NOTES

A simple encoding and recording system for small group observation

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A simple and inexpensive system for coding and recording interaction patterns in small groups is described. It consists of a keyboard and a standard tape recorder, and it is capable of storing sequential data using up to 36 codes. Its main application is in the study of speaker-target patterns, but it can also be used in encoding up to 12 behavioral codes, or six speakers and 6 codes. The keyboard costs less than \$200 and is used with conventional tape recorders and minicomputers available at most research sites.

The study of interaction patterns in small groups crosses several disciplines: sociology, psychology, anthropology, ethology, and others. Despite this diversity of substantive approach, researchers in all of these fields are developing a common interest in the technology of observation (see Lamb, Stephenson, & Suomi, 1979; Sackett, 1977). This technology is designed to replace or augment videotape as a medium for recording the complex sequences of interaction that occur in various kinds of social groups. The most widely used instrument is the Datamyte (Conger & McLeod, 1977; Sykes, 1977), which is now in its ninth generation and is commercially available from the Electro/General Corporation. The SSR system is becoming popular (Stephenson & Roberts, 1977), and other instruments also exist (e.g., ELOG by Fitzpatrick, 1977, and the inexpensive device by Magyar & Fitzsimmons, 1979). The purpose this paper is to describe another encoding and recording system that is simple, flexible, and inexpensive.

The system (called VIPER) was initially designed for the analysis of verbal interaction patterns in mock juries. The Small Groups Laboratory at the University of Victoria had two antique models of R. F. Bales' interaction recorder, an instrument that was used in most of the classic studies on small groups done by Bales and his associates (see Bales & Gerbrands, 1948, for the initial description, and Bales, 1950, for the initial application to small group interaction patterns). The machine was simply a moving paper chart on which verbal acts were coded in pencil. The VIPER system was developed as a

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new version of what Bales might have done if the technology had been available. It consists of a 12-button keyboard, plus any standard cassette tape recorder with stereo capability. The keyboard encodes information into frequencies that are recorded in real-time on standard cassette tapes. Decoding of the information is done by "turning the keyboard around" and connecting it to a minicomputer for analog-to-digital conversion. Most researchers will have access to cassette recorders and minicomputers, and so the keyboard is the only piece of hardware that must be built, borrowed, or purchased (parts are about \$200).

The encoding system is portable, and intermediate storage is on cassettes, which are cheap, reusable, and relatively permanent. The unique aspect of the system is the use of both tracks of the stereo recorder, which permits up to 36 distinct codes to be recorded in real-time, or up to 12 codes plus a complete audio record. In summary, this system provides an inexpensive, portable, and flexible means of encoding and recording interaction in small groups. The rest of this paper describes the encoding strategies possible and the mechanics of decoding, plus some data on observer reliability.

THE KEYBOARD AND ENCODING STRATEGIES

The keyboard that forms the heart of the VIPER system is powered by two 9-V batteries or by external ac current and an adapter. This allows its use in the field or in a laboratory setting. There are two banks of six keys, one for the observer's left hand and one for the right hand. Each bank of keys controls a separate voltage-to-frequency converter. When the keyboard is used in two-track mode, the six frequency levels from the left hand are output onto one track of the cassette recorder and the six levels from the right hand are recorded on the other track. If the keyboard is used in one-track mode, all 12 tones are output to a single track of the recorder, leaving the other track free for an audio recording of the group being observed or for input from another keyboard. The voltage-to-frequency converters produce 12 distinct log frequency steps from 500 Hz to 5,000 Hz, which allows good separation of the signals. A circuit diagram is available from the author at no cost.

When the keyboard is used in one-track mode, up to 12 distinct observational codes can be recorded on a single track of a stereo recorder or on a monaural recorder (which would be somewhat cheaper). Bales' (1950) 12-category interaction process analysis scheme could therefore be used: The speaker and target of each verbal act could not be encoded, but a precise temporal record of the type of act would be made. However, a more appropriate use would be to encode

the speaker of each act (for groups up to size 12) and to use the second track for an audio record that could be replayed later for content coding.

The real power of the VIPER system is in stereo mode. Few naturally occurring human groups have more than six members (data from Bakeman & Beck, 1974, and James, 1951, suggest an average size of less than three members). Therefore, a single observation session can be coded with a single keyboard for any two of the variables in Bales' (1950) scheme: speaker and target, speaker and content, or target and content. The number of categories in the content coding scheme must be six or fewer, and therefore, Bales' original 12-category system cannot be used. However, there are several revisions of his system that use only three, four, or six categories (Leik, 1963; O'Rourke, 1963; Philp & Dunphy, 1959); in fact, these revisions were designed to make coding easier and more reliable. If a more elaborate coding scheme is used, the keyboard can be used in conjunction with a four-track tape recorder, and two keyboards can be used simultaneously by two observers or (if a videotape is available) by the same observer on repeated runs. With two keyboards, it would be possible to code a six-person group for speaker, target, and content; 12 content categories could be used, and the fourth track of the recorder would still be free for an audio record.

An important feature of the keyboard is that it is a hands-on design requiring a minimum of movement for coding. Completely untrained observers can learn to code who-to-whom interaction patterns in a matter of minutes, because the left hand is associated with the speaker, the right hand is associated with the target, and there are only six keys for each hand. Data reported below on interobserver reliability clearly show the simplicity of this keyboard in use.

DECODING AND RELIABILITY OF OBSERVERS

As noted above, the encoded cassette tapes are decoded by playing the tapes back through the keyboard and having the output voltage levels digitized by a minicomputer with an analog-to-digital capability. It is assumed that researchers have access to a minicomputer; a FORTRAN program is available to perform the digitization. This program is less than 400 statements in FORTRAN IV, and it currently runs on a PDP-11. Users of the keyboard can obtain free listings of the program or can send tapes to the author for decoding. Copies on tape or IBM cards are available at cost. Output from the program is stored on diskette in fixed-length records containing the elapsed time, a key code (1 through 12, plus 0 for no key), and a code indicating one-track encoding. Although this last digit is redundant information, it is useful in checking errors of digitization. Several parameters in the decoding program allow different sampling frequencies and different definitions of error signals; there is also a calibration step that ensures reliable digitization of the voltage levels. The

continuous signal is currently sampled every .01 sec, but error signals of less than five consecutive signals at the same voltage are ignored. This sequential record of interaction can be analyzed by user-supplied programs. The author can provide a listing or hard copy of one such program, which produces Bales-type interaction matrices showing the amount of interaction between each pair of individuals in the group.

The reliability of untrained observers using this keyboard system is quite high. Five observers coded the same videotape of a four-person group on two successive occasions. Test-retest reliabilities averaged .74, and the mean interobserver reliability was .77, which appears to be higher than typical reliabilities for this type of data (see Hollenbeck, 1978, for a discussion). It must be pointed out that these observers had at most 10 min of practice using the keyboard before the first reliability test was made.

The VIPER system was designed as a simple and inexpensive encoding and recording procedure for the analysis of small group interaction. As such, it is not an alternative to the Datamyte or SSR systems, which incorporate more complex keyboards and cost substantially more. Given the small number of social groups with more than five or six members, the VIPER system can capture the major elements of social interaction and can be used by untrained observers without sacrificing reliability.

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