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BODY MOVEMENT AND VOICE PITCH IN DECEPTIVE INTERACTION

Most studies of nonverbal communication have focused on but one aspect of interpersonal behavior. To name just some of the work, in the visual channel, mutual gazing (reviewed by Exline, 1972), proxemics (reviewed by Watson, 1974), hand movements (reviewed by Ekman and Friesen, 1972), and facial behavior (reviews by Ekman, Friesen, and Ellsworth, 1972; Izard, 1971; Vine, 1970) have been examined, while, in the vocal channel, speech disruptions and voice quality (reviews by Kramer, 1963; Mahl and Schultze, 1964; Scherer, 1974) are examples of what has been studied. Few studies have attempted to interrelate measurements in the visual channel with those in the vocal channel. None have employed both the direct measurement of behavior in each channel and the observers' inferential ratings when exposed to each channel. This preliminary report is designed to answer two fundamental questions about channels of human communication: (1) What are the relationships between communication channels, as evident in the correspondence between body movement and acoustic measures, and as seen in the relationship among the information inferred by observers exposed to the body and facial sections of the visual channel, and the voice and speech sections of the auditory channel? (2) Which behavioral components within each channel account for observers' judgments of traits and states?

Audiovisual records gathered in a deception situation developed by Ekman and Friesen (1974) were used in this study. Sixteen student nurses were subjects in two standardized interviews. In each interview the subject watched a short film, and answered an interviewer's questions concerning her feelings about it. In the *honest* interview nature films designed to elicit pleasant feelings were shown, and subjects were instructed to describe their feelings frankly. In the *deception* interview, subjects saw a film showing amputations and burns, intended to elicit strong unpleasant affect, and were instructed to conceal negative feelings and convince the interviewer they had seen another pleasant film. A variety of data, reported elsewhere (Ekman and Friesen, 1974, in preparation) suggested that the subjects were highly

motivated to succeed in deception, and that the intended emotional states were elicited in each interview.

Measurements were made of both hand movements and pitch. Three types of hand movements were distinguished: *illustrators*, movements which are tied to speech rhythms and illustrate what is said; *shrugs*, a frequently occurring symbolic gesture or emblem, in which the hands are rotated at the wrists to symbolically transmit the message of uncertainty or inability (cf. Ekman and Friesen, 1974, for evidence that this is the message of the shrug); and, *adaptors*, movements in which one hand makes contact with the other hand or other parts of the body or face, such as by rubbing or scratching. Adaptors were further subdivided into *short* (two seconds or less) and *long* (longer than two seconds). The theoretical basis for these distinctions has been reported in detail elsewhere (Ekman and Friesen, 1969a, 1972, 1974). The procedure for coding hand movements is described in Friesen and Ekman (in preparation). Pitch was measured by selecting two short speech samples from the subjects' answers and extracting fundamental frequency (pitch) of the voice by autocorrelation procedures using an on-line speech analysis computer system (cf. Scherer, in preparation).

In deception there was a significant decrease in illustrators ($p < .05$), a trend for an increase in shrugs ($p < .10$), an increase in pitch ($p < .05$), and no change in adaptors or total hand activity. The detailed results on hand movements and pitch are reported in forthcoming publications (Ekman and Friesen, in preparation; Scherer, in preparation).

Separate groups of observers viewed the videotapes or heard audiotapes of these honest and deceptive interviews. One group of observers saw only the body, from the neck down; another group of observers saw only the face; a third group heard an audiotape containing electronically filtered speech which renders speech content unintelligible by removing voice frequencies above 400 Hz (cf. Rogers, Scherer, and Rosenthal, 1971); and a fourth group listened to unaltered audiotapes which exposed listeners to all speech and voice cues. Observers were told nothing about the deception situation, only that they were to judge behavior emitted during a conversation. Within each exposure condition (face, body, filtered speech, and full speech), honest and deceptive samples were seen by each group of observers, but a given observer never saw both honest and deceptive samples of the same subject. The number of observers for each condition varied from 15 to 36. Observers rated each sample on 14 bipolar scales.

There was no difference between the ratings of honest and deception samples in the ratings made on the basis of full speech, or on the basis of filtered speech. Ratings made by observers exposed to the face became more positive from honest to deception (e.g., more sincere, more sociable, more relaxed) as compared to ratings made by observers exposed to the body

which became more negative in deception. These differences reached significance ($p < .05$) and are in accordance with Ekman and Friesen's (1969b) theory of nonverbal leakage and deception clues, which predicts that when deceiving subjects manage the impression given off by their face more than their body.

Relationships between communication channels were studied in two ways: by examining the ratings of observers exposed to face, body, full speech, and filtered speech and by correlating the descriptive measurements of pitch and hand movements. There were significant correlations between the judgments made by observers on the basis of the four channel sources on just two aspects of interpersonal behavior: sociability (scales of outgoing/inhibited, expressive/unexpressive, sociable/withdrawn) and dominance (just the single scale of dominant/submissive). The information conveyed by the face, body, filtered speech, and full speech was not consistently correlated on the other scales — honest/dishonest, sincere/insincere, trustworthy/untrustworthy, calm/agitated, relaxed/tense, emotionally stable/unstable, natural/awkward, felt pleasant/unpleasant, and acted pleasant/unpleasant. The one exception occurred when ratings made by those exposed to filtered speech and full speech were highly correlated on most scales. Face ratings and speech ratings in both honest and deceptive interviews were more positive on almost all of the scales than were ratings of the body, or ratings of filtered speech (t -tests, at the .05 level or better, two-tailed tests).

The second approach to studying channel relationships was to examine behavior measurement rather than observer ratings, correlating pitch level with hand activity. It had been predicted that illustrator hand movements, theoretically expected to indicate enthusiasm and involvement, would be negatively correlated with pitch, which is theoretically expected to rise under stress. As predicted, illustrators and pitch were negatively correlated in the deception sample ($Rho = -.61$, $p < .01$).

The last question asked was how well measurements of behavior account for observer judgments within each channel. Illustrating was correlated with observers rating the body as sociable (e.g., $Rho = .66$, $p = < .01$ with judgment of expressive/unexpressive in the deception interview). Shrugs and short adaptors did not correlate with observers' ratings of the body. Long adaptors correlated with impressions that the person was awkward ($Rho = .75$, $p = < .01$ with judgment of awkward/natural in deception interview) and tense ($Rho = .62$, $p = < .01$ with judgments of tense/relaxed in deception interview). Low pitch in deception was associated with being rated sociable ($r = .58$, $p < .05$ with judgments of sociable/withdrawn), relaxed ($r = .68$, $p < .05$ on relaxed/tense), and calm ($r = .71$, $p < .01$ on calm/agitated). These results were obtained on the basis of listening to filtered speech in the

deception interview. Since these relationships were not found for ratings based on listening to full speech, it appears likely that observers were misled or confused by the subjects' management of their speech content during deception.

To summarize, this study found that measures of hand movements and voice significantly changed from an honest to a deceptive interaction, were interrelated, and accounted for certain inferences by observers when they judged voice or body movement. Illustrating decreased in deception, was related to observers' judgments of sociability, and was negatively related to pitch. Pitch became higher in deception; low pitch was associated with observers' judgments that a person was sociable and relaxed, and was negatively correlated with illustrators.

In forthcoming reports, these findings are described in detail (Ekman, Scherer, and Friesen, in preparation). Work now in progress is replicating these findings on a new sample of subjects, examining the relationship of hand movement and pitch measures to personality, and extending measurements to facial muscular behavior in the visual channel and to speech discontinuities and spectral voice analysis in the auditory channel.

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