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ON NONVERBAL BEHAVIOR AND DECEPTION DETECTION

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THE EFFECTS OF MOTIVATION, PROBES, AND MACHIAVELLIAMISM ON NONVERBAL BEHAVIOR AND DECEPTION DETECTION

By

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ABSTRACT

THE EFFECTS OF MOTIVATION, PROBES, AND MACHIAVELLIAMISM ON NONVERBAL BEHAVIOR AND DECEPTION DETECTION

By

Randall J. Koper

This study sought to assess the impact of deceitfulness, cynicism, probe intensity, and motivation on arousal, nonverbal behavior, and deception success. Findings both replicate and extend earlier work. Probe intensity was found to be related to increases in facial immediacy, which resulted in greater body immediacy and facial animation. Both tension and involvement dimensions of perceived arousal were positively related to facial animation. Deceitfulness was associated with a decrease in body animation and body adaptor behaviors and an increase in facial animation. Although facial animation was positively related to both dimensions of arousal, body adaptors were more closely related to perceived tension. Body and object adaptors were less likely to occur for highly deceitful people, suggesting either lower arousal during deception or conscious inhibition of those cues. Results indicate a moderate positive relationship between motivation and deception success. However, this effect is confounded with procedural characteristics, urging cautious interpretation. Deception success was not found to be related to any other variable in the study, including deceivee cynicism, suggesting that kinesic behaviors are poor predictors of deception success in situations in which an untruth bias exists.

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To Patricia-

I can fly higher than an eagle;
when you are the wind beneath my wings.

Accepted by the faculty of the Department of Communication, College of Communication Arts and Sciences, Michigan State University, in partial fulfillment of the requirements for the Doctor of Philosophy degree.

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CHAPTER 1

INTRODUCTION

Research in deceptive communication has generally been focused on one of two distinct concerns. Researchers interested in the behavior of message sources have worked to specify the verbal and nonverbal behaviors that are consistently associated with the encoding of deceptive messages (e.g., Hocking & Leathers, 1980; Knapp, Hart, & Dennis, 1974; Kraut, 1978; McClintock & Hunt, 1975; Streeter, Kraus, Geller, Olson, & Apple, 1977; Zuckerman, Defrank, Hall, Larrance, & Rosenthal, 1979; Zuckerman, DePaulo, & Rosenthal, 1981). A second avenue of research interest has taken a receiver orientation in assessing the relevant variables that influence the ability to successfully detect deception (e.g., Allen & Atkinson, 1981; Barland & Raskin, 1975; Bauchner, Kaplan, & Miller, 1980; Brandt, Miller, & Hocking, 1980; DePaulo, Lassiter, & Stone, 1982; DePaulo, Zuckerman, & Rosenthal, 1980; Ekman & Friesen, 1969; 1974; Hocking, Bauchner, Kaminski, & Miller, 1979).

A few scholars have recognized the need to integrate these two orientations, however, as Miller (1983) has pointed out, "researchers engrossed in these two problems have passed like scientific ships in the night" (p. 13). In attempting to understand the relationship between these two aspects of communication in the deception process,

recent studies have assessed both the encoding and decoding of deception within the same context. A current example of this approach is the work of Miller, deTurck, and Kalbfleisch, (1983) who examined the effects of self-monitoring and rehearsal on the ability of observers to detect deception and on the behavioral correlates of deception. Analysis of their data revealed an interaction between rehearsal and self-monitoring such that unrehearsed, low self-monitors displayed significantly greater pause and nonfluency rates than rehearsed, high self-monitors. Moreover, high self-monitors were more successful than low self-monitors in accomplishing deception. Their results provide "evidence of a relationship between certain behavioral correlates of deceptive communication and observer accuracy in detecting deception" (p. 114).

Ekman and Friesen (1969) suggest that deceptive communication has three primary features: (1) adoption of deceiver or detector role, (2) collaboration or antagonism in the act of deception, and (3) saliency of the deceptive information. In an effort aimed at better understanding these features of deception, two situational characteristics - motivation and probe intensity - and one individual difference characteristic - Machiavellianism - will be examined as potentiallly important influences on behavior and deceptive communication outcomes.

Motivation

In his recent monograph, Miller (1983) identifies several problems with the bulk of research on deceptive communication. Of the issues raised by Miller, perhaps the most serious indictment of past work is

for failing to adequately address the problem of motivation. The occasion to deceive others in real life is usually the result of potentially negative consequences for the deceiver if the truth were known instead (Knapp & Comadena, 1979). In other words most people would not lie if they were not encouraged to do so by situational demands. Knapp and Comadena (1979) also suggest that motivation is an important consideration in evaluating deceptive communication contexts. Ekman and Friesen's (1969) notion of salience as a primary feature of deception points to the importance of deceiver and deceivee involvement in the issues around which a deceptive message is created.

The assumption that motivation is a central variable in determining "deceptive" behavior and outcomes is not without supporting evidence. Specifically, motivation has been viewed by scholars interested in both deceptive behaviors and deception detection as a causal antecedent of arousal, "a composite of the organism's mental alertness and physical activity levels" (Mehrabian, 1981, p. 6).

An early study by Gustafson and Orne (1963) examined the influence of motivation to deceive on skin conductance. Higher skin conductance (galvanic skin response) is the result of an increase in natural skin moisture (perspiration). Their results indicate that high motivation subjects demonstrate significantly higher skin conductance than low motivation subjects. Another study which was conducted to assess the effect of motivation on arousal (Barland & Raskin, 1975) offered monetary rewards to subjects able to "beat" a polygraph regarding the truth about a factual occurrence. The results failed to replicate Gustafson and Orne's findings.

Despite the fact that empirical evidence is somewhat ambiguous, some continue to believe that motivation may be an important contextual variable related to arousal and deceptive behavior. (Greene, O'Hair, Cody, & Yen, 1985). On this basis, the following hypothesis is submitted.

H1: Motivation to successfully deceive will be positively related to physical indicators of arousal.

Although at least one study (Gustafson & Orne, 1963) has attempted to examine the effects of motivation on deception detection, there is little basis for positing the nature of the relationship between motivation and deception success. Only the effects of varying motivation levels for the deceiver have been assessed, and even then, detection was based on physiological measurement, i.e., galvanic skin response, without direct observation of overt behavioral cues.

In naturally occurring deception, it is assumed that a highly motivated deceiver distorts or conceals information that the deceivee might be similarly motivated to obtain. While it is reasonable that deceptive interaction is at least somewhat involving and motivating for the deceiver, the influence of motivation to detect deception on deceptive success remains unexplored, prompting the following research question.

RQ1: How do varying levels of motivation to detect deception influence successful detection?

Context and Probes

Historically, scholars have studied communicative phenomena in several distinct contexts, which are typically distinguished in terms of the situational differences in which the communication event takes place. As Burgoon, Dillard, Koper, and Doran (1984) have pointed out, the "rationale for these distinctions is that the phenomena that occur within each context are sufficiently different so as to constitute separate, although not necessarily independent, areas of inquiry" (p. 4). For example, face-to-face communication has been approached in a different manner than mass-media phenomena based on the assumption that qualitative differences exist in the contextual ecologies.

G.R. Miller (1978) has discussed four dimensions that may be used to differentiate traditional communication contexts. They are: (1) the number of communicators, (2) the degree of physical proximity, (3) the available sensory modalities, and (4) the availability of immediate feedback. Although Miller has rejected these situational dimensions as viable criteria for defining interpersonal communication, they are useful for describing the essential differences in various communication ecologies. The most easily distinguished categories would be described by the most polarized positions on the continua, e.g. , dyadic and face-to-face vs. mediated mass communication.

The present study addresses the nature of deception between strangers in a face-to-face dyadic context. While it may be useful and interesting to view deception as a unidirectional phenomenon, as in mass-media advertising for example, the essential features of a mediated context differ sufficiently from the dyadic context to warrant

a unique approach for the study of interpersonal deception and to make cross-context generalizations of dubious value.

The contextual difference most relevant here lies in the ability of the message recipient in dyadic, face-to-face contexts to probe the suspected deceiver for further information. As Stiff and Miller (1984) have pointed out:

> "The typical research paradigm structures situations that require persons to communicate deceptively...In this paradigm both deception and deception detection are passive events, i.e., there is no interaction between the deceiver and the deceivee. Rather, the deceiver presents a single uninterrupted statement and the deceivee is left to determine its veracity" (p. 2).

Of course, interpersonal deception rarely happens under such circumstances. Rather, if a communicator encodes a deceptive message in an interpersonal context, a receiver may choose to either (1) carefully scrutinize the suspected deceiver for the stereotypic signs of deception offered by traditional wisdom, or (2) scan the suspected deceiver while probing for more information. Such probes may range in form from subtle statements which hint at the deceivee's suspicions to "point-blank" questions regarding the veracity of the message. It would appear that users of either approach are attempting to "test" the presumed deceiver by observing the reaction to the probe. While both approaches may yield additional verbal and nonverbal information on which to base judgements, it should be noted that a subtle, non-accusatory probe is probably less likely to arouse the suspected deceiver (resulting in less information on which to base attributions) than the more direct approach. On the other hand, the more direct probe may involve a higher degree of risk to the relationship, since

the suspected deceiver may resent being accused of lying. Either way, the individuals involved may be forced to confront a breach of trust in the relationship.

It has been shown that arousal increases as individuals anticipate unusual, threatening, or complex situations (Kahneman, 1973). It is hypothesized that receivers rely on tacit knowledge of this in probing suspected deceivers, and that as probes become more explicit, arousal will increase. Related empirical evidence supports such a contention. For example, overt disapproval from an audience has been demonstrated to increase heart rate (Boman, 1966) and muscle tension (Malmo, Boag, & Smith, 1957).

On this theoretical and empirical basis, the second hypothesis is submitted.

H2: Increasingly direct post-deception probes will elicit increasingly higher levels of physical arousal.

As to whether deceivee probes result in greater detection of deceptive messages, no direct evidence is available to make this prediction. Therefore, the query will be posed as a research question.

RQ2: Are deceivee probes related to deception detection?

Machiavellianism

In the development and validation of Christie's (1970) MACH scale, research has found that high MACH scores are related to deceptive activity and success (e.g., Christie & Geis, 1970; Exline, Thibaut, Hickey, & Gumpert, 1970; Rosenthal, 1979). However, conflicting findings in the literature suggest that the advantage gained by high

Machs in deceptive situations is minimal (Oksenberg, 1970) or nonexistent (Geis & Leventhal, 1970). O'Hair, Cody, and McLaughlin (1981) found Machiavellianism not significantly related to nonverbal leakage, yet Geis and Moon (1981) suggest that high Machs are more successful than low Machs in situations that contain irrelevant affect (anxiety), invoking a distraction hypothesis to explain these findings.

Knapp, Hart, and Dennis (1974) attribute their null findings to the median-split method used. However, even when they compared the ten highest to the ten lowest scorers on the MACH scales, they found no differences for "this seemingly powerful behavioral style" (p. 22).

Recently, however, there has been accumulating a growing body of research findings which call into question the unidimensionality of the Machiavellianism scale. Since a multidimensional scale has many correlates, but these correlations are weak and causally meaningless (Hunter, Gerbing, & Boster, 1982), unidimensional measurement of the component dimensions of Machiavellianism is clearly desirable.

Hunter et al. (1982) argue that there are two competing conceptualizations of Machiavelli's social philosophies: (1) a single dimension (called Machiavellianism) and (2) a "set of related but separately maintained distinct beliefs" (p. 1294). Because these two conceptualizations imply different causal models of the relationship between the dimensions of Machiavellianism (i.e., the factors emerging from the MACH scale) and related variables, path analytic techniques allow a comparison of the goodness of fit for the two models. The results of Hunter et al.'s analyses indicate that the MACH scale is multidimensional, reducing the 20-item MACH IV scale into four factors:

deceit, cynicism, immorality, and flattery. The factors differ radically from one another in how they relate to other personality variables. For example, while dogmatism correlates highly positive with the cynicism dimension (r=.84), it is uncorrelated with the deceit factor (r=-.06).

It is hypothesized that deceitfulness, the MACH dimension that measures the willingness of individuals to practice deception in their dealings with others, is indicative of a trait of individuals who either experience less arousal during deception or are more adept at controlling the overt behavioral expressions of arousal, perhaps due to practice (Geis & Moon, 1981).

H3: Deceitfulness will be negatively related to physical indicators of arousal.

While a willingness or propensity to deceive others may aid in stifling arousal, it is also possible that another trait that Christie conceptualized as Machiavellian may influence deceptive communication in a different manner. Specifically, the cynicism dimension of Machiavellianism, which measures the belief that others are selfish and manipulative, might be tapping a characteristic relevant to the detection of deceptive messages (Zuckerman, DePaulo, & Rosenthal, 1981). While it would not be expected that deceiver cynicism would directly influence arousal during deception, it reasonably may be hypothesized that such a trait would increase the individual's expectations of the prevalence of deceptive messages in the environment. It has also been demonstrated that cynics tend to adopt a more competitive stance toward others (Hunter, Gerbing, & Boster,

1982). Given these characteristics, the cynic would probably be more suspicious of others and possibly more prepared to scrutinize and assess behavioral deviations. This sensitivity to discrepant cues coupled with competitiveness could make the cynic a more accurate detector of deceptive messages. Furthermore, recent research indicates that a "truth bias" significantly hinders accuracy in detecting deception (McCornack & Parks, 1985). Based on this reasoning, the following hypothesis is submitted.

H4: Cynicism will be a significant predictor of accuracy in detecting deception.

Arousal and Nonverbal Behavior

Several authors have specified the theoretical processes which underlie the behavioral changes that accompany the encoding of deceptive messages (Knapp et al., 1974; Kraut, 1980; Greene, O'Hair, Cody, & Yen, 1985). Zuckerman et al. (1981) have grouped these processes under four main headings: arousal, attempted control, felt emotions, and cognitive difficulty (Greene, et al., 1985). Although cognitive and affective processes may by related to behavioral output, the direct (and opposing) behavioral influences of arousal and control are of primary concern in the present discussion.

Arousal. The arousal response is characterized by: (1) increased cortical activity and (2) changes in the autonomic nervous system (Andreassi, 1980). These effects and attendant physiological changes, i.e., galvanic skin response, respiration rate, and heart rate, provide the rationale for using a polygraph as a lie detector.

In addressing the issue of which specific nonverbal behavioral changes would be expected to result from increased arousal, Burgoon and Koper (1984) suggest that arousal is "evidenced through nonverbal anxiety and adaptor behaviors" (p. 604). Specifically, it is expected that arousal will result in fidgeting, indirect head and body orientation, rigid posture, self-touching, and uncoordinated and random limb movements (Clevenger, 1959; Ekman & Friesen, 1972; Mehrabian, 1981; Mulac & Sherman, 1974).

Control. Attempted control "concerns the ability of the individual to inhibit or manipulate overt behavior in order to avoid manifestation of the nonverbal correlates of deception" (Greene, et al., 1985, p. 337). Ekman and Friesen (1969, 1972, 1974), who first explored this aspect of behavior during deception, contend that those behaviors that allow the most immediate feedback and those which are most consciously manipulated are the most controllable.

Hocking and Leathers (1980) have recently expanded this formulation in an effort aimed at integrating research findings in this area. There are two fundamental aspects to their perspective. First, they argue that deceivers attempt to avoid detection by striving to suppress those behaviors which are controllable and which are stereotypical of deceivers. Second, they contend that not all behaviors resulting from arousal are controllable, and that those that are not increase during deception. Behaviors which may be exhibited by an aroused communicator are classified as: Class I (those behaviors over which a deceiver may have the potential to exercise effective

control, e.g., gestures, body movement), Class II (those behaviors which cannot be monitored directly by the deceiver and are therefore more difficult to control, e.g., facial expression), or Class III (behaviors which cannot typically be consciously controlled,e.g., vocal cues and physiological indices of autonomic arousal, cf., Zuckerman et al., 1981).

In summary, the same situational demands that are perceived to necessitate the construction of a deceptive message would also stimulate the deceiver to make efforts to minimize his or her chances of being caught in the lie. Thus, deceptive acts initiate two resultant responses: 1) arousal of the autonomic nervous system and 2) conscious efforts by deceivers to minimize the impact of the arousal on their overt behavior. Ekman and Friesen (1969) and Hocking and Leathers (1980) effectively argue that when necessary most of us can consciously control many of the behavioral cues we exhibit, however, the less controllable and less easily monitored aspects of behavior may "leak" the individual's degree of arousal. The presence of arousal cue leakage is most likely when: (1) the central purpose of the deception is to withhold emotional information, (2) when the deceiver feels strong emotions about the topic of deception, (3) the deceiver is apprehensive about being detected, (4) the deceiver is guilty about the deception, (5) the deceiver experiences duping delight, or (6) the deception is not planned or practiced (Ekman, 1981). There is considerable support for their leakage hypothesis (e.g., Ekman & Freisen, 1974; Ekman, 1981).

Nonverbal Cues Related to Deceptive Encoding

Despite large agreement in the scientific community that leakage occurs, there is some controversy as to what specific cues are to be considered deceptive and the channels through which leakage is most likely expressed. While a number of behavioral cues that are related to deceptive communication have been identified, very few of these have been shown to be unique to deception. As Buller (1982) has pointed out, these cues appear to be "indicators of arousal and their meaning as to the deceptive intent of the communicator is determined by the attributions of the deceivee" (p. 2).

Research in the area of nonverbal behavior has resulted in finding a large variety of cues that are associated with encoding deceptive messages. These include: increased eye blinking (e.g., Cutrow, Park, Lucas, & Thomas, 1972), increased eye contact (e.g., Knapp et al., 1974; Kraut & Poe, 1980; McClintock & Hunt, 1975), increased smiling (e.g., Knapp et al., 1974; Kraut, 1978; Kraut & Poe, 1980), increased grooming and adaptor behaviors (e.g., Knapp et al., 1974; Kraut & Poe, 1980; McClintock & Hunt, 1975), increased postural shifts (e.g., McClintock & Hunt, 1975), increased leg movement (e.g., Knapp et al., 1974), and decreased gestures (e.g., Ekman & Friesen, 1974; Knapp et al., 1974; Kraut & Poe, 1980).

Unfortunately, these findings must be contrasted with the following contrary evidence. Ekman and Friesen (1974) found decreased eye contact related to deception, and McClintock and Hunt (1975) found deceptive encoding related to decreases in smiling. Kraut (1978) found a decrease in postural shifts and grooming behaviors for deceivers, and

Mehrabian (1971) found no effects for grooming and self- manipulations, rocking or trunk swivel, or gestures.

Contradictory findings such as these have raised questions as to the existence of deception specific cues. Noting that few reliable indicators of deception have been identified, Miller and Burgoon (1982) offer a concise review of the most consistent research findings. They conclude that deceivers are likely to encode the following kinesic and haptic cues: reduced eye contact, fewer head nods, less smiling, fewer gestures, indirectness in head and body orientation, frequent shifts in body and leg position, restlessness, blinking, longer and more frequent self-, face- and object adaptors, and shaking. More globally, Miller and Burgoon (1982) argue that deceptive communication is systematically associated with anxiety cues, excessive response patterns, negative affect cues, vague or uncertain responses, and incongruous expressions.

Kraut (1980), in a meta-analysis of many of the deception detection studies, found few cues consistently associated with deception. These were response latency, speech errors, eye blink, and grooming or adaptor behaviors. He argues that relatively few behavioral cues provide reliable inferences of deceptive communication.

As noted, Buller (1982) argues that nonverbal cues that are emitted are not associated with deception, per se, but rather with nonspecific arousal, i.e., they result from arousal during communication regardless of its origin. He proposes that "arousal can be induced by a variety of states and situations: communication apprehension, communication under stress, communication with high-status individuals, communication involving a sensitive issue,

communication over an important reward, or communication following some other arousing situation" (p. 6). Assuming this is the case, the challenge for scholars shifts from searching for behavioral cues of deception to exploring how receivers recognize and interpret arousal cues in attributing deceptive intent.

Nonverbal Leakage and Deception Detection

Taking issue with Kraut's (1980) conclusions, DePaulo, Zuckerman, and Rosenthal (1980) argue that, despite the absence of cues unique to deceptive communication, receivers are able to distinguish deception from truth-telling at better-than-chance levels. A closer look at the accuracy data offers another conclusion: experimental participants are consistently able to detect deception at levels only slightly better than chance (e.g., DePaulo et al., 1980; Ekman & Friesen, 1974; Hocking, Bauchner, Kaminski, & Miller, 1979; Hocking & Leathers, 1980; Kraut, 1978; Miller & Burgoon, 1982). DePaulo et al. concluded that average detection accuracy (across a number of studies) was approximately 58%. Based on the leakage hypothesis this seems surprisingly low, strengthening Miller and Burgoon's (1982) and Kraut's (1980) arguments that few behaviors are unique to deceptive communication such that they can be used to reliably detect its occurrence.

Of course, receivers continue to make attributions of deceit based on their judgements of what constitutes a deceptive cue. Zuckerman et al. (1980) report that the primary visual cues which individuals rely on in attributing deception include decreased eye gaze and increased smiling, adaptors, and postural shifts. Stiff (1984) found several

nonverbal behaviors correlated with raters' judgements of deceptiveness: blinks (r=.20), smiling (r=.36), adaptor behaviors (r=.26), hand gestures (r=-.26), and postural shifts (r=.30). In reviewing the research findings in this area, Miller and Burgoon (1982) conclude that deceivees are likely to attribute deception to communicators displaying the following cues: less eye contact, more smiling, excessive gestures, more tension, more frequent postural shifts, and less self-grooming. A comparison of the cues encoded as deceptive to the cues decoded as deceptive reveals discrepencies that would seem to account, at least partially, for the inability of receivers to detect deception with a frequency rarely better than by chance alone.

The present study will seek to further explore the nonverbal correlates of deception detection. Based on previous findings, it is hypothesized that:

H5: Receiver accuracy in detecting deceptive messages will be related to the following deceiver behaviors.
- a) reduced eye contact
- b) increased response latency
- c) increased use of adaptors
- d) increased body movement
- e) indirect head and body orientation

Ambiguity regarding some cues suggests the following research question.

RQ3: How are the following cues related to deception detection?
- a) head nods
- b) smiling and facial animation
- c) crossed legs

An Integrated Model

All of the hypothesized relationships for deceiver variables can be efficiently indicated using a path diagram:

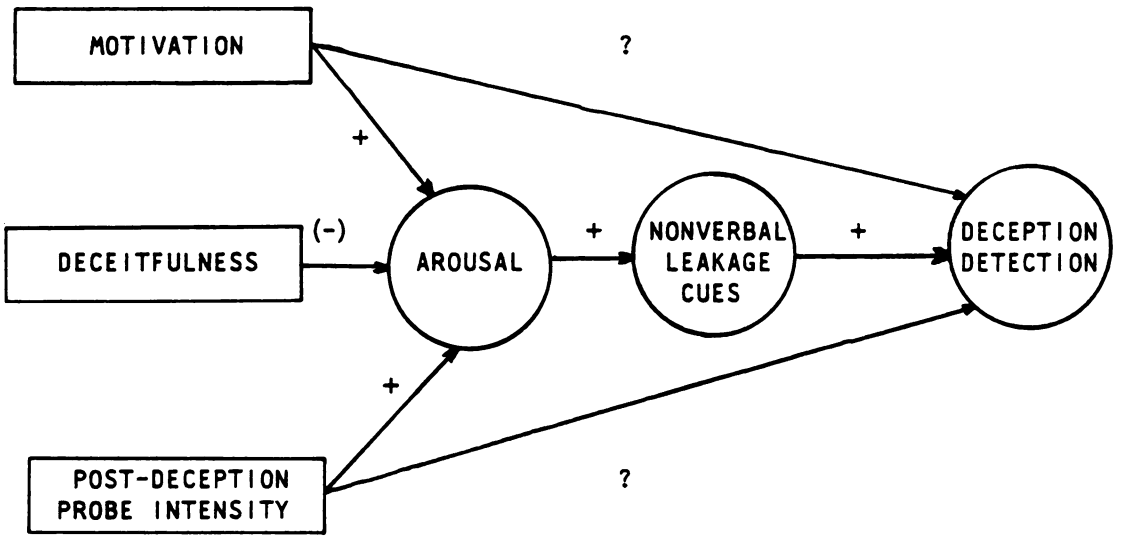

Figure 1. An integrated causal model of the hypothsized relationships for deceivers.

The model proposes that deceiver motivation will be positively related to arousal and nonverbal leakage behavior, resulting in more probable detection. Individuals who are more willing to use deception in their encounters with others are predicted to control the arousal and leakage cues, increasing the frequency of deception success. Finally, the intensity of post-deception probes by a deceivee are predicted to positively correlate with arousal and leakage cues, resulting in detection.

CHAPTER 2

METHOD

Sample

Subjects were 108 university undergraduates recruited from lower division communication classes at Michigan State University. All participants were randomly paired and asked to report to the laboratory at half-hour intervals. All volunteers received a token amount of extra credit in their communication class for their participation. To further induce participation and involvement, prizes valued at approximately $ 30.00 were offered to the three most successful deceivers and the three most successful deception detectors. The sample was 70% female.

Design

With arousal as the dependent variable, a 3 (probe) X 2 (deceit) X 2 (motivation) mixed design was used to test experimental hypotheses H1, H2, and H3. Although each subject engaged in only one of the three probe conditions, motivation was varied during each dyadic session, allowing subjects to act as their own control, i.e., repeated measures. Thus, probe and deceit varied between subjects; motivation varied within subjects.

Operationalizations

Probe Intensity. The nature of the probe variable was examined under three conditions: (1) no probes at all, (2) assertion probes, which raise the issue of deception without explicitly accusing the suspected deceiver, and (3) question probes, which specifically request

the suspected deceiver to admit whether he/she is lying. These conditions seemed to represent low, medium, and high values along a continuum of probe intensity.

Motivation. The high and low motivation conditions were manipulated simultaneously for both deceiver and deceivee in an identical fashion. During the experimental session the magnitude of monetary rewards available was varied across trials such that the high motivation condition allowed a greater reward for success (by a factor of 4) than the low motivation condition.

Deceitfulness and Cynicism. Deceitfulness and cynicism factors were extracted from Christie's (1970) MACH IV scale using exploratory and confirmatory factor analytic techniques. These dimensions (and two others) emerged in a validity study by Hunter, Gerbing, and Boster (1982), replicating the findings of Williams & Boster (1981).

Arousal. Physical arousal was judged and coded by trained raters using four sets of seven-interval sematic differential items designed to tap interest, involvement, and tension (Burgoon & Koper, 1984).

Nonverbal behavioral cues. Raters also assessed the frequency and nature of a broad spectrum of face, head, and body cues which have been indicated in the literature as likely conduits for leakage, or which have been indicated by traditional wisdom as accompanying deception.

Deception Detection. "Successful deception is conceived of as skillful behavior management" (Miller, deTurck, & Kalbfleisch, 1983, p. 99). In other words, to the extent that the deceivee is able to successfully attribute deception based on observations of the deceiver, detection will occur. Knapp and Comadena (1979) point out that deceit

may be a "rule of the game and the participants simply try to see who can out-con the other" (p. 273). In the context of the experimental situaton (detailed in the next section), if a deceivee bets on a winning hand or folds on a losing hand, it will be assumed that the deceiver was the source of some behavioral clue which revealed the nature of the hand.

Poker as a Methodology in Deception Research

Researchers attempting to understand deceptive communication have been faced with the task of creating situations that induce individuals to encode deceptive messages. In reviewing the deception literature, one is inevitably impressed with the various clever techniques used to motivate dissembling. Ekman and Friesen (1974) asked nursing students to view slides of either pleasant outdoor scenes or badly burned accident victims and report that they felt relaxed, comfortable, and happy regardless of the picture on the screen. It was assumed that they would not be giving accurate information when viewing the burn victims.

In another clever manipulation subjects were required to take $10.00 from a desk drawer and attempt to conceal the fact from a polygraph operator (Barland & Raskin, 1975). If they were successful they were allowed to keep the money, thus providing the motivation to deceive. Despite the ingenuity of the investigators, the ecological validity of both these methods has been criticized because the researchers instructed the subjects to deceive, sanctioning a normally elicit behavior.

Perhaps the most realistic induction of face-to-face deception to date involves implicating the subject in a cheating incident (Exline, Thibaut, Hickey, & Gumpert, 1970; Bauchner, Brandt, & Miller, 1977). Using a confederate to stimulate the cheating occurrence during a simple dyadic task, the naive subject is then interviewed alone and asked how their dyad did so well on the task. A monetary reward for high performance encourages the subject to make up some false method and claim that it was responsible for the high accuracy, rather than admit to cheating.

While these methods and others have proven useful in understanding deception, it is possible that limitations in degree of motivation still hamper investigators seeking realistic effect sizes. Thus, researchers continue to seek methods of approximating real world deceptive situations in which the salient issues in deception can be explored.

A simple two-handed poker game, known occasionally as "2-card Miller", may provide a stage on which the drama of deception and detection may play somewhat free of the confines of past approaches. As expressed by Hayano (1980), "Our understanding of what professional poker players do over the cardroom table may very well be significant in detecting deception and distorted structures of communication in everyday life" (P. 113). Admittedly, the rules of poker sanction deceptive behavior. However, the basis for criticism of methods inducing sanctioned deception rests on presumed differences in deceiver response to sanctioned and unsanctioned deceit.

One important feature which may generally distinguish socially approved from socially disapproved deception is the identity of the beneficiary in the situation. Often deceit which benefits others is seen as socially desirable. For example, telling a friend that we really like her new, but unattractive, hair style is encouraged as socially-appropriate behavior, and is thus sanctioned. Deception which seeks to further selfish goals at the expense of another is more typically discouraged as unethical and socially maladaptive.

Criticisms of methods that sanction deception seem to be well founded when the experimenter requests subjects to lie in order to "help in carrying out this experiment". This is clearly a benefit-other situation. However, the goal in poker is singularly the selfish, even greed, accumulation of wealth at the expense of the opponent. Although deception is sanctioned, the self-benefit goal clearly simulates unsanctioned deception.

Additionally, a method that produces a series of independent deceptive encounters allows researchers to use subjects as their own control, and thus decreasing both necessary sample sizes and sampling error. For example, the present study could have been run with each subject in only one motivation condition, but this would have required twice the sample to achieve the same power.

Procedure

Prior to entering the gaming area, all subjects completed a questionnaire consisting of the 20-item MACH IV scale (Christie, 1970). Appendix A provides the full contents of the pretest materials.

After being greeted and seated at a card table, the basic rules were explained and antes and betting limits were specified. The cards were not in random order, but rather (unknown to the players) they were carefully sequenced in order to obtain control over the vagaries of "lady luck". All hands were comprised of two cards of identical value, i.e., a pair. Cards to the deceiver (player A) were dealt face down; cards to the deceivee (player B) were dealt face up. Thus, the deceiver always knew whether he/she was holding a winning hand. A confederate dealer then dealt two practice hands, so that the players could see how the game would proceed, after which ten hands were played. Half of the hands (randomly ordered) were high motivation (large ante) and half were low motivation (small ante).

Probe intensity was varied across dyads. One-third of the dyads sat in silence after the cards were dealt and before Player B was asked to either play or fold (30 seconds); in one-third of the dyads Player B was instructed to assert his/her wishes to know Player A's cards and whether his/her hand could beat them; in the final one-third of the dyads Player B was instructed to ask Player A whether his/her cards were better and whether he/she had him/her beat. After the waiting period, Player B was asked to play or fold based on his/her observations of the opponents behavior. Appendix B contains the ante schedule, specific cards dealt during the game, and probes suggested by the experimenter.

A video camera and recorder was used to record the nonverbal behavioral cues of Player A for later coding. After completing all ten trials, the participants responded to three manipulation-check items, then were debriefed and thanked for their time and cooperation.

Coding of Nonverbal Behaviors

Two trained judges viewed the videotapes of the experimental sessions on a high-resolution 26" television monitor. Each of the ten hands played by each dyad was assessed separately and, in addition to judgements of overall physical arousal, ratings were made of a variety of kinesic and proxemic behavioral cues. A seven-item semantic differential scale was used in coding each behavior. Also coded was the outcome of each hand, i.e., the accuracy of the detector's inference regarding the quality of the opponent's hand. Appendix C contains the coding sheet which was used.

Analyses

Several analytic techniques were applied to the data. Initially, confirmatory factor analysis was used to insure unidimensionality of measurement of the dimensions of Machiavellianism, specifically deceitfulness and cynicism. Standard score coefficient *alpha* reliabilities for all multiple-item measures, as well as inter-rater reliabilities, were calculated, and manipulation checks were evaluated. Interactions among the exogenous variables were assessed using the repeated-measures MANOVA routine available on SPSS (Nie, Hull, Jenkins, Steinbrenner & Bent, 1975).

Exploratory factor analytic techniques were used to cluster the coded nonverbal behavioral cues, after which unidimensionality was assessed using a confirmatory factor analytic technique (multiple groups centroid factor analysis). All factor analyses utilized Hunter and Cohen's (1969) PACKAGE program, a set of computer routines designed specifically to analyze correlational data. Correlations were then computed between all of the theoretical variables. After all path coefficients in the integrated model were specified, the model was tested using path analytic techniques. On the basis of these results, a modified set of structural equation models were then specified and tested.

CHAPTER 3

RESULTS

Manipulation checks. In order to determine whether the experimental manipulation of the motivation variable was of sufficient magnitude to provide a reasonable test of the hypothesized relationships, three Likert-type items were administered in a post-session questionnaire. The first item asked if the "hands with higher sums of money" to be won were more involving. Seventy percent of the respondents agreed that the high motivation hands were indeed more involving, with 18% strongly agreeing and only 4% strongly disagreeing.

The second item suggested that, because the money on the table did not belong to the subject, the funds had merely token value. Sixty percent disagreed with this statement.

The third test of the motivation induction asked the subject to differentiate the high motivation hands from the low motivation hands in describing his/her excitement level. Fifty-eight percent of the sample agreed that they were more excited when the table held a larger sum. Although it was hoped that the manipulation of the motivation variable would result in more dramatic differences in involvement, these results were taken to indicate a moderately successful induction.

Inter-rater reliabilities. Inter-rater reliabilities for the coded nonverbal behaviors ranged from .26 for lip-licking to .98 for rocking. Mean inter-rater reliability for all scales was .67. Appendix D provides the inter-rater reliability for each scale.

Development of the Measurement Model

Dimensions of the MACH IV Scale. Because previous research (Hunter, Gerbing, & Boster, 1982) has demonstrated the multidimensionality of the MACH IV scale, the first task was to establish a unidimensional measurement of the component beliefs. Subject responses on the 20-item scale were submitted initially to blind exploratory factor analysis. Three factors emerged with eigenvalues greater than 1.00. After the principal components were rotated to produce maximally orthogonal factors (varimax rotation), items were assigned to clusters on the basis of the highest factor loading. It should be noted that although exploratory procedures are conservative and tend to underfactor (Hunter & Gerbing, 1982), the two factors of interest in the current study clearly emerged.

In order to insure unidimensionality of factors, Hunter and Gerbing (1982) recommend three criteria for evaluating items: 1) homogeneity of content, 2) internal consistency, i.e., the items should correlate with each other to within sampling error of the product of the items' correlations with the trait, and 3) external consistency, i.e., the items should correlate similarly with other variables.

After assessing the 20 items for these qualities, seven items were rejected and placed in a residual factor. Table 1 presents the results of the multiple groups confirmatory factor analysis, which was performed with communalities in the diagonal. The resulting loadings are thus the correlations between the items and the underlying trait with measurement error eliminated (Hunter & Gerbing, 1982).

TABLE 1

MACH IV Items, Factor Loadings, Means, and Standard Deviations Ordered by Subscale

Item	Factor Loadings Cyn	Mis	Dec	Mean	SD
Cynicism					
1) The biggest difference between most criminals and other people is that the criminals are stupid enough to get caught.	.62	-.36	-.14	4.94	1.06
2) It is wise to flatter important people.	.52	-.02	.12	3.54	1.17
3) Never tell anyone the real reason you did something unless it is useful to do so.	.49	.04	.09	4.21	1.29
4) Anyone who completely trusts anyone else is asking for trouble.	.47	-.24	-.17	3.93	1.51
Misanthropy					
5) All in all, it is better to be humble and honest than to be important and dishonest.*	.22	.63	.34	2.07	1.03
6) Barnum was wrong when he said there is a sucker born every minute.*	.03	.54	.30	3.52	1.42
7) It is safest to assume that all people have a vicious streak, and it will come out when they are given a chance.	-.21	.53	.18	3.83	1.24
8) Most people are basically good and kind.*	-.25	.51	.41	2.90	1.18
9) Most people are brave.*	.21	.47	.31	3.61	.77
10) Generally speaking, people won't work hard unless they are forced to do so.	-.40	.42	-.11	4.00	1.22
Deceitfulness					
11) There is no excuse for lying to someone else.*	.18	.24	.84	3.44	1.44
12) Honesty is the best policy in all cases.*	.23	.15	.70	3.17	1.44
13) When you ask someone to do something for you, it is better to give the real reasons for wanting it rather than giving reasons that carry more weight.*	.11	.15	.51	2.72	1.15

(continued on next page)

TABLE 1 (CONTINUED)

MACH IV Items, Factor Loadings, Means, and Standard Deviations Ordered by Subscale

Item	Factor Loadings Cyn	Mis	Dec	Mean	SD
Residual					
14) The best way to handle people is to tell them what they want to hear.	.30	-.18	.04	4.56	1.08
15) People suffering from incurable diseases should have the choice of being put painlessly to death.	.30	.08	.24	2.42	1.52
16) Most people forget more easily the death of a parent than the loss of their property.	-.24	.17	-.12	5.48	.86
17) One should take action only when sure it is morally right.*	.44	-.05	.26	3.23	1.31
18) Most people who get ahead in the world lead clean, moral lives.*	.51	.26	.36	4.41	1.30
19) It is hard to get ahead without cutting corners here and there.	-.06	.27	.41	3.04	1.15
20) It is possible to be good in all respects.*	.02	.46	.46	2.91	1.38

reflected items identified with asterisk

The measurement model underlying the MACH IV scale consists of three primary clusters which indicate cynicism, misanthropy, and deceitfulness. The cynicism cluster consists of four items which describe the world as unfair and hazardous. Williams and Boster (1981) labeled a cluster of these same items negativism. The misanthropy cluster is comprised of six items which advance the perception of others as brave, good, kind, and hard working (scored in the direction of rejection). The deceitfulness cluster consists of three items that

prescribe honesty in dealings with others (scored in the direction of rejection).

Standard score coefficient alpha reliabilities for the three factors are: cynicism - .61; misanthropy - .69; and deceitfulness - .71.

Table 2 presents the intercorrelations of the MACH IV factors.

TABLE 2

Correlations of MACH IV subscales

Measure	MACH IV	CYN	MIS	DEC
MACH IV	1.00			
Cynicism	.70	1.00		
Misanthropy	.57	.13	1.00	
Deceitfulness	.88	.17	.46	1.00

If the MACH IV scale was indeed unidimensional, all of the intercorrelations would be 1.00 (to within sampling error). Thus, these results are similar to Hunter, Gerbing, and Boster's (1982) finding that the MACH IV scale provides indices of at least three, and perhaps four, "specifically differentiated dimensions" (p. 1300). The low average correlation (r=.25) between clusters provides compelling evidence of multidimensionality.

Dimensions of arousal. Based on previous research efforts (e.g., Burgoon & Koper, 1984), four semantic-differential scales were used to rate the apparent physical arousal of the deceiving subjects. Table 3 provides summary information on the items.

TABLE 3

Arousal Items, Factor Loadings, Means and Standard Deviations Ordered by Subscale

Item	Factor Loading: tension	Factor Loading: involvement	Mean	SD
Tension				
1) cool/bothered	.97	.10	2.52	.63
2) relaxed/tense	.97	.17	2.57	.66
Involvement				
3) withdrawn/involved	.13	.99	2.52	.71
4) apathetic/interested	.13	.99	2.52	.71

Coefficient alpha reliabilities for the arousal dimensions were: tension - .97 and involvement - .99.

Two distinct factors emerged - an tension dimension which seemed to indicate nervousness, i.e., a negative-affect response, and an involvement dimension which appeared to tap a more positive-affect

dimension of arousal. The correlation between these clusters was found to be within sampling error of zero (r=.17).

Mehrabian (1981) has specifically conceptualized arousal as a combination of both activity and alertness dimensions. This multidimensional conceptualization has received empirical support as well (Burgoon & Koper, 1984).

Interactions of exogenous variables. In order to examine potential interactions among the exogenous variables (probe intensity, motivation, and deceitfulness) in predicting arousal and involvement, a 3 X 2 X 2 repeated-measures analysis of variance was computed. A non-significant probe X deceitfulness interaction was obtained for both dependent measures. Thus, only main effects were considered in subsequent analyses.

Dimensions of Nonverbal Behavioral Cues

In order to reduce the rated nonverbal cues into clusters of conceptually and empirically related variables, exploratory and confirmatory factor analyses were performed. Six factors emerged representing both facial and body cues across three dimensions: immediacy, animation, and adaptor behaviors. Two items, response latency and leg crossing, were omitted for failing to meet unidimensionality criteria. The resulting unidimensional factors are presented in Table 4.

TABLE 4

Nonverbal Items, Factor Loadings, Means, and Standard Deviations Ordered by Subscale

Item	Factor Loadings						Mean	SD
	FIM	FAN	FAD	BOA	BAN	BIM		
Facial Immediacy								
1) no/constant eye contact	.60	.18	.02	-.03	.19	.15	3.56	1.70
2) in/direct head orientation	.60	-.13	-.09	-.26	-.01	.41	5.47	.79
Facial Animation								
3) no/constant smiling	.30	.92	.08	.35	.09	.35	2.78	1.66
4) deadpan/animated face	.11	.89	.10	.42	.11	.36	3.08	1.53
5) unpleasant/pleasant face	.42	.74	-.09	.28	.16	.27	4.80	1.16
6) no/constant laughing	.07	.45	.29	.20	.07	.11	1.36	.87
7) no/constant eyebrow flash	.14	.40	-.05	.17	.09	.11	1.31	.76
8) no/constant lip licking	.07	.34	.02	.17	.11	.08	1.26	.66
Facial Adaptors								
9) no/constant face touching	-.02	.11	.95	.25	-.11	.13	2.09	1.78
10) no/constant face covering	-.09	.07	.95	.25	-.06	.04	1.88	1.67
Body and Object Adaptors								
11) no/const't random movement	-.28	.45	.19	.85	.12	.22	1.41	1.04
12) no/constant body adaptors	-.38	.30	.35	.76	.09	.19	1.73	1.21
13) no/const't object adaptors	-.24	.17	.03	.55	.13	.13	1.29	1.18
Body Animation								
14) no/constant rocking	.11	.03	-.04	.11	.90	.07	.54	1.35
15) no/constant leaning away	-.18	.06	-.06	.20	.59	.25	2.36	2.27
16) no/constant head nodding	.37	.26	-.09	.01	.58	.09	1.62	1.28
Body Immediacy								
17) no/constant twisting	-.11	.27	.05	.09	-.04	.94	1.94	2.03
18) no/constant foot shifting	.19	.26	-.04	.10	.38	.60	2.91	1.92
19) in/direct body orientation	-.54	.20	.17	.34	.09	.58	1.47	1.03

Standard score coefficient alphas for the clusters were as follows: facial immediacy - .50; facial animation - .78; facial adaptors - .94; body and object adaptors - .76; body animation - .72; and body immediacy - .74. Average alpha for all clusters was .74.

Table 5 presents the intercorrelations of the nonverbal behavioral clusters.

TABLE 5

Correlations of Nonverbal Behavioral Dimensions

Cluster	1	2	3	4	5	6
1) Facial Immediacy	1.00					
2) Facial Animation	.39	1.00				
3) Facial Adaptors	.06	.09	1.00			
4) Body/Object Adaptors	-.26	.31	.26	1.00		
5) Body Animation	.04	.23	-.09	.16	1.00	
6) Body Immediacy	.29	.24	.09	.01	.20	1.00

Facially-produced cues are weakly correlated with body produced cues across all dimensions ranging from .04 for the correlation between facial immediacy and body animation to .31 for the correlation between facial animation and body and object adaptors. The average obtained correlation across dimensions (body vs. face) was .12.

The full matrix of corrected correlations of all theoretical variables is presented in Table 6.

TABLE 6

Intercorrelations of Theoretical Variables*

	1	2	3	4	5	6	7	8	9	10	11	12	13
1) Probe Intensity	100												
2) Deceitfulness	00	100											
3) Deceivee Cynicism	00	00	100										
4) Motivation	00	00	00	100									
5) Involvememt	16	-09	-05	07	100								
6) Tension	20	08	06	-03	29	100							
7) Facial Immediacy	66	05	07	-01	30	02	100						
8) Facial Animation	29	20	06	-01	48	48	58	100					
9) Facial Adaptors	15	13	-09	06	-10	19	06	09	100				
10) Bdy/Obj. Adaptors	01	-23	02	03	01	40	-31	40	28	100			
11) Body Animation	01	-32	09	00	09	12	05	31	-11	28	100		
12) Body Immediacy	03	04	06	03	13	23	36	32	-03	01	23	100	
13) Deception Success	06	-02	05	20	-02	-01	01	-02	-05	01	-01	09	100

*corrected for attenuation due to measurement error. Decimals ommitted for clarity. N=108.

The parameters of a recursive causal model are estimated based on the obtained correlations between theoretical variables, corrected for attenuation due to measurement error. In this case, path coefficients are equivalent to regression weights (Hunter & Gerbing, 1982). When an endogenous variable has a single causal antecedent, the beta weight is equal to the correlation coefficient. If an endogenous variable has two or more causal antecedents, the path coefficient is estimated by regressing Y onto the antecedents. The path coefficient between correlated exogenous variables is simply their corrected correlation.

Figure 2 presents the hypothesized path model with path coefficients.

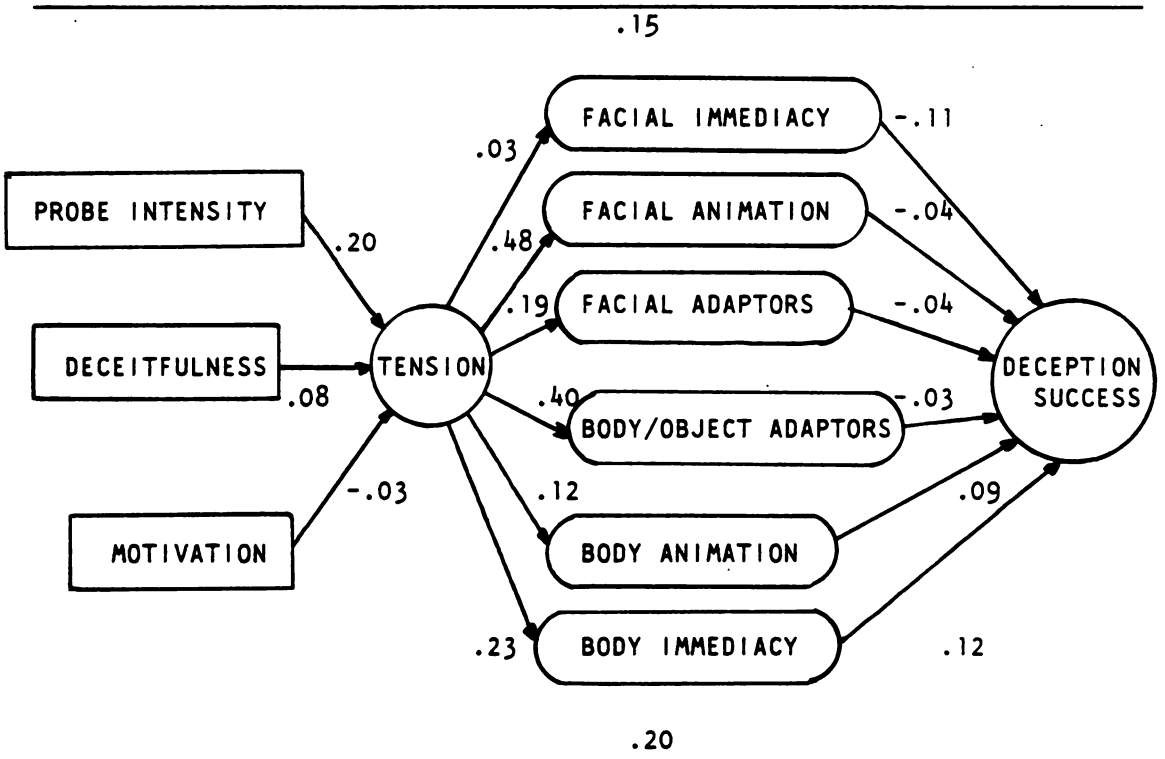

Figure 2. An integrated theoretical model of deception with path coefficients.

Test of the Theoretical Model

Path analysis allows statistical inferences as to whether the data fit the proposed model. A matrix of predicted correlations among the theoretical variables can be computed based on the estimated parameters of the hypothesized model. This predicted correlation matrix is presented in Table 7.

TABLE 7

Reproduced correlations of theoretical variables

	1	2	3	4	5	6	7	8	9	10	11
1) Probe Intensity	--										
2) Deceitfulness	00	--									
3) Motivation	00	00	--								
4) Tension	20	08	-03	--							
5) Facial Immediacy	01	00	00	02	--						
6) Facial Animation	10	04	-01	48	01	--					
7) Facial Adaptors	04	02	-01	19	01	09	--				
8) Body/Obj. Adaptors	08	03	-01	40	01	19	08	--			
9) Body Animation	02	01	00	12	00	06	02	05	--		
10) Body Immediacy	05	02	-01	23	01	11	04	09	03	--	
11) Deception Success	14	00	20	02	-11	-03	-03	-01	09	11	--

Decimals ommitted for clarity.

Subtracting the predicted correlations from those observed in the data results in an error matrix of residuals, presented in Table 8.

TABLE 8

Residual correlations of theoretical variables

	1	2	3	4	5	6	7	8	9	10	11
1) Probe Intensity	--										
2) Deceitfulness	00	--									
3) Motivation	00	00	--								
4) Tension	00	00	00	--							
5) Facial Immediacy	65	05	01	00	--						
6) Facial Animation	19	16	00	00	57	--					
7) Facial Adaptors	11	11	04	00	05	00	--				
8) Bdy/Obj. Adaptors	-07	-26	03	00	-32	21	20	--			
9) Body Animation	-01	-33	00	00	05	25	-13	23	--		
10) Body Immediacy	-02	02	04	00	35	21	-01	-08	20	--	
11) Deception Success	-08	-02	00	-03	12	01	-02	02	10	-02	--

Decimals ommitted for clarity.

Two correlations exceeded the test value for isolated discrepencies, i.e., d*=.51 (Hunter, 1983).

The sum of squared deviations for the model as tested is 1.663; the mean squared deviation is .035. The sum of absolute value deviations is 5.69; the mean absolute value deviation is .118.

In order to provide a statistical test the goodness of fit of the data to the model, Hunter's Q (Hunter, 1983), which has a chi-square distribution, was calculated. The result was a nonsignificant chi-square (X^2=24.46, 48 d.f., p>.05), indicating that the data are consistent with the proposed model.

On the other hand, in reviewing the residual matrix, several modifications in the model suggest themselves. Rather than specifying arousal as an antecedent condition for the nonverbal cues, the correlations suggested that perceived tension and involvement are the consequence of these behavioral dimensions. Moreover, deceitfulness and probe intensity appeared to be more uniformly highly correlated with several of the nonverbal dimensions than the product rule would dictate, indicating incorrect causal specification of the model. For clarity two models were constructed, one for the each of these exogenous variables.

The Deceitfulness Model

The deceitfulness model is presented in Figure 3.

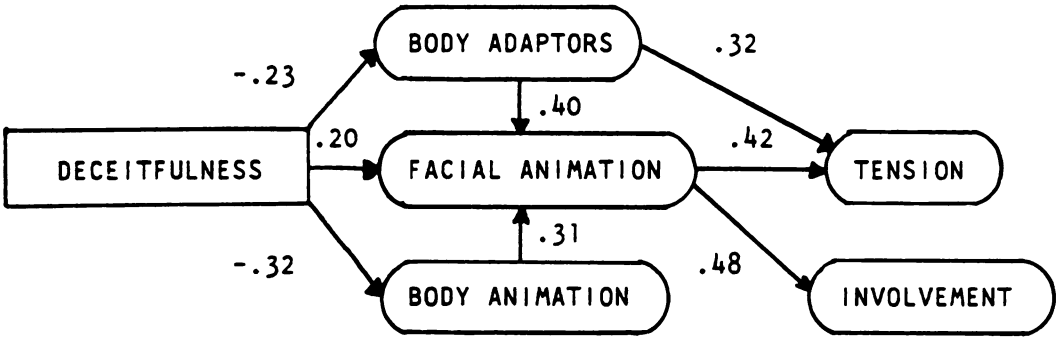

Figure 3. A theoretical path model of the impact of deceitfulness.

Tables 9 and 10 present the reproduced and residual correlation matrices for the deceitfulness model.

TABLE 9

Reproduced correlations of theoretical variables for the deceitfulness model

	1	2	3	4	5	6
1) Deceitfulness	--					
2) Bdy/Obj. Adaptors	-23	--				
3) Facial Animation	20	40	--			
4) Body Animation	-32	18	31	--		
5) Tension	-03	40	48	18	--	
6) Involvement	05	17	48	13	26	--

Decimals ommitted for clarity.

TABLE 10

Residual correlations of theoretical variables for the deceitfulness model

	1	2	3	4	5	6
1) Deceitfulness	--					
2) Bdy/Obj. Adaptors	00*	--				
3) Facial Animation	00*	00*	--			
4) Body Animation	00*	10	00*	--		
5) Tension	11	00*	00*	-06	--	
6) Involvement	-14	-16	00*	-04	03	--

Decimals ommitted for clarity. * indicates correlations constrained to zero by estimation procedure.

None of the correlations exceeded the test value for isolated discrepencies, i.e., d*=.50 (Hunter, 1983).

The sum of squared deviations for the model as tested is .07; the mean squared deviation is .010. The sum of absolute value deviations is .64; the mean absolute value deviation is .09.

A statistical test of the goodness of fit of the data (again, Hunter's $\mathcal{Q}$) resulted in a nonsignificant chi-square (X^2=1.12, 7 d.f., p>.05), indicating that the data are consistent with the proposed model.

The Probe Intensity Model

A second model was constructed which focused on the impact of probe intensity on arousal. The probe intensity model is presented in Figure 4.

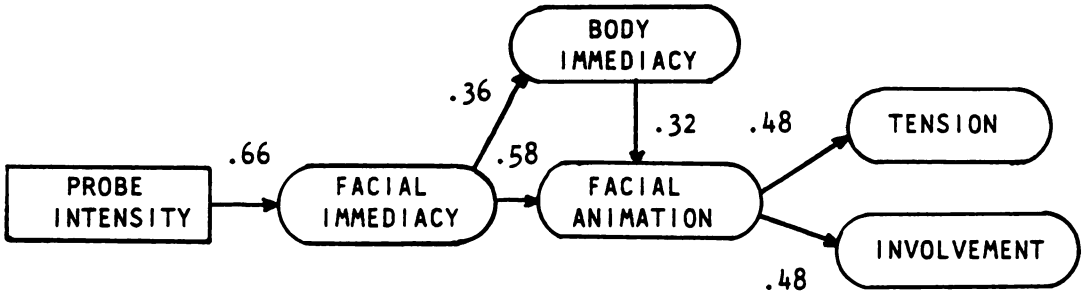

Figure 4. A theoretical path model of the impact of probe intensity on deceivers.

Tables 11 and 12 present the reproduced and residual correlation matrices for the deceitfulness model.

TABLE 11

Reproduced correlations of theoretical variables for the probe intensity model

	1	2	3	4	5	6
1) Probe Intensity	--					
2) Facial Immediacy	66	--				
3) Body Immediacy	24	36	--			
4) Facial Animation	38	58	35	--		
5) Tension	18	28	15	48	--	
6) Involvement	18	28	15	48	23	--

Decimals ommitted for clarity.

TABLE 12

Residual correlations of theoretical variables for the probe intensity model

	1	2	3	4	5	6
1) Probe Intensity	--					
2) Facial Immediacy	00*	--				
3) Body Immediacy	-21	00*	--			
4) Facial Animation	-09	00*	00*	--		
5) Tension	02	-26	08	00*	--	
6) Involvement	-02	02	-02	00*	06	--

Decimals ommitted for clarity. * indicates correlations constrained to zero by estimation procedure.

None of the correlations exceeded the test value for isolated discrepencies, i.e., d*=.49 (Hunter, 1983).

The sum of squared deviations for the model as tested is .13; the mean squared deviation is .015. The sum of absolute value deviations is .78; the mean absolute value deviation is .09.

A statistical test of the goodness of fit of the data (again, Hunter's $\emptyset$) resulted in a nonsignificant chi-square (X^2=2.05, 9 d.f., p>.05), indicating that the data are consistent with the proposed model.

Tests of the Hypotheses

The first three hypotheses predicted statistically significant relationships between motivation and arousal, probe intensity and arousal, and deceitfulness and arousal; the latter was predicted to be a negative function. Although positively correlated, motivation was not found to be a significant predictor of tension (F=.57, 1/30 d.f.,

p=.45) or involvement (F=1.59, 1/30 d.f., p=.21). Thus, H1 was not supported by these data.

Probe intensity was found to be significantly related to both tension (F=12.11, 2/30 d.f., p<.05, eta^2=.06) and involvement (F=7.86, 2/30 d.f., p<.05, eta^2=.03), offering evidence in support of H2.

Deceitfulness was predicted to be negatively related to physical indicators of arousal (H3). The results of the analysis of variance indicate a marginally nonsignificant relationship between deceitfulness and tension (F=5.17, 1/30 d.f., p=.08) and a nonsignificant result for involvement (F=1.59, 1/30 d.f., p=.21). Thus, H3 was not supported. However, because of nonverbal variables demonstrated by the path model to mediate this relationship, a low correlation would be expected.

Motivation proved to be significantly positively related to deception success. All other predictors failed to reach traditional levels of significance, thus offering no support for hypothesis four, which predicted that deceivee cynicism would increase detection accuracy, or hypothesis five, which predicted that several nonverbal leakage behaviors would be related to deception detection.

CHAPTER 4

DISCUSSION

The findings of this study both replicate and further illuminate several current methodological and theoretical issues in behavioral research. The first portion of this discussion will focus on the conceptual and theoretical issues which were addressed in this study.

Theoretical Issues

Impact of Probe Intensity. The largest correlation between any of the variables in this study was obtained for the impact of probe intensity on facial immediacy. Though mediated by facial animation, facial immediacy was clearly related to perceived tension and involvement. In other words, more direct and intense probes had the effect of increasing both involvement and tension.

The deceivers in this study responded to more intense probes by increasing eye contact and directness of head and body orientation. This would appear to be an effort aimed at avoiding deceivee perceptions of dishonesty, i.e., by squaring off and looking the opponent in the eye, the deceivers demonstrated a strategy probably designed to promote perceptions of credibility and confidence (Hemsley & Doob, 1978; Hocking, Fontes, & Miller, 1978) It should be noted that this strategy resulted in higher perceived arousal but no differences in deception success.

Impact of Deceitfulness. The specific dimensions related to deceitfulness include body animation and body adaptors. Both categories of body cues were negatively related to deceitfulness, indicating either lower tension and involvement or an inhibiting control of these behaviors in an effort to avoid the appearance of dishonesty. This interpretation supports Hocking and Leathers' (1980) argument that body movements and adaptors represent behaviors are stereotypical of deception but are also controllable.

Facial animation was also related to deceitfulness, except this dimension of cues was positively related to the trait. Thus, highly deceitful individuals were more facially active than less deceitful individuals. Again, consistent with Hocking and Leathers' (1980) perspective, facial cues (which are related to perceived arousal) were apparently the conduit for leakage of arousal.

An alternative approach yields a similar conclusion. Interpreting facial animation as a credibility cue, (Mehrabian, 1981; Zuckerman et al., 1979) it appears that individuals more willing to deceive are also more likely to manipulate behaviors associated with the stereotype of a liar, i.e., they inhibited arousal cues and increased credibility and affiliation cues.

Impact of Motivation. The strongest determinant of deception success in this experiment was motivation, which was not significantly correlated with any other variable, including arousal. Of course, this suggests that although the motivation manipulation was relatively ineffective in arousing the deceivers, it did prove at least marginally

effective in increasing deceiver success.

Conversely, leakage theories would predict that motivation would cause arousal levels to increase, producing nonverbal arousal cues from those channels which are most difficult to monitor and control (Hocking & Leathers, 1980). On this basis detection would be predicted for highly motivated deceivers. However, before challenging the utility of leakage theories, a rival explanation for this result will be considered.

Social exchange theories of behavior (c.f., Thibaut & Kelly, 1959) would predict that decisions made during the game are the result of cost/benefit analyses performed by the players. Assuming this is the case, then the amount of the ante (the motivation manipulation) may influence the likelihood of betting, independent of the nonverbal behavioral display of the opponent. The mathematics used to derive this prediction are presented in Figure 5.

If: a = amount of ante, b = amount of bet, p = probability of winning, w = amount won (or lost)

Then:
$$E(w, \text{if bet}) = p(a+b) - q(a+b)$$
$$= (p-q)(a+b)$$
$$E(w, \text{if fold}) = -a$$

Decision Rule is -

Bet if: $(p-q)(a+b) > -a$

$$p > b/2(a+b)$$

Given: $a = 1.00$, $b = .25$, bet if: $p > .10$ (Fold if "2")

Given: $a = .25$, $b = .25$, bet if: $p > .25$ (Fold if "2,3,4")

Figure 5. Decision rule for folding or staying in the game.

The logic of the situation is as follows: in the low motivation situation, the detector who decides to play will either win or lose $ .50. Since only $ .25 is lost if the player folds, and it doubles the stakes to stay in and play, the player tends to be more conservative, i.e., "If I don't have at least, say, a pair of 5's, I'll let the quarter go rather than risk losing twice that amount."

In the high motivation situation, the detector who plays stands to win or lose $ 1.25. In this case, to fold means to automatically lose the $ 1.00 ante when it only costs $ .25 to stay in. The player thus adopts a more liberal cut-off level for folding, i.e., a sure loss.

Although the subjective application of this decision rule may be expected to vary, the reasoning would probably obtain. While the attempt was made to manipulate the motivation of the players, it appears that by varying the ante/bet ratio, this method was also altering the perceived cost/benefit contingencies.

Another aspect of the method exacerbated this problem. Half of the ten hands played were low motivation and half were high motivation; Player A held winning cards on half of the hands and Player B held winning cards the other half. However, because ten hands were played, winning hands were not distributed equally for both players in both conditions. Specifically, in the low motivation condition, Player B (the detector) held winning cards in three of the five hands; in the high motivation condition, Player A (the deceiver) held winning cards in three of the five hands. Clearly, conservative play during the low motivation condition served to reduce opportunities for the deceivee to

win (precisely when the odds were in favor of holding winning cards).

These two alternatives for interpreting the motivation results provide competing possible explanations. Although the manipulation checks suggested at least moderate success in inducing the motivational difference sought, motivation was only trivially associated with every dimension of nonverbal behavior. If detection is the result of nonverbal leakage, motivation should have been negatively correlated with the nonverbal behavioral dimensions. Alternatively, perhaps more highly motivated deceivees were less able to attribute deception accurately due to their own arousal level (which was not assessed in this study). These results indicate that motivation may decrease detection accuracy. It remains for future research to further probe this relationship.

Dimensions of Nonverbal Behavior. Based on a theory of implicit communication, Mehrabian (1981) provides a conceptual framework that specifies three orthogonal dimensions of nonverbal messages: an immediacy dimension (an approach/avoidance metaphor), an arousal dimension (a combination of activity and alertness), and a dominance dimension (an assertivenes or control continuum).

The factors that emerged in the present results provide limited support for this typology. The immediacy dimension corresponds with the immediacy clusters; the arousal dimension, with the adaptor clusters, although only the tension dimension of arousal was found to correlate with adaptor dimensions; and the dominance dimension, with the animation cluster.

Impact of Cynicism. The results of both correlational and discriminant analyses indicate no significant relationship between cynicism and success in detecting deception. The hypothesis predicting the cynicism effect was warranted on the assumption that cynics maintain a higher subjective estimate of the presence of deceptive messages in the environment.

This "untruth bias" was presumed to cause cynics to attribute deception more often. However, although falsehoods are undoubtedly common occurrences, they probably still account for a small fraction of all messages in the environment. Thus, while an extreme untruth bias might increase the frequency of detection of real deceptive messages, highly frequent incorrect attributions of deception would result in lower overall accuracy.

Whether or nor cynicism would enhance or inhibit detection accuracy, at least one other variable would be expected to influence subjective probability estimates of deception likelihood, i.e., the situation in which the encounter is taking place. In other words, some situations are more likely to engender suspicion. When buying a used car or quizzing a husband about lipstick smudges, for example, the situation itself dictates a high untruth bias.

Unfortunately, another situation in which this bias occurs is in games where wagers are placed on cards known only to the players. Two-card Miller is such a game. Thus, any advantage a cynic would gain in detecting deception may have been eliminated because the situation demands that even noncynics maintain an untruth bias. Assuming this is

the case, then a rival explanation for the nonsignificant finding is that any advantage the cynic may have in detecting deception is undermined in situations which demand an untruth bias.

Determinants of Arousal. Facial animation was positively related to perceived tension in both of the final path models. Body adaptors were also related to perceived tension in the deceitfulness model, and facial animation was positively related to perceived involvement in both models.

This evidence supports the contention that attributions of arousal are based primarily on facial animation cues and, to a lesser extent, perceived tension is attributed based on body adaptor cues. Of course, this is consistent with leakage theories, especially Hocking and Leathers' argument that facial cues, as Class II behaviors, are prone to leak arousal. Hand behavior, in the form of body adaptors, is also a conduit for leakage of nervous tension.

Determinants of Deception Success. None of the variables in the study was significantly related to deception efficacy, offering support for Buller's (1982) position that, although deception may be related to arousal, deceptive intent may not be attributed based on arousal cues.

Moreover, if control is conceptualized as both inhibition and conscious enactment of behavior, one strategy in the experimental situation would be to increase the level of "noise" while attempting to decrease the "signal" level. Perhaps deceivers in this study used facial animation in an attempt either to camouflage or to distract deceivees away from other, more telling cues, making attributions of deceit more difficult. Poker players call these behaviors "false

tells" (Hayano, 1980). Although deceitfulness may aid deceivers in controlling the behaviors related to deceptive success in other contexts, this effect was not found in the present data.

Methodological Issues

For fifteen years researchers have been using the MACH scales as indices of agreement with the manipulative and self-serving philosophies of Machiavelli. Because Machiavelli advocated guile and deceit in dealing with others, researchers continue to pursue this construct as a predictor in deception situations. Results have been disappointing.

Unfortunately, virtually all of this work has treated Machiavellianism as a causal agent, i.e., a single trait. It now appears that this is not the case. Indeed, because summing across internally inconsistent items weakens the predictive power of the cluster, the failure of summed MACH scores to consistently predict deception outcomes is no surprise. These data replicate earlier findings (Hunter et al., 1982; Williams & Boster, 1981) which have demonstrated relatively stable multidimensionality of the MACH scales. Future research will benefit by recognizing the multidimensionality of Machiavellianism and acknowledging the component attitudes which comprise Machiavelli's original notion upon which Christie developed the items in the MACH scales.

A second measurement issue raised by this study is the manner in which the arousal variable is best operationalized. Of course conceptual issues must be resolved before evaluating operational definitions. When arousal is conceptualized as "an activated state",

observer-raters may suffice in assessing an individual's arousal level (Mehrabian, 1971). However, because nonverbal behavioral output mediates physiological and perceived arousal, some loss in predictive power would be expected.

Researchers who have enlisted the polygraph or similar methods (e.g., Davidson, 1968) have done so based on the explicit or implicit assumption that arousal is best conceptualized as an autonomic physiological response. This approach to measuring arousal bypasses the problem created by variance in the subjects' ability to control behavioral cues indicating arousal, and therefore minimizes the attendant problem of assessing arousal level. Unfortunately, the obtrusive nature of many physiological measures introduces other measurement problems. For example, a research subject wired up to a polygraph may experience arousal simply due to the intimidating nature of the process. These instrumentation sources of measurement error suggest that, although overt manifestations of arousal may be less detectable by observers, more direct measurement of arousal may not provide any more confident inferences about deception processes than observation.

A final methodological issue lies in the value of games (in this case, 2-card Miller) in studying deceptive behavior. A game like poker was originally considered as a new method of motivating deceptive encoding in the laboratory while avoiding the undesirable context effect created by asking subjects to lie.

Of interest in this study, as in most deception research, was unsanctioned lying. The primary feature which distinguishes sanctioned and unsanctioned deception was thought to be based on the motives of the deceiver. In day-to-day life, most lies aimed at helping another person save face, or similar deceptive acts which benefit another, are socially approved; deception with selfish motivations is more typically discouraged by social norms (Knapp & Comadena, 1979). Thus, although the game itself condones lying, the context simulates situations in which unsanctioned deception occurs. As the results of this study are evaluated with other findings produced by other methods, a clearer image of deception-related behavior and outcomes should emerge.

Limitations of the Study

In evaluating the results of this study several limitations should be recognized. First, the relatively small number of subjects (N=108) may have allowed sampling error to mask or distort the true relationships between variables. The complexity of the design further diminished the number of subjects in each cell, reducing power to detect small differences.

Second, the operationalization of the arousal variable provides, at best, gross level distinctions, and therefore, those parameters of the model related to arousal should be considered approximations of the true relationships. Some researchers believe that physiological indices of arousal may offer keener insights into deceptive communication behavior (Ward, Wilson, & Orne, 1981). Whether rater judgements of physical activation are valid estimates of physiological

arousal remains a debatable issue.

A third limitation was imposed by the experimental context for this investigation. In addition to its obtrusive nature, the method used to induce deceptive messages may have created game contingencies which differed greatly from the real-life situations in which most deception occurs. The resulting data may therefore reflect artifacts of the game itself.

A second problem with using such an induction is the perceptual bias it provokes. The players know that deception will occur in the game, and thus an untruth bias is introduced into the situation. It is expected that this contextual influence may alter the strategic options that a deceiver would consider. Generalizability of the results is thus limited to situations in which an untruth bias exists.

Finally, these data provide no comparison of truthing and lying behavior. Rather, implications may be drawn for the effects of the exogenous variables on behavior during deception. The subjects were placed in circumstances where they possessed information which they attempted to conceal; there was no prize for failure. Consequently, a player would have been foolish to admit to holding either good or bad cards, since it would have been possible to bluff the other player, i.e., either a "confidence" bluff when holding poor cards (hoping to intimidate the other into folding) or a "cool" bluff when holding good cards (in order to keep the other player, and his money, in the game). Subjects' ability to skillfully manage their nonverbal behavior was one determinant of their success. Unfortunately, this operationalization of successful deception fails to address the problem of unrelated

influences on the decision to bet or fold. The weak linkages between the nonverbal dimensions and success indicate that other aspects of the situation exerted a stronger influence on the outcome.

Implications for Future Studies

Several findings of this project offer implications for researchers involved in deception research, and more generally, the investigation of causal processes. First, the role of Machiavellian tendencies in determining deceptive behavior and outcomes should be re-assessed. Because the component beliefs of this construct are differentially related to various aspects of the deception process, past attempts treating the construct as a single causal agent have lead to erroneous conclusions. Moreover, to echo the words of Hunter, Gerbing and Boster (1982), "the entire existing literature on Machiavellianism should be regarded as misleading" (p. 1305).

The notion of control in the leakage process should be expanded beyond merely the inhibition of behavior to include the purposive enactment of nonverbal cues intending to disguise anxiety. Greene et al. (1985) propose a "second control mechanism" which deceivers may use by substituting one facial expression for another. Similarly, Ekman and Friesen (1969) suggest that deceivers may choose to underintensify, neutralize, or overintensify responses in an attempt to deceive. These strategies seem particularly appropriate in situations with an inherent untruth bias, and in fact, these techniques as applied in poker are discussed in detail by Hayano (1980). The manner in which deceivees recognize and interpret arousal cues in attributing deception is an area for future research to probe.

Greene et al. suggest that arousal and control processes are theoretically "poorly developed". Granting the point, it seems useful to acknowledge and pursue work on a broad range of strategies and behaviors in attempting to provide insight into deceptive communication processes.

Research on interactive deception should continue to investigate the influence of probes on deceptive behavior and outcomes (Stiff & Miller, 1984; McCornack & Parks, 1985). Knapp and Comadena (1979) have stressed the interactive nature of deception in dyadic, face-to-face encounters. Although the present results indicate no significant relationship between probes and deception outcomes, previous research suggests that relational development may be a relevent factor. This study focused on strangers probing strangers. The results of studies focusing on deception and relational familiarity suggest that an extensive baseline of truthing behavior may hinder detection of lies during interaction (Brandt, Miller, & Hocking, 1980; McCornack & Parks, 1985). Possibly the hypothesized effect would have occurred between intimates.

Finally, the construction and testing of causal models offers a broad perspective from which to view any behavioral process. Since theories attempt to explain causal processes, including the specification of causal antecedents and consequences, the analysis of causal models of behavior allows the most direct and comprehensive analysis of behavioral theories.

Summary

The present study sought to assess the impact of deceitfulness, cynicism, probe intensity, and motivation on arousal, nonverbal behavior, and deception success. Findings of this study both replicate and extend earlier work.

Probe intensity was found to be related to increases in facial immediacy, which resulted in greater body immediacy and facial animation. Both tension and involvement dimensions of perceived arousal were positively related to facial animation.

Deceitfulness was associated with a decrease in body animation and body adaptor behaviors and an increase in facial animation. Although facial animation was positively related to both dimensions of arousal, body adaptors were more closely related to perceived tension. Body and object adaptors were less likely to occur for highly deceitful people, suggesting either lower arousal during deception, or conscious inhibition of those cues.

Results indicate a moderate positive relationship between motivation and deception success. However, this effect is confounded with procedural characteristics, urging cautious interpretation.

Deception success was not found to be related to any other variable in the study, including deceivee cynicism, suggesting that kinesic behaviors are poor predictors of deception success in situations in which an untruth bias exists.

APPENDICES

APPENDIX A

Please carefully consider each item in the following questionnaire and provide the response which best represents your opinion. There are no right or wrong answers to any of the questions. It is important that you respond to every item. If you find some items difficult, try to determine which way you are leaning and respond as best you can.

Following each statement is a response scale which you will use to indicate your position. If you agree with the statement, you will mark either a 1, 2, or 3 depending on how strongly you agree; if you disagree you will mark 4, 5, or 6, again depending on how strongly you feel.

1. Most people are brave.

   strongly agree 1 2 3 4 5 6 7 strongly disagree

2. People suffering from incurable diseases should have the choice of being put painlessly to death.

   strongly agree 1 2 3 4 5 6 7 strongly disagree

3. Never tell anyone the real reason you did something unless it is useful to do so.

   strongly agree 1 2 3 4 5 6 7 strongly disagree

4. The best way to handle people is to tell them what they want to hear.

   strongly agree 1 2 3 4 5 6 7 strongly disagree

5. One should take action only when sure it is morally right.

   strongly agree 1 2 3 4 5 6 7 strongly disagree

6. Most people are basically good and kind.

   strongly agree 1 2 3 4 5 6 7 strongly disagree

7. It is safest to assume that all people have a vicious streak, and it will come out when they are given the chance.

   strongly agree 1 2 3 4 5 6 7 strongly disagree

8. Honesty is the best policy in all cases.

   strongly agree 1 2 3 4 5 6 7 strongly disagree

9. Generally speaking, people won't work hard unless they're forced to do so.

   strongly agree 1 2 3 4 5 6 7 strongly disagree

10. The biggest difference between most criminals and other people is that the criminals are stupid enough to get caught.

    strongly agree 1 2 3 4 5 6 7 strongly disagree

11. Barnum was wrong when he said that there's a sucker born every minute.

    strongly agree 1 2 3 4 5 6 7 strongly disagree

12. There is no excuse for lying to someone else.

    strongly agree 1 2 3 4 5 6 7 strongly disagree

13. It is hard to get ahead without cutting corners here and there.

    strongly agree 1 2 3 4 5 6 7 strongly disagree

14. Most people who get ahead in the world lead clean, moral lives.

    strongly agree 1 2 3 4 5 6 7 strongly disagree

15. When you ask someone to do something for you, it is best to give the real reasons for wanting it rather than giving reasons which carry more weight.

    strongly agree 1 2 3 4 5 6 7 strongly disagree

16. It is wise to flatter important people.

    strongly agree 1 2 3 4 5 6 7 strongly disagree

17. Most people forget more easily the death of a parent than the loss of their property.

    strongly agree 1 2 3 4 5 6 7 strongly disagree

18. All in all, it is better to be humble and honest than to be important and dishonest.

    strongly agree 1 2 3 4 5 6 7 strongly disagree

19. It is possible to be good in all respects.

    strongly agree 1 2 3 4 5 6 7 strongly disagree

20. Anyone who completely trusts anyone else is asking for trouble.

    strongly agree 1 2 3 4 5 6 7 strongly disagree

Please respond to the following items in the same manner as in the pre-game questionnaire.

1. While I was playing, I found the hands with higher sums of money in the pot more involving than the low money hands.

   strongly agree 1 2 3 4 5 6 7 strongly disagree

2. Since the money wasn't mine, there wasn't any difference between a dollor and a quarter to me.

   strongly agree 1 2 3 4 5 6 7 strongly disagree

3. I got excited when there was more than a dollar in the pot.

   strongly agree 1 2 3 4 5 6 7 strongly disagree

Thank you very much for participating in this research project.

APPENDIX B

Low motivation hands (ante=$ .25) - 1,2,5,8,9

High motivation hands (ante=$ 1.00) - 3,4,6,7,10

Cards dealt - Hand	Player A	Player B
1	6,6	10,10
2	J,J	6,6
3	2,2	5,5
4	Q,Q	J,J
5	3,3	7,7
6	9,9	8,8
7	2,2	8,8
8	7,7	Q,Q
9	K,K	9,9
10	10,10	4,4

Suggested probes -

Assertion probes - "I wish I knew if you were bluffing."

"I'm not sure if you've got me beat."

"I can't decide if your cards can beat mine".

Question probes - "Have you got me beat?"

"Are you bluffing?"

"Are your cards better than mine?"

APPENDIX C

CODING SHEET

CODER NO. DYAD NO. HAND NO.

COOL	1	2	3	4	5	6	7	BOTHERED
RELAXED	1	2	3	4	5	6	7	TENSE
INVOLVED	1	2	3	4	5	6	7	WITHDRAWN
INTERESTED	1	2	3	4	5	6	7	APATHETIC
NO EYEBROW FLASH	1	2	3	4	5	6	7	FREQUENT EYEBROW FLASH
NO EYE CONTACT	1	2	3	4	5	6	7	CONSTANT EYE CONTACT
NO LIP LICKING	1	2	3	4	5	6	7	FREQUENT LIP LICKING
NO SMILING	1	2	3	4	5	6	7	FREQUENT SMILING
NO LAUGHING	1	2	3	4	5	6	7	FREQUENT LAUGHING
NO FACE TOUCHING	1	2	3	4	5	6	7	FREQUENT FACE TOUCHING
NO FACE COVERING	1	2	3	4	5	6	7	FREQUENT FACE COVERING
UNPLEASANT FACE	1	2	3	4	5	6	7	PLEASANT FACE
DEADPAN FACE	1	2	3	4	5	6	7	ANIMATED FACE
NO HEAD NODDING	1	2	3	4	5	6	7	FREQUENT HEAD NODDING
INDIRECT HEAD ORIENTATION	1	2	3	4	5	6	7	DIRECT HEAD ORIENTATION
NO OBJECT ADAPTORS	1	2	3	4	5	6	7	FREQUENT OBJECT ADAPTORS
NO BODY ADAPTORS	1	2	3	4	5	6	7	FREQUENT BODY ADAPTORS
NO ROCKING	1	2	3	4	5	6	7	FREQUENT ROCKING
NO RANDOM MOVEMENT	1	2	3	4	5	6	7	FREQUENT RANDOM MOVEMENT
NO TWISTING	1	2	3	4	5	6	7	FREQUENT TWISTING
INDIRECT BODY ORIENTATION	1	2	3	4	5	6	7	DIRECT BODY ORIENTATION
NO LEANING AWAY	1	2	3	4	5	6	7	FREQUENT LEANING AWAY
NO FOOT SHIFTS	1	2	3	4	5	6	7	FREQUENT FOOT SHIFTS
NO LEGS CROSSED	1	2	3	4	5	6	7	FREQUENT LEGS CROSSED

Tells:	OVERLY STRONG BETTING	YES	NO
	HESITANT BETTING	YES	NO
	CHANGE IN INTEREST	YES	NO
	SHIFTY EYE GAZE	YES	NO

DID PLAYER B FOLD HIS/HER HAND? YES NO

APPENDIX D

Inter-rater reliabilities for coded behaviors

scale	reliability
cool/bothered	.55
relaxed/tense	.59
involved/withdrawn	.55
interested/apatetic	.42
eyebrow flash	.66
eye contact	.76
lip licking	.26
smiling	.86
laughing	.64
face touching	.90
face covering	.93
face pleasant	.56
face animation	.81
head nodding	.27
head orientation	.67
body adaptors	.69
rocking	.98
random movement	.49
twisting	.89
body orientation	.28
leaning away	.51
foot shifts	.73
legs crossed	.93
fold	.95

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