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Although social science research methods have been successfully applied to the phenomenon of deception, these efforts have universally been limited to laboratory study. In order to broaden the generalizability of deception research, the present study assessed the verbal and nonverbal correlates of naturally-occurring, high-motivation deceptive communication. Subjects were 23 individuals who had publicly made statements that were subsequently revealed as deceptive, either due to incriminating evidence or by their own admission. They were all well-known people from different fields. Findings support the recent Buller and Burgoon (in press) categories of deceptive behavior, in that, both leakage cues and strategic cues were significantly related to deception. Implications for arousal and cognitive-demand effects on behavior are discussed, and limitations of the study and directions for future work are outlined. (Three tables of data are included; 27 references are attached.) (Author/SR)

THE BEHAVIORAL CORRELATES OF REAL-WORLD DECEPTIVE COMMUNICATION

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THE BEHAVIORAL CORRELATES OF REAL-WORLD DECEPTIVE COMMUNICATION

Rationale

Although human interest in deception is perhaps as old as communication itself, the attempt to assess the verbal and nonverbal clues to deceitful communication using systematic, empirical methods is relatively recent. Thirty years of scientific research effort aimed at understanding deceptive communication has resulted in a detailed knowledge base concerning the verbal and nonverbal correlates of deception (for reviews, see Hocking & Leathers, 1980; Knapp & Comadena, 1979; Zuckerman, DePaulo, & Rosenthal, 1981; Zuckerman & Driver, 1985). Although there are conflicting findings for many specific cues, Miller and Burgoon (1982) argue that deceptive intent may express itself along six dimensions: anxiety, withdrawal, excessive behavior, negative affect, vagueness and incongruous behavior. Summarizing the extant literature on the behavioral correlates of deception, Burgoon, Buller, and Woodall (1989) state that "Deceivers display increased pupil dilation, blinking rates and adaptors, more segments of body behavior, and fewer segments of facial behavior" and that "Deceiver's voices are characterized by shorter answers, more errors, more hesitations, and higher pitch." (p. 271).

Unfortunately, the findings that Burgoon et al. describe are, without exception, the result of studies in which the researchers, through a variety of methods, induce "deceptive" performances from their subjects. There are at least two potential problems with these approaches. First, in many of these studies, the deceptive behaviors are actually acted out. For example, in the pioneering work of Ekman and Friesen (1969), researchers asked subjects to view slides of burn victims while announcing that they were enjoying what they saw. While it is clear that the responses were not "truthful", it is doubtful that they represent deception as it occurs naturally. Unlike "real"

deception, the subjects' personal involvement in the lie is minimal, limiting their motivation to "succeed". Even the notion of success is meaningless when the subjects' are merely reciting lines from the researchers' script into a video camera. The second problem is more profound and cuts to the heart of exactly what deception researchers are studying. In virtually every study of deceptive behavior, the researchers have sanctioned, even encouraged, the subjects' dishonest behavior, thus removing the onus of responsibility for the deception act from the deceiver and placing it on the researcher. Since real-world deceivers cannot realistically blame anyone else for their message behavior, this method clearly fails to simulate deception as it occurs outside the laboratory. Noteworthy exceptions to this generalization are the detection study of deTurck and Miller (1985) and the probe study of Stiff and Miller (1986), which both used a method pioneered by Exline, Thibaut, Hickey, and Gumpert (1970), wherein subjects are implicated in a cheating incident. Although it is the self-serving, socially-disapproved behavior of liars that we believe interests most "scholars, artists, detectives, kings, and lovers" (Greene et al., 1985), communication researchers have focused most of their efforts on studying messages that are untruthful, rather than the more specific act of deception.

Of course, there are good reasons for this neglect. Real deceptive communication is difficult or impossible to study in the laboratory, partly because the social science lab itself is not conducive to high-risk interaction, partly because the high motivation required by most people to deceive generally does not exist in the laboratory, and partly because of the questionable ethics of inducing individuals to engage in unethical behavior. Unfortunately however, this may place a severe limitation on the ability of

current research findings to inform ·· egarding the real world exigencies of assessing the veracity of others' messages. It is the specific goal of the present study to fill this void by assessing naturally-occurring deceptive communication.

Deception and Arousal

The earliest attempts at theory building in the area of deception recognized arousal as an attendant feature of most deception. The arousal response to situational stressors is characterized by increased cortical activity and changes in the autonomic nervous system (Andreassi, 1980). These effects and their accompanying physiological changes — i.e., increased perspiration, blood pressure, respiration rate, and heart rate — provide the rationale for using a polygraph as a lie detector. Ekman and Friesen (1969) refer to the expression of arousal indicators during deception as leakage.

Ekman (1981) argues that the presence of arousal cue leakage is most likely when: (1) the central purpose of the deception is to withhold emotional information; (2) the deceiver feels strong emotions about the topic of deception; (3) the deceiver is apprehensive about being detected; (4) the deceiver is guilty about the deception; (5) the deceiver experiences duping delight, or (6) the deception is not planned or practiced. There is considerable support for Ekman and Friesen's (1969) leakage hypothesis (e.g., Ekman & Friesen, 1974; Ekman, 1981).

In addressing the issue of which specific nonverbal behavioral changes would be expected to result from increased arousal, Burgoon and Koper (1984) suggest that arousal is "evidenced through nonverbal anxiety and adaptor behaviors" (p. 604). Specifically, it is expected that arousal will result in fidgeting, indirect head and boc orientation, rigid posture, self-touching,

and uncoordinated and random limb movements (Clevenger, 1959; Ekman & Friesen, 1972; Mehrabian, 1981; Mulac & Sherman, 1974).

Deceivers seeking to avoid "looking like liars" might also be expected to exercise control over these expressions of arousal. Attempted control "concerns the ability of the individual to inhibit or manipulate overt behavior in order to avoid manifestation of the nonverbal correlates of deception" (Greene et al., 1985, p. 337). Ekman & Friesen (1969, 1972, 1974), who first explored this aspect of behavior during deception, contend that behaviors that allow the most immediate feedback and behaviors that are most consciously manipulated are the most controllable, and thus, most likely to be managed.

Leakage and Control

In an effort to integrate existing research findings, Hocking and Leathers (1980) expanded the preceding formulation. They argue that deceivers attempt to avoid detection by striving to suppress those behaviors that are controllable and that are stereotypical of deceivers. They also contend that not all behaviors resulting from arousal are controllable, and that uncontrollable behaviors increase during deception. Behaviors that may be exhibited by an aroused communicator are classified as: Class I (those behaviors a deceiver may have the potential to control, e.g., gestures, body movement), Class II (those behaviors that cannot be monitored directly by the deceiver and are thus more difficult to control, e.g., facial expression), or Class III (behaviors that are typically uncontrollable, e.g., vocal cues and physiological indices of autonomic arousal, see Zuckerman et al., 1981).

The same situational demands that are perceived to necessitate the construction of a deceptive message would also stimulate deceivers to make

efforts to minimize their chances of being challenged in the lie. Thus, encoding a deceptive message initiates two resultant responses: arousal of the autonomic nervous system and conscious efforts by deceivers to minimize the impact of the arousal on their overt behavior. Ekman and Friesen (1969) and Hocking and Leathers (1980) effectively argue that most of us can consciously control many of the behavioral cues we exhibit; however, the less controllable and less easily monitored aspects of behavior may "leak" the individual's degree of arousal.

Leakage and Strategic Communication

As models of deceptive communication have evolved, the role of the deceiver's strategic intentions has been expanded to include deception as a persuasive (Miller, 1983) or compliance-gaining strategy (Neuliep & Mattson, 1990) and as an impression management technique (Koper & Miller, 1991). Perhaps the most comprehensive model of deception is that of Buller and Burgoon (in press), who argue that categories of deceptive behavior can be differentiated into strategic cues and leakage cues. Burgoon, Buller and Woodall (1989) explain:

> Strategic cues are encoded to establish the veracity of the deceptive message, to distance or disassociate the deceiver from the deceptive message, to reduce the deceiver's responsibility for the deceptive statement, or to reduce the negative consequences if the deception is detected. (p. 270)

Four categories of strategic deception cues were identified by Buller and Burgoon (in press): 1) uncertainty and vagueness cues, 2) nonimmediacy, reticence, and withdrawal cues, 3) disassociation cues, and 4) image-protecting cues. Leakage cues, on the other hand, may unintentionally reveal deceptive intent and include 1) arousal and nervousness cues, 2) negative affect cues, and 3) incompetent (awkward or nonnormative)

communication performances. One of the advantages of the Buller and Burgoon model is that it is broad enough to include both verbal and nonverbal behavior along both leakage and strategic dimensions. The hypotheses for the present study will be structured around their categories.

Hypotheses

Leakage cues. As discussed above, there are numerous conduits for the leakage of arousal. Both specific indices of arousal and global ratings of arousal level will be assessed.

H1: Compared to truthful communicators, deceivers will demonstrate:
- a) more frequent blinking,
- b) more frequent self and object adaptors,
- c) more frequently lick their lips,
- d) more frequent leg and foot shifts,
- e) more frequent postural shifts,
- f) more profuse perspiration,

and be rated:
- g) higher in vocal tension,
- h) higher in overall tension, and
- i) higher in overall arousal.

Negative affect will be assessed in terms of both frequency of smiling and laughing and overall facial pleasantness.

H2: Compared to truthful communicators, deceivers will demonstrate:
- a) fewer smiles,
- b) fewer laughs,

and be rated:
- c) lower in overall facial pleasantness.

When a communicator chooses to construct a fiction, one likely result will be an increase in cognitive processing demand. As Greene et al. (1985) point out, "cognitive work [is] the integration, or assembly, of activated elements from procedural memory...[A]s the number of these elements increases, so, too, will cognitive difficulty" (p. 341). Because creating fiction tends to place a greater number of constraints on the encoder than telling the

truth, deceptive communication should reveal itself as less fluent and competent.

H3: Compared to truthful communicators, deceivers will demonstrate:
a) longer response latencies,
b) a higher rate of speech errors, and
c) more frequent pauses.
and be rated:
d) lower in verbal consistency, and
e) lower in verbal plausibility.

Strategic cues. Although it is not clear what strategic purpose uncertainty may serve in deception (it could be classified as a leakage cue), vague responses may provide the deceiver with plausible deniability in the event of detection. Since it is not clear which specific cues may demonstrate uncertainty and/or vagueness, overall ratings will be assessed.

H4: Compared to truthful communicators, deceivers will be rated:
a) lower in vocal certainty,
b) lower in vocal directness, and
c) lower in verbal directness.

Perhaps as a result of the negative affect that results from creating deceptive messages, deceivers should tend to distance themselves from the receiver(s) and from the communication event. Buller and Burgoon's nonimmediacy and disassociation categories seem similar enough, i.e., both describe lower-level involvement in an interaction, to include them together. Again, both specific behaviors and overall ratings will be assessed.

H5: Compared to truthful communicators, deceivers will demonstrate:
a) shorter response duration,
b) fewer emblems,
c) fewer illustrators,
d) less eye contact, and
e) less direct head and body orientation,
and be rated:
f) lower in facial immediacy,
g) lower in body immediacy,
h) lower in facial animation,
i) lower in overall involvement, and
j) lower in overall interest in the interaction.

The last strategic category, image protection, should be evidenced by cues related to credibility, security, and honesty. However, it is clear that the task creates conflicting demands on the deceiver. For example, a deceiver may want to avoid eye contact to lower involvement in an unpleasant deceptive episode and at the same time increase eye contact to boost perceived candor. Excuses and justifications, which admit to inappropriate behavior, should be minimal, while denials and blames, which seek to protect the deceiver's image of honesty, should be expressed by the deceivers. Thus, we offer hypothesis six:

H6: Compared to truthful communicators, deceivers will demonstrate:
a) more head nods,
b) more head shakes,
c) fewer excuses,
d) fewer justifications
e) more denials, and
f) more blames,
and be rated:
g) higher in vocal security, and
h) higher in verbal security.

METHOD

Subjects

Subjects were 23 individuals that had publicly made statements that were subsequently revealed as deceptive, either due to incriminating evidence or by their own admission. Represented in the sample were: athletes (Ben Johnson, Pete Rose), politicians (Gary Hart, Richard Nixon, Kurt Waldheim, Michael Deaver), military personnel (Oliver North), an actress (Zsa Zsa Gabor), and a religious figure (Peter Popoff). Additional segments focused on aides and assistants to the public figures.

Materials

In order to procure instantiations of naturally-occurring deception, news videotape footage of individuals making statements that subsequently were revealed as deceptive were collected through the facilities at the Vanderbilt University Television News Archive. Segments were purchased based on their selection from the monthly index of nationally televised news broadcasts. Only segments in which the subject appears on-camera while speaking were purchased. Additional segments were collected from televised interviews (20/20, The Public Mind) or programs (The Peter Popoff Show, The Tonight Show). Although every effort was made to include in the sampled materials both truthful and deceptive segments for each subject, truthful segments were not available for some of the subjects. A total of 2.3 hours of message behavior, representing 165 videotaped sequences, comprised the final sample materials.

Coding Procedures

Coders were two undergraduate female students enrolled in a Nonverbal Communication course. The students coded the videotaped segments as part of their semester project in the course and received credit for their efforts. Training consisted of two stages. First, the coders were taught the conceptual and operational definitions for each coded variable in the study. Second, several practice sessions were conducted using videotaped sequences not used in the present study. Upon completion of training and demonstration of an acceptable level of interrater reliability (approximately 90% agreement), coding of the actual data proceeded. The coders were not informed whether individual sequences were truthful or deceptive, nor were they given any information regarding the hypotheses of the study.

Raters assessed the frequency and nature of a broad spectrum of visual, vocal, and verbal cues that have been indicated in the literature as likely conduits for leakage or that have been suggested as impression management strategies. Behaviors were quantified based on either actual counts or evaluative ratings on a seven-point semantic differential scale.

Visual behaviors that were counted (occurrence indices) include: blinks, smiles, laughs, self and objects adaptors, lip licks, head nods, head shakes, emblems, illustrators, leg and foot shifts, and postural shifts. Visual behaviors that were rated (rated indices) include: sweatiness (no sweat/very sweaty), arousal (cool/bothered), tension (relaxed/tense), involvement (withdrawn/involved), interest (apathetic/interested), eye contact (low/high), facial immediacy (low/high), facial pleasantness (not pleasant/very pleasant), facial animation (low/high), head orientation (indirect/direct), body orientation (indirect/direct), and body immediacy (low/high).

Vocal behaviors that were counted (occurrence indices) include: speech errors and pauses.Vocal behaviors that were rated (rated indices) include: vocal directness (evasive/direct), vocal certainty (uncertain/certain), vocal tension (relaxed/tense), and vocal security (insecure/secure). In addition, two vocal features of each sequence were timed; these include: response duration and response latencies (in cases where interaction occurred).

Verbal behaviors that were counted (occurrence indices) include: excuses, justifications, denials, and blames. Verbal behaviors that were rated (rated indices) include: verbal consistency (inconsistent/consistent), verbal plausibility (implausible/plausible), verbal directness (evasive/direct), and verbal security (insecure/secure).

Analyses

Prior to statistical analysis of the data set, all occurrence indices were standardized to account for the varying length of the sequences. All results are reported in occurrences per minute. All coded indices were the result of both coders averaged ratings.

In order to assess the relative strength of each predictor variable in distinguishing truthful from deceptive message behavior, a simultaneous discriminant analysis was performed on the data. Subsequent classification analysis was performed utilizing the split-sample, or holdout, method (Hair, Anderson, Tatham, 1987).

RESULTS

Interrater reliabilities

Interrater agreement for each index was estimated using a Pearson product-moment correlation coefficient, which is an appropriate reliability estimate when coding dimensions are composed of equal interval scales (Scott, 1955). Reliabilities for the coded nonverbal behaviors ranged from .30 for body immediacy to 1.00 for speech errors. Mean interrater reliability for all behaviors was .78. Table 1 provides the mean, standard deviation, and interrater reliability for each behavior.

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Insert Table 1 about here

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Discriminant Analysis

Simultaneous entry of all discriminating variables into the analysis resulted in a single canonical discriminant function with an eigenvalue

greater than one. Due to large amounts of missing data for the leg/foot shifts variable, it was dropped from the analysis. The canonical correlation between the discriminant function and the criterion variable was $R = .76$ and was significant, $X^2(40) = 97.26$, $p<.0001$. The summary statistics for the discriminant function are presented in Table 2.

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Insert Table 2 about here

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Standardized discriminant coefficients reflect the relative contribution of each variable to the function. Because larger weights indicate a greater contribution to the discriminating function, they are analogous to beta weights in regression analysis, however, they are subject to the same criticisms, e.g., instability, effects of multicollinearity (Hair et al., 1987). Because of the deficiencies in interpreting discriminant weights, researchers are turning more frequently to discriminant loadings, sometimes called structure correlations, as the basis for interpretation (Hair et al., 1987). Discriminant loadings describe the simple linear correlation between each predictor and the discriminant function. They reflect the variance that the predictor variables share with the discriminant function, similar to factor loadings, and can be interpreted like factor loadings in assessing the relative contribution of each of the predictors to the discriminant function. Table 3 presents the discriminant weights, loadings, and significance of each predictor.

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Insert Table 3 about here

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The structure correlations presented in Table 3 indicate that perceived arousal is the single best predictor for distinguishing between liars and truthtellers (r=.47, p<.001), followed by perceived tension (r=.40, p<.001). Liars are more aroused and tense than truthtellers. However, liars also demonstrated fewer self-adaptor behaviors (r=-.37, p<.001) than truthtellers as well as fewer illustrators (r=-.35, p<.001). Liars were more involved in their presentation (r=.35, p<.001) and were more immediate (r=.30, p<.001) and interested (r=.26, p<.001). Not surprisingly, the truth sounded more plausible (r=-.27, p<.001) than did deception. Liars' perspired more than the truthtellers (r=.23, p<.01), and their voices were more tense (r=.24, p<.01), less direct (r=-.19, p<.01), and less certain (r=-.17, p<.05). Verbally, their stories were perceived as less consistent (r=-.18, p<.05), and liars were more apt to issue denials (r=.16, p<.05) than truthtellers. The remainder of the predictor variables were not significantly related to the discriminant function.

Classification analysis

Two classification analyses were performed in order to validate the discriminant function. First, the discriminant function was used to blindly classify the original cases, resulting in a "hit ratio" of 92%, $X^2(1) = 75.75$, p<.0001, C=.59. However, because the same data was used to create the function, this method results in a biased estimate of the actual discriminating ability of the function. Therefore, an alternative method, utilizing a hold-out sample, was applied. The sample was randomly split into two groups. The first group was then used to develop estimates of the discriminant coefficients, which were then applied to the second subsample in a classification analysis. Although the derivation of the function was based

on only half of the sample, the resulting classi .ication was still significant, $X^2(1) = 12.62$, $p<.0004$, $C=.40$, suggesting a high degree of consistency in the classification scheme.

Hypotheses

The results for the test of Hypothesis 1 were mixed. During deception, communicators demonstrated more profuse perspiration, $F(1,163) = 8.36$, $p<.05$ and were rated higher in vocal tension, $F(1,163) = 8.47$, $p<.05$, overall tension, $F(1,163) = 31.70$, $p<.001$, and arousal, $F(1,163) = 45.69$, $p<.001$. However, contrary to the hypothesis, deceivers exhibited a significantly lower self-adaptor rate, $F(1,146) = 28.60$, $p<.001$. The hypothesized relationships between deception and blink rate, lip licking, and postural shifts were not supported.

Hypothesis 2, which focused on negative affect cues, was not supported by these data. Neither facial animation nor smiling/laughing was a significant predictor of deception.

The test of Hypothesis 3 resulted in partial support. Although the differences in means for response latencies, speech errors and pauses were nonsignificant, deceiver's messages were rated as less consistent, $F(1,161) = 4.96$, $p<.05$, and less plausible, $F((1,162) = 16.65$, $p<.001$, supporting the hypothesis.

In assessing the vagueness of deceivers, Hypothesis 4 received mixed support. Truthful and deceptive messages did not significantly differ in their verbal directness, however, vocal cues during the deceptive messages were rated as less certain, $F(1,163) = 4.24$, $p<.05$, and less direct, $F(1,163) = 7.90$, $p<.01$.

The expectation that deceivers would be less immediate with receivers

(Hypothesis 5) was largely not supported, and in two-tailed t-tests, contradicted by these data. Although deceivers exhibited fewer illustrators, $t(146) = 4.39$, $p<.05$, they engaged in longer duration responses, $t(163) = 2.14$, $p<.05$, and were rated higher in body immediacy, $t(162) = 4.44$, $p<.05$, more involved, $t(163) = 5.21$, $p<.05$, and more interested, $t(163) = 3.60$, $p<.05$. The remainder of the hypothesized differences were not significant.

Hypothesis 6 found very limited support. Deceivers did exhibit more denials, $F(1,163) = 4.41$, $p<.05$. The differences for head nodding, head shakes, excuses, justifications, blames, and verbal and vocal security were not significant.

DISCUSSION

Perhaps the most striking feature of the present study is the nature of the deception analyzed. Unlike past work (which has tended to neglect the motivation required to stimulate unethical behavior), these data did not result from the researcher staging a scenario in order to induce subjects to encode untruthful statements. The motivations that prompted the deceit were genuine and personally involving, and the ramifications of detection ranged from public embarrassment to ruined careers.

While the present study provides general support for laboratory findings, these data suggest a more complex portrait of the deceiver than most previous models have painted. It is apparent that although arousal is an important feature of deception, highly motivated prevaricators are also actively involved in both controlling leakage and creating a confusing barrage of cues designed to undermine attributions of deceit and encourage perceptions of candor and sincerity. As Hocking and Leathers (1980) have suggested, deceivers are as aware of stereotypic cues of deceit as the potential

detectors, and they are capable of exercising some control over them. Subjects of the present study exhibited fewer adaptors when deceiving than when telling the truth, and they were more immediate, more involved, and more interested in the deceitful interaction. The term "performance" is appropriately applied to such behavior.

Equally apparent is the increased cognitive demand that hampers liars as they endeavor to create plausible fictions. Few of the messages evaluated in this study were spontaneous, yet both the consistency and the plausibility of the deceptive messages suffered in the telling. Despite the attempts at cultivating an image of honesty, deceptive performances demonstrated less vocal certainty and directness. The most direct line, denying allegations of wrong-doing, seemed to be the most popular defense for liars, perhaps because it is easy and does not require the construction of additional fiction.

The model of deceptive effects offered by Buller & Burgoon (in press) is generally supported by the findings of this study. Deceivers are more aroused than truthtellers; they experience more cognitive difficulty; they tend to be more vague and indirect; and they are actively engaged in image management. However, they are more, not less, immediate, probably in an attempt to appear honest and sincere. "Look 'em in the eye, and they'll believe anything", seems to be the maxim guiding the behavior of many deceivers.

While it is hoped that this study provides a unique perspective on deceptive behavior, the very nature of the data offers numerous limitations. First, the setting is enormously obtrusive; many of the subjects were facing news cameras from the major television networks. Even so, despite the expected increases in arousal attributable to speaking before a national

audience, the largest differences in truthful and deceptive behavior were in the indices of arousal. Second, because news footage tends to rely on full-frame, close-ups, the feet and/or legs of the subjects were observable in only 27 of 165 sequences. Caution should be exercised in interpreting this finding. Third, these data do not address the effects of spontaneous deception on behavior. It is likely that few of the sequences exhibited message behavior that had not been considered prior to the event.

Future work should continue to address deceptive phenomena as a highly involving and highly motivated behavior. With the possible exception of pathological liars, people probably do not create deceptive messages unless there is something important at stake. While the present study focused on prepared lies, we know little of spontaneous, high motivation deception. Despite the difficulties in accessing this type of situation, a complex understanding of deceptive communication must recognize the importance to the deceiver of avoiding detection as well as the behavioral means of addressing this goal. Only then will a complete and accurate picture of the real world deceiver emerge.

TABLE 1

Means, standard deviations, interrater reliabilities

Behaviors	Means Truthful	Means Deceptive	interrater reliability
Rated Indices —			
Sweating	1.05 (.145)	1.60 (.956)	.85
Arousal	4.55 (.868)	5.37 (.621)	.60
Tension	4.66 (.939)	5.45 (.735)	.64
Involvement	4.95 (.834)	5.58 (.616)	.61
Interest	4.84 (.671)	5.26 (.659)	.58
Eye Contact	5.67 (.854)	5.65 (.711)	.80
Facial Immediacy	5.64 (.650)	5.73 (.721)	.69
Facial Pleasantness	3.82 (.518)	3.82 (.653)	.46
Facial Animation	4.06 (.717)	4.06 (.828)	.67
Head Orientation	5.82 (.307)	5.88 (.481)	.57
Body Orientation	5.83 (.263)	5.80 (.461)	.49
Body Immediacy	5.34	5.80	.30

	(.745)	(.500)	
Vocal Directness	5.43 (.513)	5.11 (.699)	.51
Vocal Certainty	5.17 (.739)	4.86 (.880)	.69
Vocal Tension	4.85 (.839)	5.26 (.780)	.55
Vocal Security	4.98 (.862)	4.81 (.874)	.69
Verbal Consistency	5.34 (.564)	5.11 (.674)	.51
Verbal Plausibility	4.63 (.731)	3.88 (1.13)	.80
Verbal Directness	5.22 (.657)	5.01 (.841)	.59
Verbal Security	4.99 (.805)	4.84 (.907)	.67
Occurrence Indices —			
Response Duration	19.18 (26.43)	49.50 (92.63)	1.00
Response Latency	.41 (.757)	.87 (2.79)	1.00
Blink Rate	21.78 (16.51)	21.93 (14.80)	.99
Smile Rate	.95 (2.27)	1.30 (3.49)	.98
Self Adaptor Rate	3.54 (5.08)	.62 (1.93)	.98
Object Adaptor Rate	.85 (2.25)	.42 (1.35)	.99
Lip Licking Rate	1.64 (3.64)	1.02 (2.97)	.99
Head Nodding Rate	5.02	7.94	.99

	(6.61)	(9.22)	
Head Shaking Rate	6.47 (7.27)	5.23 (7.77)	.98
Emblem Rate	.25 (.702)	.19 (.965)	.99
Illustrator Rate	13.52 (20.71)	3.12 (7.94)	.99
Leg/Ft Shift Rate	8.56 (5.84)	4.14 (5.09)	.99
Posture Shift Rate	2.87 (6.34)	2.62 (3.97)	.99
Speech Error Rate	6.29 (8.42)	4.64 (7.06)	1.00
Pause Rate	6.85 (5.82)	6.27 (5.48)	.99
Excuses Rate	.62 (1.79)	.14 (.98)	.48
Justification Rate	1.52 (3.14)	1.25 (2.64)	.92
Denials Rate	.25 (1.14)	2.47 (5.02)	.99
Blames Rate	.49 (1.71)	.39 (2.09)	.97

Standard deviations in parentheses. All rated indices on a 7-point scale; all occurrence indices based on actual counts. Duration and latencies in seconds; all rate values per minute.

TABLE 2

Summary of discriminant function

Function	Eigenvalue	Wilks' Lambda	Chi-Sq.	sig.	Canonical Correlation
1	1.365	.423	97.26 (40 df.)	.000	.76

TABLE 3

Discriminant weights, loadings, and F tests

Behaviors	Discriminant Weights	Discriminant Loadings	F value	sig. level
Arousal	.549	.466	45.69	.000
Tension	-.138	.402	31.70	.000
Self Adaptor Rate	-.277	-.367	28.60	.000
Involvement	.491	.346	27.14	.000
Illustrator Rate	-.470	-.345	19.27	.000
Body Immediacy	.554	.299	19.17	.000
Verbal Plausibility	-.402	-.273	16.65	.000
Interest	-.185	.256	12.96	.000
Vocal Tension	-.300	.241	8.47	.002
Sweating	.262	.233	8.36	.002
Vocal Directness	.121	-.193	7.90	.003
Verbal Consistency	-.447	-.175	4.96	.024
Vocal Certainty	-.699	-.168	4.24	.021
Denials Rate	.209	.161	4.41	.020
Verbal Directness	.291	-.142	2.16	n.s.
Vocal Security	-.233	-.136	1.12	n.s.
Speech Error Rate	.120	.128	1.09	n.s.
Response Duration	.177	.120	< 1	n.s.
Head Nodding Rate	.123	.119	< 1	n.s.
Verbal Security	.911	-.109	< 1	n.s.
Facial Animation	.037	-.097	< 1	n.s.
Blink Rate	.104	.089	< 1	n.s.
Facial Pleasantness	-.125	-.086	< 1	n.s.
Lip Licking Rate	.148	-.082	< 1	n.s.
Body Orientation	-.405	-.074	< 1	n.s.
Head Shaking Rate	-.043	-.060	< 1	n.s.
Eye Contact	.302	-.054	< 1	n.s.
Response Latency	-.091	.049	< 1	n.s.
Justification Rate	.275	-.046	< 1	n.s.
Facial Immediacy	.279	-.043	< 1	n.s.
Smile Rate	-.039	.032	< 1	n.s.
Emblem Rate	.050	-.032	< 1	n.s.
Excuses Rate	.054	-.027	< 1	n.s.
Posture Shift Rate	-.230	-.015	< 1	n.s.
Pause Rate	.015	-.015	< 1	n.s.
Head Orientation	.180	-.007	< 1	n.s.
Blames Rate	-.039	.006	< 1	n.s.
Object Adaptor Rate	-.208	.005	< 1	n.s.

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