DECEPTION AND AROUSAL: ISOLATING THE BEHAVIORAL CORRELATES OF DECEPTION

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A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Communication

1984

ABSTRACT

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The present study employs a physiological arousal framework based on Hull's (1943) drive-reduction learning theory to explain why liars and nonliars engage in different patterns of verbal and nonverbal displays. Although most communication researchers have claimed liars' behavior differs from nonliars' because they are aroused, only the polygraphy literature has shed light on this critical theoretical assumption. Yet polygraphers have not directly tested liars' arousal levels with nonliars' but only "eyeballed" the graphic differences.

The present study tested this critical theoretical assumption and sought to isolate the behavioral idiosyncrasies of deceptive communicators. To test these concerns, three separate groups of communicators had their skin resistance monitored and were videotaped during two separate interviews after they had been implicated in a cheating situation. Two groups paralleled earlier deception research: unaroused truthful communicators and deceivers. A third group of truthful communicators was subjected to a noise stimulus so as to yoke their arousal to a level comparable with deceivers' arousal.

Results obtained supported the hypothesis that communicators shifting from a truthful to a deceptive message experienced an increase in sympathetic activation when compared to consistently truthful communicators. Moreover, as expected, when communicators shifted from a truthful to a deceptive message they displayed an increase in adaptors, hand gestures, speech errors, pauses, and response latency, and a decrease in message duration compared to their truthful unaroused counterparts. Comparing liars' behavior to aroused truthful communicators' behavior revealed several similarities to the unaroused truthful/deception analyses: Liars engaged in more adaptors, hand gestures, paused more, and took more time to respond to interviewer's queries.

The present study also examined whether the "internalizer-externalizer" results from the nonverbal literature apply to deceptive communication. This literature reports that men communicating emotional reactions to stimuli experience greater physiological arousal (internal) and display fewer overt cues (external) than females, who communicate similar emotional reactions with less physiological arousal but greater overt or behavioral expression. Regression analyses revealed a number of significant arousal-behavioral relationships. Implications of the results and recommendations for future research are discussed.

Dedicated to my wife and daughter,

Bridget and Rachel.

ACKNOWLEDGMENTS

During my four years of graduate education in communication, I was fortunate enough to experience a number of successes. However, none was more satisfying than the present opportunity to recognize formally all the people responsible for my completion of the Ph.D. program. To all of you, I extend my deepest thanks for making my dream a reality.

First, I want to thank my mentor and friend Gerald R. Miller for his intellectual inspiration and interpersonal support. I have been extremely fortunate for the past four years to have the opportunity to benefit from his wisdom and devotion. Perhaps no mentor is revered more by his/her students than G.R. While I am thrilled to leave Michigan State with my Ph.D., I will miss his presence very much.

To be sure, no one has sacrificed more for me than my wife Bridget and daughter Rachel. Both of them have endured numerous financial and social hardships so that I could obtain my Ph.D. For all of their love, encouragement, and patience, I dedicate my dissertation to Bridget and Rachel.

Much of the reward in receiving my Ph.D. derives from the tremendous pleasure it gives me to share my success with my parents, Maurice and Mary Jane deTurck. For thirty years my parents have devoted themselves completely to my brothers' and my intellectual, social, and spiritual development. I am keenly aware and most grateful for all their sacrifices. Were it not for my parents, I would not have finished my B.A., let alone my Ph.D.

I am extremely appreciative of my committee's contributions to my dissertation. Norbert Kerr and Michael and Judee Burgoon offered many vital suggestions implemented in the conceptualization, design, and analysis of my dissertation. It has been my good fortune to have them serve as committee members.

Finally, I wish to thank my graduate student colleagues and friends who have contributed immensely to my academic growth. Jarold Hale, James Dillard, James Stiff, and Scott Garrison. We not only survived a gauntlet but managed to have a lot of laughs in the process. I am fortunate to number these friends among colleagues.

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CHAPTER I

INTRODUCTION AND RATIONALE

Students of communication have devoted considerable research energy to understanding the process of deceptive communication. One line of research has examined observers' ability to detect deception on the part of relative strangers (Bauchner, Brandt & Miller, 1977; Bauchner, Kaplan & Miller, 1980; Ekman & Friesen, 1974; Miller, deTurck & Kalbfleisch, 1983). A second line of research has investigated the verbal and nonverbal correlates of deceptive communication (Knapp, Hart & Dennis, 1974; Kraut, 1978; Miller et al., 1983; O'Hair, Cody & McLaughlin, 1981). Yet a third avenue of deception inquiry has developed almost exclusively among criminal justice scholars. These researchers employ a polygraph apparatus or some combination of physiological measures to detect deception perpetrated by a bogus criminal (Dawson, 1980; Gustafson & Orne, 1963, 1965; Lykken, 1979; Thackery & Orne, 1968).

A common assumption linking the three literature domains is that lying is an arousing communicative experience. Few people would deny that lying stirs at least a twinge of anxiety and at most a state of panic. Though numerous researchers have invoked an arousal model to explain their results, except for studies of physiological deception detection (PDD), no research has examined the arousing properties of deception. The purpose of this study is to outline a conceptual framework for investigating an arousal interpretation of deception and to employ procedures which test the arousing properties of deception.

Deception and Arousal: Sympathetic Activation During Deception

That deception increases a person's physiological arousal is not a novel idea. Marston (1921) compared blood pressure recordings between deceptive and nondeceptive communicators and reported 94% accuracy in detecting deceivers. However, when Marston enlisted a group of experimenters to review the same blood pressure records he used to judge veracity, the experimenters achieved only a mean accuracy of 74%. Unfortunately, this early PDD research is not an isolated example regarding the degree of variability among PDD researchers' reliability.

Lykken (1979) argued that the polygraph test is accurate from 64% to 71% of the time (with a chance level of 50%) when polygraph data (graphs) are judged blindly. Save for electrodermal responses, a close examination of the PDD literature reveals considerable ambiguity about the utility of specific physiological measures for detecting deception. For instance, using finger pulse volume and blood volume measures to detect deception, PDD researchers have achieved a range of 54% to 73% accuracy (Podlesney & Raskin, 1977). Similar discrepancies have emerged for other specific physiological detection criteria, e.g., blood pressure, heart rate, respiratory measures, and muscle activity (Podlesney & Raskin, 1977). Yet electrodermal measures--

e.g., skin resistance and skin conductance--consistently yield high rates of detection accuracy. Moreover, with an average rate of 90% accuracy, electrodermal responses have emerged as the single best measure for detecting deception in a laboratory (Orne, Thackery & Paskewitz, 1972).

Consideration of the neurophysiological properties of the organs being monitored during a "lie detector test" reveals the reason for the superiority of electrodermal responses for detecting deception. Within the autonomic nervous system, there are two subsystems of nervous fiber: parasympathetic and sympathetic. The parasympathetic nervous system is predominant when a person is relaxed and functions to maintain basic body operations. Sympathetic nerve fiber serves to regulate organic functions during time of stress so as to support the organism. The parasympathetic and sympathetic nervous system complement each other. When an organism confronts a stressful situation, the sympathetic nervous system is activated to prepare the organism for danger. The parasympathetic nervous system returns the organism to a homeostatic state after the threatening stimulus ceases.

Adams (in press) offers a particularly useful neurophysiological review of the effects of stress on the autonomic nervous system as they relate to polygraph examinations. Adams points out that most organs are innervated by fibers from the parasympathetic and sympathetic nervous systems. For instance, a person's heart, gastrointestinal tract, muscles (voluntary and involuntary), and glands receive information from both branches of the automatic nervous system. One notable exception is the atrichial sweat glands located over the entire body surface. These glands are activated only by sympathetic nerve fiber, and therefore, receive no negative feedback from parasympathetic innervation.

That all of the organs except atrichial sweat glands monitored during polygraph exams receive "dual autonomic innervation" provides at least one explanation for the relatively poor accuracy of polygraphers in detecting deceptive messages. Organs receiving parasympathetic and sympathetic nerve fiber may not accurately reflect low to moderate levels of stress since they are "stimulated" by sympathetic nerve fiber but also "sedated" by parasympathetic input. More specifically, parasympathetic responses may minimize or negate sympathetic activation during low to moderate levels of stress. Polygraphers attempting to make veracity judgments based on graphic differences between physiological responses measured during truthful and deceptive communication may have difficulty interpreting the results accurately. Since most polygraphs measure organs receiving "dual autonomic innervation," parasympathetic stimulation may minimize the increase in arousal when a communicator shifts from a truthful to a deceptive message. Electrodermal responses, however, are based on atrichial secretion and these glands are unaffected by parasympathetic regulation. As a result, veracity judgments based on electrodermal response graphs are far more accurate since these measurements reflect only sympathetic arousal.

While Adams' neurophysiological insight provides a rationale for polygraphers' relatively poor ability to detect deception, an even greater problem confronts polygraphers. The guiding assumption of PDD research is that when persons encode a deceptive message they emit greater levels of sympathetic activation than when they communicate truthfully. Although polygraphers measure sympathetic activation while communicators encode deceptive and nondeceptive messages, PDD researchers do not compare directly rates of sympathetic activation during deception to rates of sympathetic activation during truth telling. Rather, PDD researchers compared trained observers' ability to interpret physiological response graphs taken while a communicator lied and told the truth to detect at what point, or on which verbal response, the communicator was lying.

The approach employed in PDD research serves well the purposes of polygraphy, for the polygraphy researcher's primary concern is to replicate the conditions under which polygraphy examinations are conducted during criminal investigations. Despite the leading role of physiological measurements in PDD research, the introduction of human judgment provides only an indirect test of the assumption underlying this research paradigm. To test directly the effects of deception on sympathetic activation, the level of sympathetic arousal during deception must be compared directly to the level of sympathetic arousal while communicating veridically. The impressive rate of deception detection accuracy based on electrodermal graphs provides strong indirect support regarding the arousing property of deception. Although there is substantial indirect evidence supporting the claim that deceivers emit greater sympathetic activation, this study seeks to test directly the hypothesis that liars experience greater levels of sympathetic arousal than nonliars. Formally:

> H1: Communicators switching from a truthful to a deceptive message demonstrate greater levels of a sympathetic activation than communicators who encode only truthful messages.

The Effects of Arousal on Verbal and Nonverbal Behavior During Deception

Directly comparing the sympathetic activation of communicators during deceptive and truthful encoding provides a critical test of an arousal interpretation of the deception literature. This comparison, however, deals only with the physiological domain of deception research. Researchers examining the behavioral correlates of deception have argued that deception-induced arousal is the mechanism underlying differences between the behavioral displays of liars and nonliars. A careful perusal of the research investigating the verbal and nonverbal correlates of deception reveals that no one has tested the relationship between communicators' arousal and behavior while encoding truthful and deceptive messages. This section explains why deception-induced arousal should stimulate greater verbal and nonverbal responding. Although Hemsley found that when compared to nondeceivers, deceivers engaged in more eye movements, blinks, adaptors, nonfluencies, and smiles, had shorter response latencies, and added more information to their communication; he failed to test if increases in arousal corresponded with increases in these nonverbal behaviors. Hemsley's study is typical of the research in this domain of deception inquiry;

deception is assumed to increase a person's arousal and the deception-induced arousal is assumed to affect verbal and nonverbal behavior.

The Effects of Arousal on Behavior

Not only do deception researchers assume that arousal affects a communicator's verbal and nonverbal behavior, a number of studies have demonstrated that increases in arousal are related to increases in certain verbal and nonverbal behaviors. Using eyeblinks as an indicator of generalized arousal, Meyer (1965) observed an increase in blinking as arousal increased. Williams and Stevens (1969) analyzed pilots' radio transmissions and found their fundamental frequency increased with stress during airborne difficulties. Fairbanks (1940) also found that persons intentionally expressing arousing emotions such as fear and anger encoded with greater fundamental frequencies than their relaxed counterparts. More recently, Scherer (1980a, 1980b) reviewed the relevant research regarding the effects of stress on fundamental frequency and concluded that experimentally-induced arousal increases fundamental frequency. Thus, highly arousing emotions are associated with increases in fundamental frequency while emotions characterized as low in arousal are associated with low fundamental frequency. Kasl and Mahl (1965), examining the relationship between arousal and speech errors and hestiations in an interview setting, concluded that as interviewees' level of anxiety increased, their number of nonfluencies and pauses also increased. Finally, persons experiencing greater stress, as measured by the Taylor Manifest Anxiety Scale, during a complex verbal-coding task were found to have longer response latencies than more relaxed persons (Katchmar, Ross & Andrews, 1958). The studies reviewed above provide direct support for the relationship between arousal and certain behavioral displays.

Less direct evidence exists for expanding the relationship between arousal and overt actions to include additional verbal and nonverbal behaviors. Several deception researchers have argued that eye movements, or shifts from a "look" to a "nonlook" position, indicate a state of internal arousal. Recently, Burgoon, Buller, Hale, and deTurck (1984) investigated the meanings people assign to various nonverbal behaviors. Their results revealed an inverse relationship between eye gaze, smiling, and perceived arousal. More specifically, communicators maintaining little eye contact and rarely smiling were judged to be more anxious than communicators displaying more eye contact and smiling during their interactions.

More salient behavioral displays have been linked with physiological activation. For instance, adaptors, or behavioral adaptations, are gestures used to relieve some physical or emotional need. Such gestures include picking, scratching, grooming, and manipulating an object or oneself. Self-adaptors refer to self-manipulation whereas object-adaptors refer to manually manipulating an object other than oneself. Working with counseling patients, Dittmann (1962) and Sainesbury (1955) found that high levels of emotional arousal are associated with high rates of adaptive behavior.

Turning to yet another body of literature, the concept of source credibility provides some insight regarding the relationship between arousal and behavior. One underlying dimension of credibility is composure (Berlo, Lemert & Mertz, 1969). Composure refers to the amount of anxiety or arousal that the communicator is perceived to be experiencing. Presumably, as a communicator's manifest arousal exceeds some optimal threshold, his/her credibility begins to decrease. Introductory communication and public speaking texts provide "cookbook recipes" for students as to which behaviors they should control so as to appear calm and to increase their credibility. Many of these same behaviors have already been discussed; however, leg and feet gestures or fidgeting are salient behavior displays missing from the above list. Students learning the art of communication typically are taught not to engage in excessive leg or foot movements so as to distract their audience.

Ekman and Friesen (1969) argue that a person's extremities provide the most valuable source of information for deception detection. According to their <u>leakage hypothesis</u>, when people encode deceptive messages they experience some arousal. The hands, legs, and feet provide the best sources for detecting arousal, since they are not as easily controlled by liars as the face. In other words, liars leak more information regarding their arousal through their hands, legs, and feet than through their faces. Ekman and Friesen (1974) support their initial claim (Ekman and Friesen, 1969) that the legs, feet, and hands provide the richest source of nonverbal information regarding a communicator's veracity.

Message duration, or the length of time communicators spend encoding a message, is another cue to deception that has not been linked directly to sympathetic activation. Deceivers have typically required more time to encode their messages than nondeceivers (Motley, 1974), but this result has not been tied to an arousal interpretation. Matarazzo, Wiens, Jackson, and Manaugh (1970) indirectly examined the effects of deception-induced motivation on response duration and found deceivers required less time than nondeceivers to encode their messages. Matarazzo et al. (1970) argued that encoding a deceptive message increases a communicator's motivational state which in turn reduces his/her message duration. To the extent physiological activation "drives" the above verbal and nonverbal behaviors, an increase in sympathetic activation should result in changes in behavioral frequencies for the cues outlined above. Formally, as their arousal increases, communicators will display:

H2: More blinks.

H3: More adaptors.

H4: Fewer smiles.

H5: More leg/feet gestures.

H6: More hand gestures.

H7: Less eye contact.

H8: More speech errors.

H9: More time pausing.

H10: Increased response latencies.

H11: Decreased message duration.

Arousal and Behavior: The Behavioral Correlates of Deception

All of the behaviors reviewed above have emerged in at least one study as an index of deception (Hemsley, 1977; Knapp et al., 1974; Kraut, 1978; Miller et al., 1983; O'Hair et al., 1981; Streeter, Krauss, Geller, Olson & Apple, 1977). A perusal of the research examining the nonverbal correlates of deception reveals that when compared to non-deceivers, deceivers blink more frequently (Hemsley, 1977); display more eye shifts (Knapp et al., 1974), engage in more adaptors (O'Hair et al., 1981), display more leg and feet gestures (Ekman & Friesen, 1974), and display fewer smiles (O'Hair et al., 1981).

Deceptive communicators also emit different rates of various verbal responses than truthful communicators. More specifically, compared to veridical communicators, prevaricators encode with a higher fundamental frequency (Ekman, Friesen & Scherer, 1976), commit more speech errors (Kraut, 1978), pause more frequently (Feldman, Devin-Sheehan & Allen, 1978), and have longer response latencies and shorter message durations (Kraut, 1978). To the extent deception is an anxiety-producing communicative experience, as communicators shift from encoding a truthful to a deceptive message should produce both changes in sympathetic activation rates and verbal and nonverbal responding.

Isolating the behavioral correlates of deception. Despite the large number of cues posited as indices to deception, Kraut's (1980) meta-analysis revealed only four behaviors that reliably distinguished deceivers from nondeceivers: blinks, adaptors, speech errors, and message duration. The findings from Kraut's (1980) meta-analysis may prematurely lead researchers to abandon examining the effects of deception on behaviors other than those he has identified. Many of the studies reviewed by Kraut (1980) suffer from methodological problems that may contribute to Type II errors. For instance, several studies have provided deceivers with five to ten minutes to prepare and rehearse their deceptive messages without systematically controlling for rehearsal effects (see, for example, Knapp et al., 1974; Mehrabian, 1971). Recently, investigators have revealed that the opportunity to rehearse exerts a definite effect on deceptive communication (DePaulo, Davis & Lanier, Note 1; Littlepage & Pinnault, Note 3; Miller et al., 1983; O'Hair et al., 1981). Miller et al. (1983) argued that rehearsal may serve to reduce at least some kinds of deceivers' arousal to a level similar to nondeceivers. As a result, rehearsed deceivers would display patterns of verbal and nonverbal responding similar to those of spontaneous truth tellers.

Another meta-analytic study (Zuckerman, DePaulo & Rosenthal, 1980) confirmed Kraut's finding that adaptors and speech errors reliably distinguish fabulists from nonfabulists. In addition, Zuckerman et al. identified several other nonverbal and linguistic indicators of deceptive communication. Hand shrugs, negative statements, irrelevant information, voice pitch, and pupil dilation also emerged as reliable markers of deception. That Zuckerman et al. and Kraut identified only two common behaviors which reliably distinguish liars and nonliars raises suspicions regarding the reliability of the additional deception cues cited by Zuckerman et al. While the latter authors argued that data show hand shrugs to be a valid indicator of deception, at least two studies not reviewed by Zuckerman et al. suggest deceivers do not engage in significantly greater rates of hand shrugs than nondeceivers (Ekman & Friesen, 1974; Feldman et al., 1978). Similarly, while Zuckerman et al. report that the combined effect of four studies indicates irrelevant information is a linguistic marker of deception, Kraut reviewed seven studies and obtained no overall effect for the discriminatory value of this variable between deceptive and truthful language. The overall effect for negative statements mentioned by Zuckerman et al. primarily is based on the findings in Knapp et al. who found no significant difference between liars and nonliars with respect to their frequency of negative remarks. The other two studies reviewed by Zuckerman et al. reveal trivial differences between deceivers and nondeceivers regarding their negative communication. Pupil dilation is the one cue reported by Zuckerman et al. but not by Kraut that appears to be a reliable indicator of deceptive communication. Unfortunately, the value of this cue for distinguishing between deceivers and nondeceivers is overshadowed by the difficulty in detecting it. Most persons probably cannot track another's pupillary changes during an ongoing conversation. Whereas the other cues reviewed thus far are readily available to persons in a "normal" conversational distance, detecting pupil dilation would require extreme scrutiny during an interaction, scrutiny which might itself trigger pupillary movement. Similarly, it is doubtful that people are sensitive enough to detect deviations from normal voice pitch patterns during ongoing interaction.

A number of deception researchers may have inadvertently increased truth tellers' arousal to a level similar to deceivers by exposing them to arousing stimuli. Miller et al. (1983), for example, had research participants view two types of stimulus slides. One set of slides depicted beautiful landscapes and gardens whereas the other set of slides were photographs of horribly disfigured third-degree burn victims. Miller et al. (1983) had research participants view four sets of slides and required each participant to lie and tell the truth while exposed to the pleasant slides and lie and tell the truth while viewing the unpleasant slides. Unpublished findings obtained by Miller et al. (1983) revealed that when communicators reported their truthful feelings while viewing the grotesque burn victims, they were judged more often to be lying than in any other condition. This finding suggests the unpleasant slides sufficiently aroused truthful communicators so as to generate a pattern of behavioral responses similar to deceivers' behavior. Miller et al's. (1983) use of pleasant and unpleasant stimulus slides is not an isolated case (Brandt, Miller & Hocking, 1980a, 1980b; Ekman & Friesen, 1974; Ekman et al., 1976; Hocking & Leathers, 1980).

To the extent aroused truthful and deceptive communicators emit similar patterns of verbal and nonverbal behavior, persons seeking to make veracity judgments are confronted with the problem of distinguishing liars from nervous nonliars. One strategy for solving this problem lies in comparing the behavior of aroused truthful communicators with that of deceptive communicators to isolate the verbal and/or nonverbal cues unique to deception-induced arousal. If both deceivers and aroused nondeceivers evince comparable levels of sympathetic activation but if deceivers display some unique configurations of verbal and/or nonverbal cues, these behaviors could serve as indicators of deception-induced arousal. Moreover, if these same cues also distinguish unaroused nondeceivers from aroused deceivers, they can be invoked as reliable indices of deception across a wider range of deception detection contexts.

Although several behavioral correlates of deception also serve as indices of generalized arousal, certain verbal and/or nonverbal cues may appear in concert during deception, or may occur with greater frequency during deceptive encoding than during veridical encoding. Hull's (1943) drive-reduction learning theory provides a useful framework for conceptualizing why sympathetic activation may result in different behavioral manifestations. If we conceive of arousal, or drive, as a generalized energizer that increases the probability of all possible responses to a given stimulus, behaviors with stronger stimulus-response (S-R) pairings--i.e., with greater habit strength--are relatively more likely to occur than weaker responses when drive is increased.[1]

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[1]According to Hullian theory (1943), drive and habit strength combine in a multiplicative function; in addition, the strength or magnitude of the reinforcer contributes in predicting whether an organism will respond in the presence of a given stimulus. Formally, Excitatory Potential (behavior) = Drive X Habit Strength + Reinforcement.

According to Hull, there are no qualitatively different types of arousal or drive. In other words, the sympathetic changes occurring during deception do not differ qualitatively from other emotional states. For instance, fear-arousing stimuli, sexually arousing stimuli, and deception-induced arousal all result in sympathetic activation, i.e., increased heart and respiratory rates, greater muscle tension, and more atrichial secretion. Nevertheless, persons experiencing these emotional states do not typically display the same patterns of verbal and nonverbal behavior. People who are frightened by someone, for instance, typically assume a rigid posture and display very little movement. Sexual arousal, however, may be reflected by an increase in immediacy cues (see, for example, Mehrabian, 1971). More specifically, sexual arousal is associated with an increase in eye contact, touching, more direct body posture, and verbal indications of interest and attraction. According to the studies outlined above, deception-induced arousal results in a number of verbal and nonverbal displays that can hardly be characterized as increased immediacy. Instead, deceivers typically engage in behaviors that qualify as nonimmediate responses.

To be sure, the behavioral displays in the three examples cited above are not mutually exclusive. Similar to liars, when people are frightened they engage in more hand gestures, stutter, and blink more frequently. The distinguishing feature between deception-induced arousal and other emotional states may be the habit strengths associated with the various displays. A goal of the present study is to determine the behavioral similarities and differences between deception-induced arousal and generalized arousal (see, for example, Duffy, 1957). The following hypotheses and research question are derived from the preceding line of argument. When compared to nonaroused nondeceivers, liars will display:

H12: More blinks.

H13: More adaptors.

H14: Fewer smiles.

H15: More feet/leg gestures.

H16: More hand gestures.

H17: Less eye contact.

H18: More speech errors.

H19: More time pausing.

H20: Longer response latencies.

H21: Shorter message duration

Q1: Compared to aroused nondeceivers, do deceivers display different patterns of verbal and nonverbal behaviors?

The Effects of Gender on Sympathetic Activation and Behavior During Deception

Examination of the PDD research reveals that women have seldom participated in these studies. Studies reporting the gender of research participants reveal that only males were recruited to participate in PDD research. This obvious sampling flaw calls into question the external validity of many of the polygraph findings. There is, however, some evidence suggesting that males and females respond to emotional situations with different levels of sympathetic activation.

Jones (1960) monitored both the physiological responses and overt behavior of males and females as they experienced various emotions. His results indicated that the sexes responded differently during emotional arousal with respect to physiological activation and overt expressiveness. More specifically, males responded to emotional arousal with greater physiological activation than females but displayed less overt expressiveness than females. Jones labeled persons who primarily responded to emotional arousal with physiological activation "internalizers" and labeled as "externalizers" those persons who responded to emotional arousal with overt expressiveness.

More recently, Buck, Savin, Miller, and Caul (1974) monitored men's and women's physiological and behavioral responses while they communicated emotional reactions to various stimulus slides. Buck et al's. findings duplicate Jones' (1960) results: Females communicating their emotional reactions to stimulus slides responded with physiological nonactivation and overt expressiveness ("externalizers") whereas males responded with overt nonexpressiveness and physiological activation ("internalizers"). If we conceive of deception as an emotionally-arousing communicative context, the findings reported by Jones (1960) and Buck et al. (1974) provide a basis for predicting that men and women will differ in sympathetic activation while deceiving. Formally:

H22: When switching from a truthful to a deceptive message males will experience greater sympathetic activation than their female counterparts.

The results of Jones (1960) and Buck et al. (1974) suggest that when compared to male liars, females encoding deceptive messages should display greater rates of overt behavior. Nonetheless, of the few studies that have tested for behavioral differences between men and women during deception, there is little evidence to support the claim for gender differences regarding overt deceptive cues. Three studies (DePaulo, Rosenthal, Rosenkrantz & Green, Note 2; Dulaney, 1982; McClintock & Hunt, 1975) found no statistical differences between men's and women's behavioral responses during deception. Only one study (Feldman et al., 1978) obtained results indicating that men and women exhibit different behavioral patterns during deception. Contrary to Jones' (1960) and Buck et al's. (1974) findings, Feldman et al. (1978) found males displayed greater rates of hand and leg gestures than their female counterparts. Thus, males and not females appear to respond with more overt expressiveness during deception, but this effect is limited to peripheral body movements such as hand and leg gestures. The above line of argument suggests the following hypothesis:

H23: When switching from a truthful to a deceptive message, men will display greater rates of hand and leg/feet gestures than their female counterparts.

CHAPTER II

METHOD

This chapter presents conceptual and operational definitions for the following constructs: deception, arousal, and the verbal and nonverbal correlates of deception reviewed above. The procedures for testing the proposed arousal model are also discussed.

Definitions

Deception is defined conceptually as "the withholding and/or substitution of information by an individual with the deliberate intent to create beliefs on the part of others which the individual believes are false or invalid" (Miller, Bauchner, Hocking, Fontes, Kaminski & Brandt, 1981). Consistent with the conceptual definition borrowed from Miller et al. (1981), deception was operationalized by implicating persons in a cheating situation during a problem-solving task. Persons implicated in the cheating were interviewed to determine how they solved the problem. Anyone reporting anything other than the fact he/she cheated or witnessed someone cheating was considered deceptive.

Arousal is defined as a communicator's degree of sympathetic activation. According to Adams (in press), atrichial secretion is controlled by only sympathetic innervation. Moreover, Adams provides an excellent overview of the effects of sweat gland activity on the electrodermal properties of the skin. As perspiration rate increases, the dermis becomes saturated with a mild salt solution. Since salt water is a good conductor of electrical current, an increase in perspiration results in a decrease in the skin's resistance to electrical current. Based on Adams' neurophysiological review of arousal and its measurement, arousal was operationalized by measuring cutaneous resistance to electrical current.

Nonverbal Behaviors

In laying the foundation for an arousal interpretation of deceptive behavior, six nonverbal cues were identified as indices of deceptive encoding: blinks, eye contact, smiles, adaptors, feet/leg gestures, and illustrators. Definitions of these nonverbal cues are summarized in Table 1. The rate of occurrence of these behaviors was determined either in terms of frequency or duration. More specifically, behaviors denoted by an "f" in Table 1 were measured by counting how often a communicator/deceiver displayed that particular behavior while encoding truthful and deceptive messages. Behaviors denoted by a "d" were timed to determine how long a communicator/deceiver engaged in that behavior while encoding truthful and deceptive messages. The rates of communicator/deceivers' nonverbal behavior during truthful encoding were determined by dividing the behavioral frequencies or durations by the total duration communicator/deceivers required to encode their truthful messages. Similarly, behavioral response rates during deception were determined by dividing the behavioral frequencies or durations by the total duration of time communicators/deceivers required to encode a deceptive message.

Table 1

Definitions of Nonverbal Behaviors[a]

Nonverbal Behaviors	Definitions
Eyecontact (d)	Duration of time communicator/deceiver spends looking at the interviewer.
Blinks (f)	Any time the communicator/deceiver completely closes his/her eyelids and reopens them.
Smiles (f)	Any time communicators/deceivers display major changes in positive facial affect, excluded are hard to distinguish grins.
Adaptors (d)	Any time a communicator/deceiver manipulates any part of his/her body or some object, excluded are hand gestures that do not involve touching or manipulating some body part or object.
Feet/leg gestures (d)	Any time a communicator/deceiver moves his/her legs and/or feet, e.g., crossing and uncrossing of legs, nervous twitches in feet, etc.
Hand gestures (d)	Any time a communicator/deceiver moves his/her hand(s) and/or arm(s), gesturing horizontally or vertically, i.e., any time when a communicator/deceiver's hands are not in a motionless or touching position.

[a]Behaviors denoted with an (f) indicate they were measured as a frequency of occurrence; behaviors denoted with a (d) indicate they were measured as a duration of time.

Verbal Behaviors

Definitions of the verbal correlates of deception reviewed earlier are summarized in Table 2. Each communicator/deceiver's speech error and pause rates were determined using the same method outlined for nonverbal behaviors. Since it does not make sense to discuss message rates or response latency rates, these behaviors were operationalized as temporal durations.

Procedures

Sample

Sixty students were solicited from introductory communication classes to participate for extra credit in the proposed study. Thirty male and thirty female students served as communicator/deceivers. The sixty communicator/deceivers were randomly assigned to one of three conditions with equal numbers of men and women in each condition: deception, nonaroused truthful, and aroused truthful.[2]

Experimental Procedures

Deception. Using the same basic procedures as Exline, Thibaut, Hickey, and Gumpert (1970), communicator/deceivers were implicated in cheating during a task performed with a confederate. Upon arriving at the experimental site, communicator/deceivers received a typewritten prebriefing message detailing the purpose of the study and their role

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[2]One of the videotapes was accidentally destroyed during coding. As a result, five communicator/deceivers' responses were lost. One additional communicator/deceiver was eliminated randomly from the deception condition so as to maintain an equal N per cell. Fifty-four communicator/deceivers remained for all analyses (27 men and 27 women).

Table 2

Definitions of Verbal Behaviors

Verbal Behaviors	Definitions
Message duration (d)	The amount of time a communicator/deceiver spends talking.
Pauses (d)	Periods of silence of one second or more following an utterance by a communicator/deceiver followed by an utterance or speech error by the communicator/deceiver, i.e., uninterrupted by the interviewer.
Response latency (d)	The amount of time between the end of the interviewer's question and the beginning of the communicator/deceiver's answer, excluded are speech errors.
Speech errors (f)	Nonfluencies or quasiverbalisms like uh, ah, um, er, mm, etc. uttered by communicator/deceivers.

[a]Behaviors denoted by an "f" indicate they were measured as a frequency of occurrence; behaviors denoted by a "d" indicate they were measured as a duration of time.

The prebriefing mentioned two major objectives in the study: first, to determine the effects of group size on problem-solving abilities and procedures--i.e., to determine the strategies used by groups of differing size to solve a given problem; second, to determine the relationship between group tension and the type and number of solutions groups generate. Communicator/deceivers were informed that they had been randomly selected to work with only one other person in the problem-solving task.

Communicator/deceivers were joined by the confederates in the room where the experimental task was to be performed. The experimenter then left the communicator/deceiver and confederate alone for three minutes so they could become acquainted. The confederate was instructed to be very friendly toward the communicator/deceiver. This ingratiation period was designed to minimize communicator/deceiver mortality. Since communicator/deceivers in the deception condition were to witness the confederate "cheat" and to become involved with the confederate in cheating, it was necessary to minimize the likelihood of communicator/deceivers telling on the confederate or confessing they had participated in the cheating. Confederates were unaware at this time of the condition to which the communicator/deceiver was assigned.

After three minutes had passed, the experimenter returned and explained the nature of the problem-solving task to the communicator/deceiver and the confederate. Since previous deception research has been criticized for failing to provide deceivers with adequate motivation to deceive (Knapp & Comadena, 1979), the experimenter instructed the participants that the problem-solving task was a very reliable intelligence test. Gustafson and Orne (1963) found that when communicator/deceivers were informed the task they participated in reflected their intelligence, they were significantly more motivated than uninformed communicator/deceivers. Moreover, communicator/deceivers were informed that their results on the intelligence test would be compared to their grades from the communication class from which they were recruited to determine the validity of the test. It was stressed that the results from the study would not affect the participants' grades other than the extra credit they would earn from participating in the study.

Communicator/deceivers were also told that the results of their participation in the intelligence test would be shared only with their communication instructor. This maneuver was intended to suggest possible negative consequences for cheating on the test and lying about it. Presumably, communicator/deceivers in the deception condition would be worried about what might happen if their instructor learned they were involved in cheating.

The prebriefing also provided a description of the problem-solving task. The task consisted of ten dot cards grouped in two sets of five cards each. The experimenter instructed participants that their task was to work with each other to estimate the number of dots that appeared on the two separate sets of five cards (ten cards total). After each dyad had made its estimates for the first set of cards, the participants were interviewed to determine the dyad's strategies for estimating the number of dots and recognizing the shapes formed by the dots.

After the communicator/deceivers completed their first interview, they were reunited with the confederate in the original room used during the first series of dot estimations. The experimenter explained to them that he would be gone for about five minutes to get the cards needed for the second series of dot estimations. Before leaving, the experimenter placed the group's first answers in his folder. Immediately after the experimenter left the room, the confederate started complaining about the failure of the experimenter to provide them with feedback concerning their performance on the first series of estimations. The confederate asserted: "How does he expect us to see where our mistakes are if he doesn't tell us where we went wrong on the first set? He is supposed to tell us the answers for the first set, isn't he? I don't know about you, but I don't want my communication instructor to know I flunked an easy intelligence test."

The confederate then pointed out to the communicator/deceiver that the experimenter left his folder behind and suggested they look in the experimenter's folder to review their answers. If the communicator/deceiver objected, the confederate explained to him/her that the experimenter should have given them the correct answers to their first estimations anyway. Despite what the communicator/deceivers said, the confederate located their answers to the first set of cards and "accidentally" found the answer key for the entire set of stimulus cards. The confederate verbally related the answers to the communicator/deceiver and suggested that she learn the first three and the communicator/deceiver memorize the last two. The experimenter monitored the confederate's actions through a microphone placed in the room for interviewing after each series of estimations. After the confederate returned the folder to its original position, she waited a minute and then remarked, "I wonder where he is?" This was the experimenter's cue that it was clear to return.

To involve the communicator/deceivers in the cheating as much as possible, the confederate pushed the communicator/deceiver to report the exact number of dots listed in the answer key for each card. If communicator/deceivers resisted, the confederate was instructed to push as much as seemed reasonable and to hold out for an answer, 10 or 20 dots away from the exact number.

Aroused/truthful and nonaroused truthful. The procedures for communicator/deceivers in the aroused/truthful and unaroused/truthful conditions were identical to the procedure outlined above for the deceptive condition, except communicator/deceivers in these conditions did not participate in any cheating. To maintain parallelism between all three conditions, the confederate behaved the same way in all three conditions save for the cheating. For instance, during the five minutes while the experimenter was out picking up the second set of cards, the confederate complained about lack of feedback just as she did in the deceptive condition. Thus, all facets of the three conditions were the same except for the cheating.

Interviewing and Videotaping

Deception and nonaroused truthful. After the first series of estimations, the experimenter informed the dyad that they were going to be interviewed to determine the group strategy for estimating the dots. The experimenter pointed out that he would like to interview both persons simultaneously so as to save their time. He asked the confederate if she would mind going down the hall to be interviewed since there was only enough room and equipment to interview one person in the experimental room. Confederates, of course, were not actually interviewed.

Communicator/deceivers were led to a chair in the experimental room located in front of the interviewer's chair. When communicator/deceivers were seated, the experimenter informed them that he was going to attach them to the muscle tension monitor. The experimenter stressed that the electrodes did <u>not</u> deliver painful shocks or sensations and reminded the communicator/deceivers that one goal of the study was to determine the relationship between group size and members' tension. The electrodes were attached to each communicator/deceiver's left hand and were actually connected to a skin resistance amplifier. The experimenter also informed the communicator/deceivers that the video cameras were necessary so that persons could view the tapes and code the type of strategies the dyad used to estimate the number of dots. Wiemann (1981) demonstrated that obtrusive videotaping did not affect communicators' arousal nor their overt behaviors such as adaptors, leaning, gesturing, nods, and number of turns.

After the electrodes were attached, the interviewer commenced with the interview. Each of the two interviews consisted of two sets of three questions. The initial three questions were designed to provide communicator/deceivers an adjustment period so they could acclimate to the interview and equipment (Table 3).[3] Before the interviewer began asking questions, a research assistant started the video cameras and skin resistance monitor. Interviewers did not know the condition assignment of the communicator/deceivers. One video camera was focused on the communicator/deceiver's face to provide a head-only view while the other camera was focused on the communicator/deceiver's entire body so as to provide a head and body view. To assure that communicator/deceivers did not move their chairs out of the picture during the interview, their chairs were fixed.

After the dyad completed the second series of estimations following the implication or nonimplication of the naive participant in cheating, the two members were ushered by the experimenter to separate rooms to be interviewed individually. As in the first interview, communicator/deceivers were attached to the skin resistance monitor under the guise of muscle tension monitor. The protocol for the second interview is summarized in Table 4. The interview protocol is adapted from Exline et al. (1970).

Aroused/truthful condition. The interviewing procedures for communicator/deceivers in this condition were exactly the same as described above except for the arousal manipulation. In the deceptive condition, communicator/deceivers' arousal was manipulated by

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[3]The baseline questions for both interviews were counterbalanced.

Table 3

Interview Protocol for the First Interview

Before I ask you any questions about the strategies you and your partner used to estimate the number of dots, I want to ask you some questions so we can make sure all the equipment is working properly.

1. What are your favorite TV shows?

2. What are some of your hobbies, i.e., what do you do in your spare time?

3. What do you like most about Michigan State University?

O.K., now I am going to ask you several questions about how you and your partner made your estimations.

1. Could you tell me what strategy or strategies you and your partner used to arrive at your answers? Try to detail what you did. For instance, did you use an averaging procedure or counting procedure? (If the communicator/deceiver remains silent, the interviewer will ask him/her if they each made their own estimates and then averaged the two together for their final answer.)

2. Surely you and your partner did something else. It would be nearly impossible for you and your partner to come up with the answers you did using a guess-averaging procedure (if necessary, substitute method or methods given by communicator/deceiver). Did you discover any pattern to the number of dots on the cards or did you see any relationship between the number of dots on the cards and the shapes formed by the dots, what patterns did you find?

3. Based on what you have told me, I cannot figure out how you came up with the answers you did. What else happened that may have affected your ability to perform well on the test? For example, did (name of experimenter) go too fast or did your partner not try to do well, or what?

Thank you for your answers. I will go and get (name of experimenter) so he can remove the electrodes and you can continue with the rest of the study.

Table 4

Interview Protocol for the Second Interview

Before I ask you any questions about the strategies you and your partner used to estimate the number of dots and shapes formed by the dots during the second series of estimations, I want to ask you some questions so we can make sure all the equipment is working properly.

1. What are your least favorite TV shows?

2. What do you like to do least in your spare time?

3. What do you like least about Michigan State University?

O.K., now I am going to ask you several questions about how you and your partner made your estimates for the second series of cards. I am surprised at how well you did this time. In fact, your second score borders on the impossible. This is surprising since you did poorly the first time. Just for fun we have figured out approximately what the chances are that you could get the answers to the second series of cards perfectly correct by pure guessing. The chances are roughly 1 in 15,000. Now your group did not do this well, but the chances of your group doing as well as it did are almost as high.

1. Could you tell me what strategy you and your partner used to arrive at your answer?

2. Surely you and your partner did something else. It would be nearly impossible for you to do so well using the methods you have told me. Did you discover any pattern to the number of dots this time or see a relationship between the number of dots and the shapes formed by the dots? What patterns did you find?

3. Based on what you have told me, I cannot figure out why you suddenly have done so well. What else happened that may have affected your ability to perform so well on the test? Did (name of experimenter) or your partner do something differently this time from the last time?

implicating them in cheating and having them lie about it. So as to guarantee comparable levels of arousal between the two arousal conditions, communicator/deceivers' arousal in the aroused/truthful condition was yoked to deceptive communicator/deceivers' arousal levels. More specifically, communicator/deceivers in the deception condition participated first so their mean rate arousal level could be assessed. After arousal level in the deceptive condition was assessed, communicators' arousal in the aroused/truthful condition was matched to it.

To match arousal levels between the two arousal conditions, communicators in the aroused/truthful condition were subjected to a noise stimulus before and during their second interview so as to increase their physiological arousal to levels comparable with communicator/deceivers in the deception condition. The mean difference in arousal for deceivers between their first and second experimental interviews served as a guide for how great a stimulus was needed to increase aroused/truthful communicators' arousal to a comparable level. The volume of noise was adjusted during pretesting to arrive at this determination.

After a series of dot estimations and while the experimenter was attaching the electrodes to the communicator/deceivers, a research assistant in the adjoining control room played a tape of white noise through an audio system to ceiling speakers in the experimental room. An assistant first fed several short bursts into the audio system. After the sudden bursts of noise in the experimental room, the experimenter remarked that a technician was fixing the audio system and needed to test it periodically. When the experimenter finished attaching the electrodes, he told the interviewer he was going down the hall to ask the technician to stop while they were interviewing.

Shortly thereafter, the experimenter returned to the adjoining room and signaled the interviewer to begin the interview. After the communicator completed his/her reply to the third baseline question, the experimenter fed the white noise into the audio system for 30 seconds. During this time the interviewer remained silent. To maintain communicators' arousal throughout the interview, the white noise was fed through the audio system in a short burst after communicators finished answering the first two experimental questions.

After the second interview, all communicator/deceivers were led to another room and asked to complete two brief questionnaires. The first questionnaire contained Spielberger's (1976) State-Trait anxiety scale, nine questions regarding communicator/deceivers' feelings toward the confederates and the dot estimation task, and several demographic questions. The second questionnaire was designed to assess whether communicator/deceivers had any suspicions regarding this study. Communicator/deceivers reporting they knew the actual purpose of the study were not included in data analysis. Similarly, communicator/deceivers in the deception condition who failed to lie during their second interview were not to be included in data analysis.[4] Before

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[4]Although none of the communicator/deceivers reported they knew the purpose of the study, four communicator/deceivers confessed they either actively engaged in cheating with the confederate or witnessed

leaving the test site, communicator/deceivers received a detailed debriefing explaining the goals of the study and the measures employed. Communicator/deceivers were asked not to discuss their participation in the study with anyone until data collection was completed.

Coding Communicator/Deceivers' Verbal and Nonverbal Behavior

Two trained raters coded the videotaped interviews.[5] Rater training consisted of learning the verbal and nonverbal behavioral definitions summarized in Tables 1 and 2. After learning the definitions and demonstrating a minimum of .80 reliability on sample tapes, raters began coding the experimental tapes.[6] To code eye contact, blinks, and smiles, coders used those tapes providing a head only view of communicator/deceivers. All other behaviors were coded from tapes with a full head and body view of communicator/deceivers.

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the confederate cheat (three women and one man). Additional communicator/deceivers were solicited to replace the four deceivers who confessed.

[5]Coders were not informed of the study's purpose. To guarantee their ratings were blind, the word "communicators" was substituted in Tables 1 and 2 for communicator/deceivers.

[6]Interrater reliabilities were computed using Pearson's r. The following reliabilities were obtained: response latency (.92), eye contact (.88), blinks (.88), smiles (.89), pauses (.82), adaptors (.89), hand gestures (.88), leg gestures (.95), duration of interaction (.94), message duration (.95), speech errors (.86).

CHAPTER III

RESULTS

This chapter summarizes tests of the hypotheses and research question posed in Chapter I. Analysis of the data yielded the following results.

Hypothesis 1

This hypothesis specified that compared to communicators who consistently communicate truthfully, communicators shifting from a truthful to a deceptive message will experience higher levels of sympathetic activation. A 2 (message type: truthful unaroused/ deception) X 2 (interviews: first interview/second interview) repeated measures analysis of variance design was employed to test Hypothesis 1. The mean skin resistance readings according to condition are summarized in Table 5. Results confirmed the predicted message type X interviews interaction (F, 1/34 = 24.31; $p < .05$, Omega^2 = .25; Figure 1) and revealed a significant main effect for interviews (F, 1/34 = 13.88; $p < .05$, Omega^2 = .19). Due to the cross-over interaction, the main effect for interviews is uninterpretable. As predicted, when communicators in the deception condition went from telling the truth in the first interview to lying during the second interview, their sympathetic activation increased sharply ($t_{17} = 3.49$, $p < .05$). However,

Table 5

Means for Skin Resistance[a] for Message Types by Interviews

First Interview			Second Interview		
Truthful Unaroused	Deception	Truthful Aroused	Truthful Unaroused	Deception	Truthful Aroused
493.39	491.44	490.33	492.72	496.28	494.06

[a]Skin resistance measured in hertz.

unaroused truthful communicators experienced a nonsignificant decrease in sympathetic activation from the first to the second interview (t_{17} = <1, $p > .05$).

To verify that truthful aroused communicators experienced greater sympathetic arousal than truthful unaroused communicators across interviews, a 2 (message type: truthful unaroused/truthful aroused) X 2 (interviews: first interview/second interview) repeated measures analysis of variance was performed. The results revealed a significant message type X interviews interaction (F, 1/34 = 13.45, $p < .05$, $\text{Omega}^2 = .15$) and a significant main effect for interviews (F, 1/34 = 6.49, $p < .05$, $\text{Omega}^2 = .09$). Due to the cross-over interaction, the interviews' main effect is not interpretable. Since it is germane to the present study that aroused truthful communicators and deceivers experience comparable increases in sympathetic activation across interviews, a 2 (message type: deception/truthful aroused) X 2 (interviews: first interview/second interview) repeated measures analysis of variance was conducted to test the success of the truthful aroused manipulation. Results revealed a significant main effect for interviews (F, $1/34 = 47.00$, $p < .05$, $Omega^2 = .46$). Based on these findings, it was concluded the arousal manipulation for truthful communicators was successful.

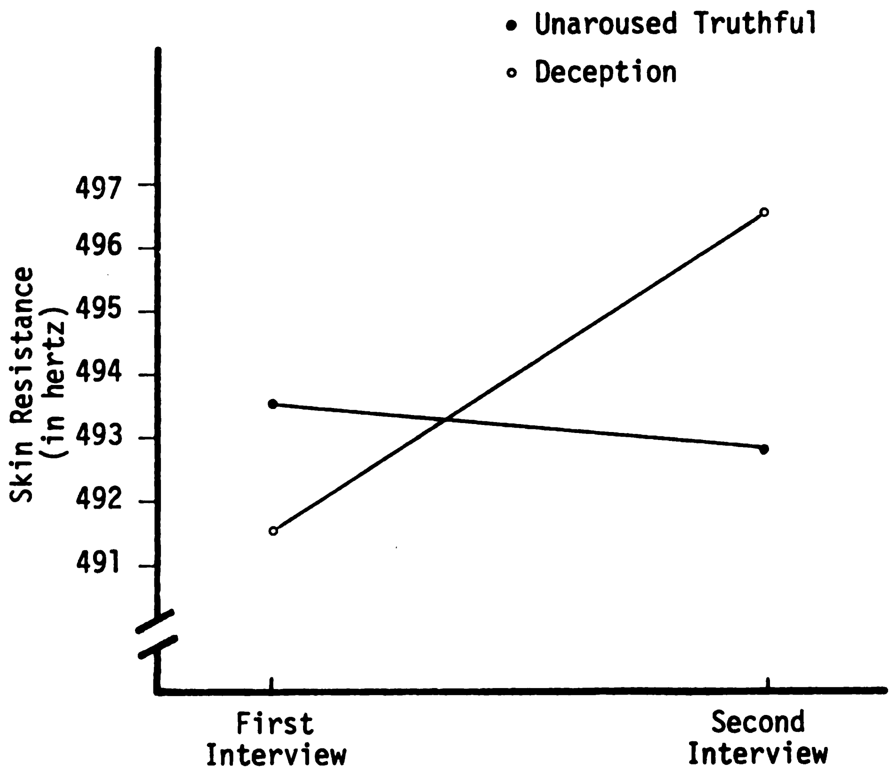

Figure 1. Sympathetic Activation in the Four Conditions.

Hypotheses 2-11

To test the relationship between communicator/deceiver's sympathetic activation and their overt displays, each verbal and nonverbal behavior was regressed on two independent variables: first, the linear component comprising the arousal-behavioral relationship; and second, the quadratic component of the arousal-behavioral relationship. Since the present design includes three experimental conditions, the quadratic component was added to the regression equation to determine if the arousal behavioral relationship is described better by a linear or curvilinear function. The results of the regression analyses are summarized in Table 6. The Beta for each component is presented along with the R^2 for the linear model and the R^2 change after adding the quadratic term into the equation.

Hypothesis 2

As predicted, there was a significant positive linear relationship between communicator/deceivers' arousal and blinking ($F, 1/52 = 12.16$, $p < .05$). However, the quadratic component contributes a significant amount of variance explained when added to the linear predictor ($F, 1/51 = 4.68$, $p < .05$). While the linear arousal-behavioral relationship is significant, a curvilinear relationship accounts for more of the variance, and therefore, provides a better fit with the data.

Hypothesis 3

As predicted, there was a significant positive relationship between communicator/deceivers' sympathetic activation and their

Table 6

Summary Results of Regression Analyses Between Skin Resistance and Deception Cues

	Skin Resistance Predictors			
	Linear[a]		Quadratic[b]	
Behaviors	B	R^2	B	R^2 Change
Blinks	.26	.18[c]	.31	.07[c]
Adaptors	.41	.23[c]	.14	.02
Smiles	-.14	.02	-.02	.00
Feet/leg gestures	.07	.02	.12	.01
Hand gestures	.18	.03	-.02	.00
Eye contact	-.30	.03	-.23	.04
Speech errors	.34	.07[c]	-.13	.03
Pauses	.25	.08[c]	.05	.00
Response latency	.27	.11[c]	.11	.01
Message duration	-.20	.03	.05	.00

[a]df for F = 1, 52.

[b]df for F = 1, 51.

[c]$p < .05$.

adapting behavior (F, $1/52 = 15.89$, $p < .05$). The quadratic component failed to contribute significantly to the overall variance accounted for above the linear component. Thus, Hypothesis 3 was confirmed; as communicators' arousal increases so does their adapting behavior.

Hypothesis 4

Although the negative linear relationship between communicator/deceivers' arousal and smiling is in the predicted direction, it was not significant. Moreover, the quadratic component in the equation was not significant.

Hypothesis 5

Hypothesis 5 was not confirmed. Although there was a positive linear relationship between communicator/deceivers' arousal and feet/leg gestures, it was nonsignificant. The quadratic contribution to the overall variance accounted for also failed to reach significance.

Hypothesis 6

Although the positive linear relationship between communicator/deceivers' arousal and hand gestures is in the predicted direction, it was not significant. Similarly, the quadratic component was not significant.

Hypothesis 7

Although the negative linear relationship between communicator/deceivers' arousal and eye contact is in the predicted direction, it was not significant. The quadratic component was also nonsignificant.

Hypothesis 8

As predicted, there was a significant, positive relationship between communicator/deceivers' sympathetic activation and their speech errors (F, $1/52 = 4.15$, $p < .05$). The quadratic component failed to contribute to the explained variance above the linear component, therefore, the predicted linear relationship provides the best fit.

Hypothesis 9

As predicted, there was a significant, positive relationship between communicator/deceivers' arousal and their pausing (F, $1/52 = 4.43$, $p < .05$). The quadratic component failed to contribute significantly to the overall variance accounted for in the regression equation.

Hypothesis 10

As predicted, there was a significant, positive relationship between communicator/deceivers' arousal and their response latencies (F, $1/52 = 6.42$, $p < .05$). The quadratic component failed to contribute significantly to the explained variance.

Hypothesis 11

Although the negative linear relationship between communicator/deceivers' arousal and message durations is in the predicted direction, it was not significant. The quadratic component was also nonsignificant.

Hypotheses 12-21

To test Hypotheses 12-21, the same 2 (message type: unaroused truthful/deception) X 2 (interviews: first interview/second interview) repeated measures analysis of variance design was employed. The means for all ten behaviors was summarized in Table 7. The results of the analyses of variance are summarized in Table 8.[7]

Hypothesis 12

The prediction that liars would display greater frequencies of blinking than unaroused nonliars was not confirmed. Both groups displayed comparable blinking frequencies during the second interview (t_{34} = 1.15, $p > .05$). Moreover, although deceivers and unaroused truthtellers displayed increases in blinking from the first to the second interview, neither increase was significant (t_{17} = 1.54, $p > .05$) and (t_{17} = 1.49, $p > .05$), respectively

Hypothesis 13

As predicted, there was a significant message type X interviews interaction. Deceivers' adapting increased significantly from the first to the second interview (t_{17} = 3.99, $p < .05$). Unaroused truthtellers' adapting decreased across the two interviews, however, the decrease was not significant (t_{17} = <1, $p > .05$). Moreover, during the second

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[7]Since analyzing frequency data using parametric statistical techniques takes liberty with the assumptions underlying these procedures, all three behaviors coded as frequencies (blinks, smiles, and speech errors) were transformed using an arcsine transformation prior to analyses. The untransformed means are presented for ease of interpretation.

Table 7

Mean Behavioral Rates for Message Types Interviews[a]

	First Interview			Second Interview		
Behaviors	TU	D	TA	TU	D	TA
Blinks	.39	.36	.32	.44	.46	.37
Adaptors	.16	.11	.18	.13	.34	.24
Smiles	.03	.02	.02	.03	.02	.01
Feet/leg gestures	.20	.13	.22	.20	.16	.27
Hand gestures	.28	.25	.23	.21	.38	.18
Eye contact[b]	.26	.27	.20	.24	.33	.21
Speech errors	.27	.27	.22	.21	.38	.22
Pauses	.06	.04	.06	.04	.08	.03
Response latency	5.11	4.51	5.33	3.52	9.17	4.91
Message duration	55.22	49.22	59.22	54.61	37.06	53.83

[a]TU = truthful unaroused, D = deception, TA = truthful aroused.

[b]Denotes proportion of time spent looking away from the interviewer.

Table 8

F Values[a] and Omega² for Hypotheses 12-21[b]

Behaviors	TU/D	Interview	TU/D X Interview
Blinks	.02(.00)	4.02(.04)	.66(.00)
Adaptors	.49(.00)	16.80(.18)[c]	26.00(.26)[c]
Smiles	.70(.00)	.01(.00)	1.11(.00)
Feet/leg gestures	1.40(.00)	.11(.00)	.17(.00)
Hand gestures	1.84(.01)	1.64(.01)	19.94(.21)[c]
Eye contact	1.67(.01)	1.63(.01)	.75(.00)
Speech errors	4.40(.05)[c]	.54(.00)	8.92(.10)[c]
Pauses	.69(.00)	1.70(.00)	20.80(.22)[c]
Response latency	10.77(.12)[c]	3.37(.03)	14.54(.16)[c]
Message duration	2.72(.02)	10.03(.11)[c]	8.82(.12)[c]

[a]All F tests are based on 1,34 df.

[b]TU = truthful unaroused, D = deception, Omega² in parentheses.

[c]$p < .05$.

interview, deceivers engaged in more adaptors than unaroused truthtellers ($t_{34} = 2.15$, $p < .05$).

Hypothesis 14

The predicted message type X interviews interaction for smiling was not confirmed. During the second interview deceivers and unaroused truthtellers engaged in comparable amounts of smiling ($t_{34} = 1.44$, $p > .05$). Moreover, deceivers' and unaroused truthtellers' smiling behavior did not change significantly from the first to the second interview ($t_{17} = <1$, $p > .05$) and ($t_{17} = <1$, $p > .05$), respectively.

Hypothesis 15

The predicted message type X interviews interaction was not obtained. Deceivers and unaroused nondeceivers engaged in similar rates of feet/leg gestures during the second interview ($t_{34} = <1$, $p > .05$). In addition, deceivers' and unaroused truthtellers' feet/leg gesture rates did not change significantly from the first to the second interview ($t_{17} = <1$, $p > .05$) and ($t_{17} = <1$, $p > .05$, respectively.

Hypothesis 16

As predicted, there was a significant message type X interviews interaction for hand gestures. While deceivers displayed a sharp increase in their hand gesture rates ($t_{17} = 3.43$, $p < .05$), unaroused truthtellers displayed a sharp decrease in their hand gesture rates ($t_{17} = 4.54$, $p < .05$). As a result, deceivers displayed significantly greater rates of hand gestures than unaroused nondeceivers during the second interview ($t_{34} = 14.88$, $p < .05$).

Hypothesis 17

The predicted message type X interviews interaction was not obtained. During the second interview deceivers and unaroused nondeceivers maintained similar rates of eye contact with the interviewer (t_{34} = 1.37, $p > .05$). In addition, deceivers' and unaroused nondeceivers' eye contact with the interviewer did not change significantly across the two interviews (t_{17} = < 1, $p > .05$) and (t_{17} = < 1, $p > .05$), respectively.

Hypothesis 18

As predicted, there was a significant message type X interviews interaction for speech errors. During the second interview, deceivers commited more speech errors than unaroused nondeceivers (t_{34} = 2.58, $p < .05$). Moreover, deceivers committed nonsignificantly more speech errors during the second interview than the first (t_{17} = 2.01, $p > .05$), while unaroused nondeceivers committed fewer speech errors during the second interview than the first (t_{17} = 3.04, $p < .05$).

Hypothesis 19

As predicted, there was a significant message X interviews interaction for pauses. During the second interview, deceivers spent much more time pausing than unaroused nondeceivers (t_{34} = 59.50, $p < .05$). Moreover, deceivers' pausing increased significantly across the two interviews (t_{17} = 5.15, $p < .05$) while unaroused nondeceivers paused nonsignificantly less during their second interview than their first (t_{17} = 1.93, $p > .05$).

Hypothesis 20

As predicted, there was a significant message type X interviews interaction for response latency. When responding to the interviewer's queries during the second interview, deceivers' response latencies were significantly longer than unaroused truthtellers ($t_{34} = 4.12$, $p < .05$). Moreover, deceivers' response latencies increased significantly from the first to the second interview ($t_{17} = 3.42$, $p < .05$) while unaroused nondeceivers' response latencies decreased significantly across the two interviews ($t_{17} = 2.76$, $p < .05$). This cross-over interaction overrides the obtained main effect for message type.

Hypothesis 21

As predicted, the message type X interviews interaction for message duration was confirmed. During the second interview, deceivers' message durations were significantly shorter than unaroused truthtellers ($t_{34} = 2.56$, $p < .05$). From the first to the second interview, deceivers' message durations decreased significantly ($t_{17} = 2.84$, $p < .05$) while unaroused truthtellers' message durations also decreased, but this difference was not significant ($t_{17} = < 1$, $p > .05$).

Research Question 1

To determine if aroused truthtellers differed from deceivers with respect to the ten behavioral correlates of deception, each behavior was entered as the dependent variable in a 2 (message type: truthful aroused/deception) X 2 (interviews: first interview/second interview) repeated measures analysis of variance. The mean behavioral rates for each condition and the analysis of variance results are summarized in Tables 7 and 9, respectively

Blinks

A significant main effect was obtained for interviews. Deceivers and aroused nondeceivers blinked more during the second interview than the first interview.

Adaptors

There was a significant message type X interviews interaction. Despite the fact deceivers and aroused nondeceivers engaged in comparable rates of adapting during the second interview ($t_{34} = 1.11$, $p > .05$), deceivers' adapting rate increased significantly from the first to the second interview ($t_{17} = 3.99$, $p < .05$) whereas aroused nondeceivers' adapting rate did not increase significantly ($t_{17} = 1.37$, $p > .05$).

Smiles

There were no main effects nor was the message type X interviews interaction significant. Moreover, there were no significant changes in deceivers' and truthful aroused nondeceivers' rate of smiling across the two interviews ($t = < 1$, $p > .05$) and ($t = < 1$, $p > .05$). In addition, there was no significant difference between deceivers' and aroused nondeceivers' rate of smiling during the second interview ($t_{34} = < 1$, $p > .05$).

Table 9

F Values[a] and Omega² for the Research Question[b]

Behaviors	TA/D	Interview	TA/D X Interview
Blinks	.99(.00)	4.21(.04)[c]	.63(.00)
Adaptors	.03(.00)	15.50(.17)[c]	5.23(.06)[c]
Smiles	.08(.00)	2.48(.02)	.49(.00)
Feet/leg gestures	4.82(.05)[c]	1.66(.00)	.13(.00)
Hand gestures	4.67(.05)[c]	2.16(.01)	9.26(.10)[c]
Eye contact	5.69(.06)[c]	.79(.00)	.55(.00)
Speech errors	5.24(.06)[c]	2.97(.03)	3.06(.03)
Pauses	2.82(.02)	.67(.00)	45.83(.38)[c]
Response latency	5.04(.05)[c]	7.11(.08)[c]	10.37(.12)[c]
Message duration	3.62(.04)	6.41(.07)[c]	.96(.00)

[a]All F tests based on 1,34 df.

[b]TA = truthful aroused, D = deception, Omega² in parentheses.

[c]$p < .05$.

Feet/Leg Gestures

There was a significant main effect for message type. Aroused nondeceivers engaged in more leg/feet gestures than deceivers. While deceivers and aroused nondeceivers increased their rate of leg/feet gestures across the two interviews, neither change was significant ($t_{17} = <1$, $p > .05$) and ($t_{17} = 1.28$, $p > .05$). Both groups of communicators also engaged in comparable rates of leg/feet gestures during the second interview ($t_{34} = 1.98$, $p > .05$).

Hand Gestures

There was a significant message type X interviews interaction. Deceivers' hand gesture rates increased significantly across the two interviews ($t_{17} = 3.43$, $p < .05$) while aroused nondeceivers' hand gesture rates decreased across the two interviews, but this change was not significant ($t_{17} = 1.88$, $p > .05$). As a result, the two groups differed significantly during the second interview with respect to hand gesture rates ($t_{34} = 16.29$, $p < .05$). The main effect obtained for message type is uninterpretable in light of the cross-over interaction.

Eye Contact

There was a significant main effect for message type. Deceivers engaged in less eye contact than aroused nondeceivers. Both groups maintained comparable levels of eye contact during the second interview ($t_{34} = 2.04$, $p > .05$) and deceivers' and aroused nondeceivers' rates of eye contact did not change significantly across the two interviews ($t_{17} = <1$, $p > .05$) and ($t_{17} = <1$, $p > .05$), respectively.

Speech Errors

There was a significant main effect for message type. Deceivers' speech error rate was greater than aroused nondeceivers' rate. Although there was no significant change in deceivers' and aroused nondeceivers' speech error rates ($t_{17} = 2.01$, $p > .05$) and ($t_{17} = < 1$, $p > .05$), respectively, deceivers' speech error rate was greater during the second interview than aroused nondeceivers' speech error rate ($t_{34} = 2.35$, $p < .05$).

Pauses

There was a message type X interviews interaction. Deceivers' pausing increased significantly across the two interviews ($t_{17} = 5.15$, $p < .05$) while aroused nondeceivers' pausing decreased significantly across the two interviews ($t_{17} = 4.99$, $p < .05$). As a result, both groups differed significantly during the second interview with respect to the amount of time they paused ($t_{34} = 131.50$, $p < .05$).

Response Latency

There was a significant message type X interviews interaction. Deceivers' response latencies increased significantly across the two interviews ($t_{17} = 3.42$, $p < .05$) while aroused nondeceivers' response latencies decreased nonsignificantly over the two interviews ($t_{17} = < 1$, $p > .05$). As a result, both groups differed significantly during the second interview with respect to their mean response latencies ($t_{34} = 3.00$, $p < .05$).

Message Duration

There was a significant main effect for interviews. During the second interview, communicator/deceivers' message durations were significantly shorter than during the first interview. Deceivers' message durations decreased significantly across the two interviews ($t_{17} = 2.84$, $p < .05$) while aroused nondeceivers' message durations decreased nonsignificantly across the two interviews ($t_{17} = < 1$, $p > .05$). As a result, both groups differed significantly during the second interview with respect to their mean message durations ($t_{34} = 2.32$, $p < .05$).

Hypothesis 22

To test for the predicted gender X interviews interaction, deceivers' skin resistance data were input as the dependent variable in a 2 (gender: male/female) X 2 (interviews: first interview/second interview) repeated measures analysis of variance. Summaries of deceivers' mean skin resistances and results of the analysis of variance appear in Tables 10 and 11, respectively. There was a main effect for interviews corroborating the finding in Hypothesis 1. Compared to when they communicated truthfully during the first interview, deceivers experienced greater sympathetic activation during the second interview.

Table 10

Means for Skin Resistance[a] for Gender by Interviews

First Interview		Second Interview	
Male	Female	Male	Female
490.78	491.56	495.44	495.67

[a]Skin resistance expressed in hertz.

Table 11

F Values and Omega^2 for Skin Resistance in Gender by Interview

Repeated ANOVA		
Gender	Interview	Gender X Interview
.08(.00)	23.14(.38)[a]	.09(.00)

[a]$p < .05$.

Hypothesis 23

To test for the predicted gender X interviews interaction, deceivers' feet/leg and hand gesture data were input as dependent variables in separate 2 (gender: male/female) X 2 (interviews: first interview/second interview) repeated measures analyses of variance. The mean behavioral rate for deceivers according to conditions and the analyses of variance results are summarized in Tables 12 and 13. For feet/leg gestures, the gender X interview interaction was confirmed. Males' feet/leg gestures increased nonsignificantly over the two interviews ($t_8 = 2.12$, $p > .05$) while females' feet/leg gestures decreased nonsignificantly across the two interviews ($t_8 = 1.89$, $p > .05$). Taken together, the increase in males' feet/leg gestures and the decrease in females' feet/leg gestures from the first to the second interview produced a significant mean difference between men and women during the second interview ($t_{16} = 9.72$, $p < .05$).

Table 12

Feet/Leg and Hand Gesture Mean Behavioral Rates for Gender by Interview

	First Interview		Second Interview	
Behaviors	Male	Female	Male	Female
Feet/leg gestures	.09	.17	.19	.09
Hand gestures	.35	.24	.41	.37

Table 13

F Values and Omega^2 for Feet/Leg and Hand Gestures in Gender by Interview Repeated ANOVA

Behaviors	Gender	Interview	Gender X Interview
Feet/leg gestures	.06(.00)	6.67(.14)[a]	7.80(.16)[a]
Hand gestures	.11(.00)	13.48(.26)[a]	2.15(.03)

[a]$p < .05$.

CHAPTER IV

DISCUSSION

This chapter reviews and interprets the findings presented in Chapter III in terms of their theoretical significance.

A primary concern of the present investigation was to verify that encoding a deceptive message is an anxiety-producing activity. The obtained results provide unequivocal evidence that deceptive communicators experience greater levels of sympathetic activation than truthful communicators. However, a major question remains unanswered: What properties underlie deception that make it anxiety-producing? In addition to physiological arousal, Zuckerman et al. (1981) suggest several cognitive processes that distinguish deception from truthful communication. It may be the case that these cognitive processes contribute toward increasing liars' sympathetic activation. One of these processes relates to the guilt/anxiety liars experience because they are lying to someone and worrying about being caught. A second possibility is that encoding a lie requires more cognitive input. As a result of the greater cognitive complexity required to encode a deceptive rather than a truthful message, liars become more aroused. The third process, mentioned only briefly by Zuckerman et al., concerns the extent to which liars consciously attempt to control their behavior.

While the present study by no means provides a critical test of Zuckerman et al's. model, some indirect evidence gathered suggests that this is not the case. Recall that after the second interview, communicator/deceivers completed Spielberger's State and Trait Anxiety scales. More specifically, communicator/deceivers were asked to report their state of anxiety during the second interview. A cluster analysis of these data revealed two basic dimensions underlying communicator/deceivers' state anxiety: worry over future consequences and anxiety over the situational demands. These two dimensions parallel Zuckerman et al's. processes of guilt/anxiety and cognitive complexity. Using each cluster as a dependent measure in a one-way analysis of variance revealed no significant difference between liars and nonliars (aroused and unaroused). However, two factors mitigate against drawing any firm conclusions from this analysis. First, while the clusters obtained from Spielberger's State Anxiety scale parallel two of Zuckerman's processes, they may not accurately operationalize the cognitive processes outlined by Zuckerman et al. Second, communicator/deceivers were asked to recall how anxious they felt during the second interview. Cognitive dissonance theory would argue liars would resolve their deception-induced anxiety by down-playing their deceptive role, i.e., by reporting they felt relaxed and comfortable.

If we conceive of deception communication as a persuasive message strategy (Miller, Note 4), however unethical, cognitive dissonance theory provides a useful conceptual framework for understanding the anxiety-producing nature of deception. According to a dissonance theory interpretation of deceptive communication, when a communicator says "X" when he or she believes "not X" under conditions of minimum justification, maximum choice, and maximum effort, he or she should experience a state that is psychologically uncomfortable, or cognitively dissonant. A state of cognitive dissonance is assumed to be accompanied by a state of physiological arousal. Despite problems with earlier attempts to confirm the physiologically arousing properties of cognitive dissonance (Fazio & Cooper, 1983), recent evidence indicates that communicators encoding a counterattitudinal message experience greater sympathetic activation than truthful communicators (Croyle & Cooper, 1983).

Although a number of liars experienced considerable psychological discomfort as a result of deceiving the interviewer, one deceiver in the present study epitomized the dissonance-arousing properties of deception. A male deceiver arrived at the lab immediately after attending religious services. He was extremely reluctant to participate in the cheating and derogated the confederate for having cheated. During the second interview, this particular male deceiver did not stop fidgeting and shifting in his chair. His responses to the interviewer's queries were abrupt. Moreover, he not only replied with short, confusing answers, he interrupted his own responses and directed the interviewer to continue. In short, he behaved like the prototypic liar. Since he came to the lab directly from church, I was certain he would not allow the confederate to cheat or lie about it, but he did. In terms of a dissonance theory interpretation, the male deceiver probably perceived himself as an honest, moral person, particularly after attending church, but realized he cheated and then lied about it. To be sure, not all instances of deception in the present study or in our everyday routine provoke as much dissonance over lying to someone else. Although admittedly extreme, this instance illustrates the dissonance-arousing agents underlying deception.

The most interesting findings of the present study lie in the behavioral comparisons between unaroused and aroused nondeceivers on the one hand, and deceivers on the other. Six of the ten behaviors studied distinguished unaroused nondeceivers from deceivers. Of the six behaviors, all four of the verbal behaviors (speech errors, pauses, response latency, and message duration) reliably distinguished deceivers from unaroused nondeceivers. That twice as many verbal as nonverbal behaviors served to distinguish deceivers from unaroused nondeceivers supports previous research contending that verbal cues to deception are more abundant (DePaulo et al., Note 2; Miller et al., 1983).

Comparison of the above results to the findings for the behavioral comparisons between deceivers and aroused nondeceivers reveals four of the six behaviors (adaptors, hand gestures, pauses, and response latency) that distinguish deceivers from unaroused nondeceivers also differentiated between deceivers and aroused nondeceivers. If the findings from the independent t-tests for speech errors and message duration are included in the above comparison, then the six behaviors that reliably distinguished between deceivers and unaroused nondeceivers also differentiated between deceivers and aroused nondeceivers. Again, verbal behaviors emerged more frequently as cues to deception than nonverbal behaviors casting further doubt on earlier emphasis on nonverbal behaviors as the primary source of leakage during deception (Ekman & Friesen, 1969; Hocking & Leathers, 1980; O'Hair et al., 1981).

At first glance, the present findings indicate at least six behaviors can be applied to deception detection contexts regardless of the anxiety-producing stimuli present. However, care must be taken in evaluating the relative utility of these behavioral cues for detecting deception. Only four of the six mean behavioral rates (hand gestures, speech errors, response latency, and pauses) among the three conditions follow patterns across the two interviews that suggest they may facilitate deception detection. For instance, while deceivers' mean behavioral rates for these four behaviors increase or decrease depending on the type of cue, both groups of nondeceivers' mean behavioral rates went in the opposite direction of deceivers or remained constant. By contrast, all three groups of communicators' message durations decreased across the two interviews. Similarly, both deceivers' and aroused nondeceivers' adapting rates increased across the two interviews. Despite the fact deceivers' mean adapting rates and message durations were significantly different from both groups of nondeceivers, it would be extremely difficult to train observers attempting to detect deception to distinguish between similar behavioral responses that occur at slightly different rates.

That deceivers and aroused nondeceivers experienced comparable levels of sympathetic arousal but displayed six varying behavioral responses suggests that different behavioral habit strengths may be associated with similar drive states. This Hullian interpretation is tempered, however, by the results obtained from the regression analyses where the only curvilinear relationship that emerged was between communicator/deceivers' sympathetic activation and blinks. A linear-model provides the best fit for four of the five arousal-behavioral relationships: adaptors, speech errors, pauses, and response latency. The present findings indicating a significant relationship between communicator/deceivers' sympathetic activation and speech errors, pauses, and blinks support Zuckerman et al's. argument that physiological arousal is the process underlying these behaviors.

Zajonc's (1965) model of social facilitation provides a useful framework for explaining the behavioral discrepancies between deceivers and truthful aroused communicators. To the extent truthful communication is a well-learned task compared to deceptive communication, we would anticipate arousal in truthful interactions to facilitate communicators' message encoding. By contrast, deception-induced arousal would interfere with a liar's message encoding. Underlying this interpretation is the assumption that people tell the truth much more often than they lie. As a result, we have more practice at truthtelling and arousal facilitates our communicative performance. Evidence for this position lies in the comparison of truthful unaroused and truthful aroused communicators' behavioral patterns across the two interviews. More specifically, the means reported in Table 7 suggest that truthful aroused communicators responded to the interviewer's queries more quickly, paused half as much, and talked less than their unaroused counterparts. In some situations, this behavioral pattern may serve to enhance a communicator's credibility (Miller & Burgoon, 1981). Zajonc's social facilitation model also provides a common link throughout the deception literature that examines the impact of individual difference variables on the behavioral correlates of deception. For instance, communicators characterized as high self-monitors or high Machiavellians are presumed to engage in deception more frequently than their low counterparts, and therefore, deception-induced arousal facilitates their deception while hampering the deception perpetrated by low self-monitors and low Machiavellians (Miller et al., 1983; Riggio & Friedman, 1983).

Turning to the final set of findings concerning gender effects, it is clear the predicted internalizer-externalizer effect was not obtained. The men and women communicator/deceivers displayed almost identical increases in sympathetic activation from the first to the second interview. While the mean behavioral rates for men and women for hand and feet/leg gestures were in the predicted direction, only feet/leg gestures reliably distinguished the men and women deceivers.

At least two major differences between the body of internalizer-externalizer literature reviewed earlier and the present study may account for the lack of empirical isomorphism. First, Buck et al. (1974) were concerned with communication of various emotional states other than deception, e.g., surprise, happiness, and sadness. Although there may be some behavioral similarities when communicating during different emotional experiences, there may be a difference between the behavioral habit strengths associated with more traditional conceptualizations of emotional states and deception. Second, Buck et al's. (1974) design only allowed communicators to encode their emotions using the nonverbal channel through an enclosed chamber. Since communicator/deceivers in the present study lied in a face-to-face setting, the type of communicative act, deceiving, in conjunction with the availability of verbal and nonverbal channels may have evoked slightly different patterns of physiological and behavioral responses.

Deception researchers have not speculated as to how the information available regarding deceptive communication can be put to use. One notable exception is Miller and Burgoon's (1981) chapter where they meld the credibility and deception literatures and apply the existing body of knowledge to the legal environment. The justice system provides an ideal setting for applying what we have learned from deception research. Since polygraph examinations are not admissible evidence in all courts of law, it would be useful to train jurors as to what to look for if they question the veracity of witnesses' testimony. One research strategy would be to acquaint prospective lie detectors with behaviors to focus on and behaviors to ignore. Recall that prior research (e.g., Bauchner et al., 1977; 1980) found humans as lie detectors are only about 55% accurate in spotting a lie. However, human lie detectors report they are about 80% confident their truth-deception attributions are correct.

Obviously, this 35% objective-subjective discrepancy in deception detection can cause decisional problems. Jurors, for instance, may be convinced a witness is lying when in fact the witness' testimony is truthful. Such attribution errors in the legal environment may sometimes mean the difference between life and death. To the extent that we can train people to judge the veracity of others' communication more accurately, we may be able to narrow the objective-subjective deception detection gap. This strategy does, however, make at least one assumption: Training people to detect deception only influences their actual ability and not their percevied ability, i.e., training in deception detection should minimize the subjective deception detection/objective deception detection ratio. In sum, future research in deceptive communication would contribute to an already strong literature by attempting to utilize the existing body of knowledge in communicative contexts where deception flourishes such as boardrooms, courtrooms, and bedrooms.

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