eye movements, voice tone and pitch, and verbalizations. These behaviors serve a wide variety of functions, some of which include the communication of liking, status, and responsivity between interactants (Mehrabian, 1972), information gathering and the development and maintenance of intimacy in social groups (Argyle & Dean, 1965), and the expression of emotion and the regulation, emphasis, and illustration of speech (Ekman & Friesen, 1969).

MEASURING NONVERBAL BEHAVIOR

The measurement of nonverbal behavior may take many forms and usually depends on the questions one is interested in addressing, as well as the categories one chooses to study. Research in which a number of specified or target behaviors are observed and recorded exactly multiple measures across behavior channels as well as within respective channels of communication. That is, in addition to measures of frequency of occurrence and duration of discrete and cumulative behavior episodes within any one behavior mode, social behavior researchers have shown interest in patterns of covariation across multiple behavior categories. An example of this can be found in the work stemming from Argyle and Dean's (1965) equilibrium theory, which, simply stated, suggests that a compensatory relationship between intimacy-related behaviors exists such that an increase

in one behavior brings about a necessary decrease in another behavior (e.g., increasing proximity beyond some comfortable point may lead to a reduction in mutual gaze between interactants). Similarly, research focusing on ongoing social interactions has found it useful to consider patterns emerging from a between-persons as well as from a within-persons analysis of multiple-behavior categories. For example, the early work of Kendon (1967) and, later, the work of Duncan and Fiske (1977) show this tendency when reporting findings on rule-governed behaviors such as speaker-auditor turn-taking activities.

From the simplest case of single-behavior recording to the more complex issue of multiple behavior, multiple-person recordings, researchers, until the recent availability of portable computer systems, have had to rely on laboratory recording techniques that have generally included the use of cumulative stopwatches, event recorders, serially arranged time clocks, and a host of "homemade" mechanical and electrical devices. Notwithstanding the accomplishments of those using such systems, a number of limitations exist with respect to those data gathering devices, some of which include input and output capacity and the problem of transforming records to some meaningfully descriptive form. For example, early research on visual interaction (e.g., Exline, Gray, & Schuette, 1965) often relied on devices such as the Esterline-Angus recorder to provide chart recordings of the behavior. Ink pens charting the experimental time course are deflected through the use of external switches and indicate the occurrence of single behavior episodes or, as in the case of measuring the simultaneous occurrence of two or more behaviors, multiple behavior categories. Figure 1 provides an example of a chart recording taken from an Esterline-Angus recorder and shows looking and speaking behaviors as they might occur over a 2-min period. Calculating these behaviors in terms of frequency, duration, and overlap, however, was left to the researcher and invariably proved quite time-consuming. For example, using this method, it would require approximately 14 person-hours to calculate frequency, duration, and overlap for

Figure 1. Shown is a 2-min sample event recording for looking and speaking behaviors. Also indicated are markings showing two segments of looking-speaking overlap.

two behavior categories over a 3-min interaction period for 96 dyads (the number of dyads used in the present study), whereas on-line computer summaries of such data can be made available within seconds upon command. This not only represents a considerable savings in time for the researcher but also reduces the likelihood of error due to human handling, another problem inherent in early laboratory recording techniques.

USING THE COMPUTER AS A DATA GATHERING AND SCORING DEVICE

Recently, a time-sampling program titled TACT3, written for an Apple II computer system, was utilized for research on nonverbal patterns of adjustment in humans in our social psychology laboratory at the University of Nebraska—Lincoln. The computer system served a twofold purpose. First, it was adapted for use as an on-line data collecting system that allowed for the continuous recording of a subject's behavior. In the study reported here, eye gaze, defined as the tendency to look in the line of regard of the coparticipant, and verbalizations, defined as the verbal initiations of one participant to the other, were the key behaviors studied. Measures were obtained on the number of episodes and the percentage of total time each behavior occurred for each of the two participants. Point of behavior onset and

mean length of behavior were also taken and provided information on the development of behavior activities throughout the session. Summaries of these behaviors were made available to the experimenter on a continuous basis through an update display that appeared on a video monitor and in an expanded printout form following the experimental session. The moment-to-moment summary displayed on the video screen enabled the researcher to monitor the experimental session time and cumulative updates of target-behavior frequencies. Two very important practical functions were served by this summary display. First, the continuous display of the experimental session time, serving as a clock, enabled the researcher to control the length of each session by terminating data collection (stopping the program) at the end of a 3-min period, the session length chosen for this study. Second, the continually changing summary display served as a system check for the researcher. A continually changing display meant that the program was running, the recording switches were operable, and data were being received and stored in the internal memory of the computer. The data were also stored on disk for later reference. Second, the system provided a means for subsequently scoring videotaped segments of the social interactions for purposes of reliability. Two measures of reliability were taken. One involved the confederate's behavior across subjects for both structured and unstructured sessions. The other involved the confederate and researcher's judgments on eye gaze and verbalizations, respectively.

Specific hypotheses were tested relating the impact of task structure to the type of nonverbal adjustment responses made during social interaction. One major prediction was that reciprocity (i.e., the matching of intimacy-relevant behaviors) would emerge as the primary nonverbal response between interactants in unstructured settings, whereas compensation would predominate in highly structured settings calling for

Figure 2. Nonverbal communication laboratory.

Figure 4. Data summary printout of MAINSUM.

IMPLICATIONS

The advantages of utilizing computer systems in social science laboratory settings appear manifold. With its capacity for recording, summarizing, and analyzing data on-line, the computer serves as a time-saving device and thereby offers the potential for extending observation time far beyond that which it has been in the past. Questions concerning the development and adjustment of behavior patterns in social interaction over long periods of time can now be addressed with minimal time loss to the researcher. Error due to human handling of the data, as it may occur when calculating and transcribing, is virtually eliminated, although it should be noted that human error at the point of data entry into the system still remains a potential problem. This, however, can be monitored through the continued use of reliability checks. Finally, the flexibility which characterizes portable computer systems provides social scientists with an opportunity for extending their inquiry beyond

the laboratory setting, and thus may help bridge the problem most researchers face in generalizing their findings to applied settings.

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