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Perceptions vs Reality: A Longitudinal Experiment in Influence Judgment Performance

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PERCEPTIONS VS REALITY: A LONGITUDINAL EXPERIMENT IN INFLUENCED JUDGMENT PERFORMANCE

THESIS

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Abstract

Government reliance on computer-mediated information has transformed it from "enabler" to "target" which now demands the detection of manipulated and deceptive measures a primary security objective. As people are not inherently good performers at detecting deceptive communications, this study draws on interpersonal deception theory (Burgoon, 1986) and social cognitive theory (Bandura, 1986) to measure personal perceptions that influence decisions operationalized as the successful detection of a deceptive measure. Department of Defense personnel (*N=119*) participated in a longitudinal experiment that measured detection performance before and after training and feedback treatments. Self-efficacy and perceived training effectiveness emerged as dominant factors in predicting performance. The most significant finding was the reciprocated effect of feedback on performance history as it clearly governed self-reports of self-efficacy and training effectiveness, which in turn positively influenced future deception detection accuracy. This suggests the cognitive foundation for future decision-making can be altered and performance predicted as a result. Furthermore, while personal beliefs influence behavior, realized performance will direct personal beliefs which in turn further influence future behavior. It is recommended that continued research on the effect of honest feedback and effects of media richness be investigated when regarding computer-mediated information.

PERCEPTIONS VS REALITY: A LONGITUDINAL EXPERIMENT IN INFLUENCED JUDGMENT PERFORMANCE

I. Introduction

Information as an "Enabler"

The purpose of warfare is the same now as it has always been: to achieve political objectives with force. Leaders direct resources on their respective battlefield to win with overwhelming might and minimal loss. In Joint Vision 2020 (Chairman of the Joint Chiefs, 2000), the documented United States military's vision, information superiority is identified as a "key enabler of the transformation of the operational capabilities." Be it superiority, dominance, or supremacy, it is widely believed that one who controls the flow of information to the battlefield will emerge the victor. However, unlike early military research and development where technologies were created and advanced internally, information and computing technology is largely commercialized and therefore available to all. The proliferation of information technologies has, and will continue to substantially change the conduct of military operations.

The advantages of such an information rich environment have enabled data to be collected from geographically separated sources, centrally reviewed and coordinated, then disseminated to the lowest echelons faster and more accurately than ever before. Real-time text, audio, and video can be transmitted worldwide in milliseconds enabling stockbrokers to buy and sell outside stock exchanges, surgeons to operate on a patient from a different continent, moms to watch security cameras on their children at

preschool, and military leaders to precisely engage targets on the move. Financially, simulation and modeling techniques are saving millions in research and design and passing on front end cost savings to consumers. Computing power previously only accessible to governments with extraordinary budgets is now available to small businesses and individuals. From a morale standpoint, a Navy seaman who used to be authorized a single 10-minute phone call every two weeks can now electronically mail his family every day and, if necessary, watch via videophone the birth of a child; newsgroups and collaborative work environments bring people, ideas, and solutions together making the work itself less hectic and stressful. Information technologies have brought about great advances in bringing people together and completely altering management lifestyles, but its rapid progress has left open a great many faults in its wake.

Information as a "Target"

Does the amount of information really provide an advantage? The sheer volume of uncontrolled information readily available via the Internet is uncountable. Humans are inundated daily with useless information in the form of "spam", unwanted email and pop-up windows that devour communication bandwidth and memory storage, let alone diverting people from productive work. Many have compared the jokes, chain letters, and prayer requests analogous to the car alarm in a parking lot as a common and inevitable annoyance. This begs the additional question: Does information technology really hold an advantage if everybody has it?

The entire world is now interconnected by powerful computer networks and communications systems. Militaries now almost all use sophisticated command, control

and communications systems to visualize the battlefield, develop courses of action, and to pass orders. Just as with a country's military industrial complex (oil, power, manufacturing, etc.), these command and control systems are becoming targets themselves (Computer Security, 2002). Therefore, a country need not put "steel on target" in order to attack another country's infrastructure and thus commit themselves to a likely costly war. Because the playing field has been so leveled via technology, a single person from a remote location can disrupt, deny, or even discontinue the required flow of information. Note the use of the word "required" as no longer are information systems being used as mere conveniences, but are now integral parts to security as a whole.

Confounding the problem is the federal, military, and public reliance on such communicative technology. It is reported that 59% of individuals and groups in industrialized society use email daily where 49% use the Internet to communicate (NCSA, 1997); other studies purport that even higher numbers (85+%) are closer to the truth (eSearch, 1996; UT Research Consulting, 2000; Yahoo, 1997). In the military, official message traffic is utilized, and many times requested, by commanders before conducting operations; only recently have top military leaders approved email as a method for inter-command communications. Because email automatically documents the time and date a statement is made, not to mention provides written word for personnel to act on, it has taken on a management characteristic of its own as a tool for policy. Just as leaders have come to rely on their emails being taken seriously, their subordinates often request guidance and direction be provided in email form.

Limited available bandwidth has made text-based email the current communicative tool of choice. Pertaining further to the military, email is considered by many active duty

armed service members as the most effective and essential means of communications available. Email is not restricted by geographic bounds and provides nearly instantaneous correspondence capability. Of perhaps greatest value is the fact that a person does not need the latest and greatest technology to utilize email. Standards in technology and format enable low-end and mobile hosts to participate in worldwide communications just as any other person utilizing a desktop computer. This mobile capability is a boon for military coordination of forces which, combined with quantum advances in encryption, makes possible classified communication and information transfer without the need of expensive courier services. This capability exists not only for text, but as email may sometimes carry a tag of ambiguity, attachments can provide audio/visual aid and clarify meaning and intent. Text, audio, video, and still imagery can be digitally forwarded quicker and at far less cost than by courier, satisfying both battlefield commanders and congress, respectively. Combined with redundant systems, overlapped networks, and fairly high reliability, expectations for secure and uninterrupted communications are now a forgone conclusion.

The high usage of email has made it a command and control tool in and of itself, and therefore a target; our reliance on email has further made it a vital target. As a computing tool, email is susceptible to the same electromagnetic security risks as other computer-related software and hardware. The risk is exacerbated in that email capabilities can be destroyed in close proximity or remotely. Further, email most often resides on a computer used for purposes other than only email and other information can then be exploited. The Melissa Virus exhibited such destructive capabilities as an email attachment that when executed searched macros and spread as rich-text files to all email

accounts in an address book, forcing entire site networks to take their mail systems offline (CERT/CC, 2002). The denial-of-service attack was catastrophic for some organizations, one receiving 32,000 copies of mail messages containing Melissa on its systems within 45 minutes. It can therefore be viewed that the Melissa virus acted deceitfully; someone opened the email attachment believing it to be an appropriate action. It follows that such an attack on a government system, especially a military system containing classified information, puts the security of the nation at risk.

Research Questions

The decision-making capability of the person who first opened the Melissa virus was impaired or manipulated in some fashion. This person made a conscious—even if heuristic—decision and the virus took over from there. Cognitive effort was made and a reaction occurred, which in turn should alter the level of future cognitive effort. This situation can be likened to that of Pavlov's (1926) experiments in physiological and psychological conditioning: as people develop their own experiences and personality, they largely base future decisions on past occurrences. Tactics (military, political, and interpersonal) which have shown previous success are replicated until failure emerges the dominant outcome.

In light of the aforementioned, the focus questions presented for this study are:

1) Do cognitive characteristics and relationships exist which affect individual deception detection accuracy in a computer-based environment?

2) Do these characteristics and relationships change longitudinally?

3) Do these longitudinal changes in turn alter future individual deception detection accuracy?

Thesis Objective

Deception, and its detection thereof, has only recently been the focus of research in communication methods and media. Marked by an interest to examine the arts of both *deception* and *detection*, researchers have embarked on a quest to identify the "how" from both sides of the interaction. In controlled experiments, observers have demonstrated an ability to identify certain cues exhibited by deceivers and more effectively detect deceptive communications (Zuckerman, DePaulo, and Rosenthal, 1981; Zuckerman and Driver, 1985; DePaulo and DePaulo, 1989). However, research and experiments repeatedly report judgment accuracy rates between 40-60% (Kalbfleish, 1985; Kraut, 1980); one could flip a coin and just as accurately detect deception as if directly lied to in a face-to-face conversation. Such results have confounded researchers towards developing a singularly accurate model for identifying predictive causal constructs in deceptive communications.

The objective of this study was to identify possible characteristic perceptions that affect a person's ability to detect deception and measure their respective longitudinal relationships with the response—deception detection accuracy. Once identified, a Likert scale-style instrument for measuring perception characteristics believed related to deception detection was administered. A computer-mediated environment is the focus for all measurement and experimentation. At pre-staged time intervals, individuals were presented with computer-based deceptive text, audio, and audio/video formatted communications. Individuals made a decision whether a deceptive communication occurred which acted as the deception detection accuracy measurement—performance.

The culmination of detection accuracy acted as the performance history. A feedback treatment (reciprocation) was given after performance. Perceptions could then be measured to constitute the effect performance has on perceptions. As a longitudinal study, changes in perceptions and performance can be monitored over time (Faraway, 1999; Freese, 1981). The study will conclude with a review of identified cognitive characteristics, their affect on detection accuracy, and any longitudinal results deserving note.

Research Goals

The goals of this research correspond directly with the three identified focus questions. First, an extensive literature review was conducted in order to derive (at minimum) four cognitive characteristics that may exhibit a direct relationship to deception detection accuracy. The second goal was to measure these characteristics against deception detection accuracy and identify any existing relationship. The third goal pertains directly to the reciprocating effects of cognitive behavior on deception detection accuracy over time; this measurement will be of particular interest as most studies conduct efficacy measures statically rather than longitudinally. It was expected that these measurements could provide some quantifiable venue into deception detection trends, thereby leading action towards more accurate detection of interpersonal deception.

Summary

This chapter discussed the problems associated in dealing with manipulated information meant to deceive. The following chapter will review the literature on

deception and cognitive characteristics that may provide insight into improving detection. Specifically, hypothesis concerning perceptions (self-efficacy, training effectiveness, power, and Machiavellianism) and their relationship to performance, and that reciprocated relationship for future performance judgments, will be proposed. Chapter three will present the methodology for measuring these perceptions and performance records, information on the relevant population, and experiment data collection techniques. Chapter four will analyze the data collected from the longitudinal experiment. Chapter five will discuss the results, findings, limitations, and implications of this research effort to practice and the US Air Force, and concludes with recommendations for future research.

II. Literature Review

Background

This chapter contains a literature review with detailed information on subjects and research relevant to this effort, with a particular focus paid to deception and the ultimate goal—detection. This portion of the writing culminates with the generation of a theory involving four individual perception characteristics—self-efficacy, training effectiveness, perceived power, and Machiavellianism—and purported hypotheses correlating these perceived characteristics to the successful detection of a deceptive measure.

Deception

It is always the best policy to speak the truth--
unless, of course, you are an exceptionally good liar.
Jerome K. Jerome (1859 - 1927)

Several models and theories have emerged regarding deception, its detection, and lack thereof. Deception has been defined in several ways, both in message content and delivery. Focusing on the message rather than the deceiver, researchers have delved into categorizing messages into deceptive types (Hopper and Bell, 1984; Buller, 1986; Turner, Edgley, and Olmstead., 1975) whereas others have identified a continuum from which message deception can exist and operate from (Metts, 1989). Such studies have led additional research into the deceptiveness of the message itself, and consequentially, and perhaps more importantly, the interpersonal constructs surrounding communications between both deceiver and receiver. For the purposes of this essay, the terms "sender" and "deceiver" will be used interchangeably; this is not meant to intend unidirectional

communication occurs, nor that the cognition of deception occurs at only the deceiving end, but to clarify the current conductor of deceptive behavior.

In studying partner-relationships, McCornack and Parks (1986) identify a "truth bias" where people initially and inherently believe they are being told the truth, and therefore display a predisposition to believe their partner and an inability to detect deception. This bias was more profound in well-developed relationships, contrary to persons in less developed relationships. By invoking suspicion, receiver truth biases could be manipulated to a point that a lie bias was present. Stiff and Kim (1992) went on to operationalize the truth bias as a cognitive heuristic, identifying it as a function present until determined by the receiver to be unwarranted, via suspicion or the discovery of deceit. An important step in Stiff and Kim's study was that it extended to strangers and showed that when a third party invoked suspicion, detection was no greater for either strangers or those in relationships. It follows then that that a personal truth bias is not a forgone conclusion, but a tendency for a receiver to want to believe they are being told the truth. When presented with factors that put a sender's truthfulness in question, the receiver scrutinizes communicated information before making a decision (Levine and McCornack, 1991, 1992; Millar and Millar, 1998).

In order to communicate, sender and receiver exchange information at a level where an understanding of one another's implications is set. Grice (1989) proposed in his theory of conversational implicature that a Cooperative Principle exists where maxims of conversation are followed and those involved can then communicate effectively with each other. When these maxims are not followed, the Cooperative Principle no longer holds true and some form of misunderstanding has occurred. It is on this foundation that

McCornack (1992:5) went on to base his Information Manipulation Theory claiming "messages that are commonly thought of as deceptive derive from covert violations of the conversational maxims." Grice acknowledges blatant "flouts" of conversation such as sarcasm and joking. The maxims are not strict rules, but meant to imply that a person can extract *meaning* from a conversation. It is when this meaning is misrepresented that a violation of the Cooperative Principle has taken place. A receiver's beliefs (truth biases) are exploited in cooperative conversation via *covert* deviations. Though Grice's (1989) Cooperative Principle identifies four specific maxims (quantity, quality, relation, and manner), McCornack inflects that infinite possibilities exist as a gradient of deviations ranging from outright blatant lying to equivocal shading of the truth. Therefore, interpersonal factors may or may not be readily identified by the receiver as deceitful as the message itself follows the maxims and is conveyed as truthful. A biased receiver is then inclined to believe the message as truthful and respond as such.

Information Manipulation Theory is severely limited to deceptive message design (Jacobs, Dawson, and Brashers, 1996) as it negates supportive behaviors that either contribute to or detract from a deceptive communicative process. It is assumed the deception exists only in the message's verbiage; deceptive behavior is ignored. This is somewhat acknowledged where IMT is meant "as a descriptive tool for addressing particular messages" (McCornack, 1992:13). It is very possible that an IMT approach may prove more effective to not only deception, but the detection thereof, in less rich media (text-based, archived) than that of richer media (face-to-face, video, audio) where such supportive behaviors and deceptive cues are more predominant (Dennis and Kinney, 1998). Where IMT is limited then to more static environments, a theoretical model is

needed portraying a richer, more realistic interaction where receiver cognition is not only focused on the conversational message, but on cognition of the entire interaction occurring (Burgoon, Buller, Floyd, and Grandpre, 1996).

There is no doubt that the veridicality of message content is important to a receiver's detection of sender deception, but the uncountable other nuances of interpersonal communication contribute greatly to receiver judgments. Communicative skill (Riggio, 1986; Riggio and Friedman, 1983, 1986), poise (Burgoon and Buller, 1994), control (Burgoon, Buller, Guerrero, and Feldman, 1994), motivation, (Ekman, 1992; Burgoon and Floyd, 2000), and successful expectation (DePaulo, LeMay, and Epstein, 1991) have all shown to increase sender believability. However, communication is not a unilateral act. Receivers react, respond, and create feedback that may create a reflective response from a deceiver (Buller and Burgoon, 1996). On the other hand, receivers may decide to withhold behavior in order to garner control of the conversation and effectually manipulate the sender (Toris and DePaulo, 1984). It is precisely these, and numerous other, individual characteristics that contribute further to the argument that deception is a much larger process than merely message content, but a reciprocative process of intended behavior and perceived behavior between sender and receiver.

Interpersonal Deception Theory (Buller and Burgoon, 1996) acknowledges the biases inherent in recipient communication and proposes an interactive foundation for human agency in deceptive communications. IDT is founded heavily on not only actions but also the process of developing perceptions by both sender and receiver in communication as seen in the model first proposed by Buller and Burgoon (1993, see Figure 1) and later

expounded as these perceptions are believed to direct strategic and nonstrategic behavior on behalf of both interactants dynamically (Buller and Burgoon, 1994, 1996).

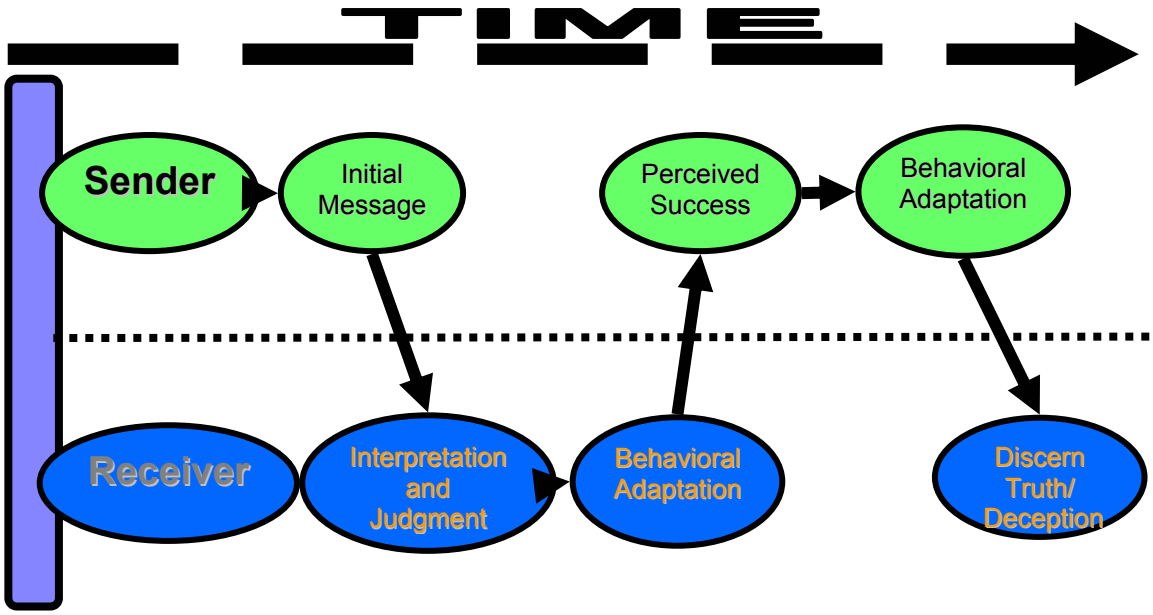


Figure 1. Interpersonal Deception Theory Model

The dynamic nature implies that the process is interactive, and therefore a deceiver does not act based solely on intentions upon entering a dyadic communicative process, but ingests feedback from the receiver and bases judgment for further deceptive action and the control thereof. The same is implied for the receiver who collects and amasses deceiver action, verbal and non-verbal, and bases judgment for further responsive action and the control thereof, to include suspicion and attention. It should be fairly apparent then that it is individual cognitive properties which drive personal behavior and, in turn, reciprocation from the other communicative partner.

When the dynamic nature of immediate interaction is interrupted, such as is the case of video or audio mediated communication, full access to social information is limited.

Immediacy may be implied, but is often uncontrolled and will vary relative to the indigenous environment of communication (Buller and Burgoon, 1996). Performance diminishes respective to the richness of a mediated environment (Daft and Lengel, 1986; Dennis and Kinney, 1998, Purdy and Balakrishnan, 2000). Computer mediation plays in crucial role for receiver detection by providing an environment that is interactive (video-teleconference) or static (email).

Behavioral adaptations to perceptions of deception may be present but are concealed by the media itself. In a text-based non-synchronous medium such as email, it is expected that due to the unavailability of social context and cues, performance at both conducting and recognizing deception will be less than that of a richer communication media, and much less than that of a face-to-face social environment (George and Carlson, 1999). The same can be said for artifact data such as that residing in a database awaiting retrieval; informative cues of deception in this environment will also be lessened. Therefore, not only are personal factors and behaviors key to such interpersonal interaction, but also the environmental context will greatly affect the success of both deceiver and receiver cognitions. As interactants internalize the multitude of cognitions, strategic behavior is formalized and reformalized, directed and redirected.

It is contended that deception is a goal-driven act (Buller and Burgoon, 1996) and empirical results support that position as an individual's leading reason to engage in a deceptive act (O'Hair and Cody, 1994). What follows then is a belief that control of the cognitions establishes a control of the strategic behavior; by manipulating strategic information, strategic activity can be manipulated. In a technologically mediated organization, a very real possibility exists for deceit and misrepresentation efforts (Zmud,

1990). As dependence on strategic artifact information increases, the opportunity to manipulate will increase as well, as will the difficulty in identifying possible deceivers in an environment bounded by deficient media.

Detection

Any fool can tell the truth, but it requires
a man of some sense to know how to lie well.
Samuel Butler (1835 - 1902)

Detecting deceptive communication has been the subject of a great deal of communications theory research with a focus to discover what constructs affect and aid the receiver in detecting sender deception (O'Hair and Cody, 1994). Some research has shown certain constructs such as cue "leakage" detection (DePaulo and DePaulo, 1989; Zuckerman and Driver, 1985), moderate suspicion (McCornack and Levine, 1990), and training and warning (Biros et. al., 2002) can actually improve detection accuracy. Just as well, it has been shown that consistency may be utilized as a deceptive cue often, but detection accuracy as a result is critically low (Granhag and Stromwall, 2001).

Deception is definitively attributed as a sender knowingly transmitting false information in order to foster a false belief or conclusion by a receiver (Ekman, 1985), yet the prevailing view of detection is that it exists on a continuum of cognizant suspicion (Levine and McCornack, 1991). This essay generalizes to two primary arenas for suspicion: 1) a predisposition invoked via biases, prior relationship, warning, training, etc. and 2) a situationally aroused occurrence discovered during a communication transaction. Unless either forms of suspicion are made aware to the deceiver, intentionally or unintentionally, the receiver will not truly know whether a deceptive

communication occurred (Stiff and Kim, 1992). As well, the sender will not be aware of the receiver's suspicion. Cognition exists, confirmation does not. Though manifested in suspicion, numerous other effects act on sender and receiver cognition.

IDT proposes that the sender-receiver relationship is dynamic and reciprocative and perceives deception as "a goal-oriented, intentional act" (Buller and Burgoon, 1996:216). A truth bias exists as a receiver predisposition for truthful communication and is mediated by suspicion (McCornack and Parks, 1986). Because communicative skills and knowledge are relative to the individual, as are the cognitions enlightened while engaged in communication, it stands to reason that personal cognitions will contribute the interaction, and ultimately the success of sender deception and/or receiver detection.

Truth and lie biases have shown negative correlations to detection accuracy (O'Sullivan, Ekman, and Friesen, 1988), however these biases are based on the receiver's perceptions of the expected environment. Environmental expectations may induce certain expectations of one's own ability, such as was seen in Ekman and O'Sullivan's (1991) study evaluating personnel from the US Secret Service, Central Intelligence Agency, Federal Bureau of Investigation, National Security Agency, Drug Enforcement Agency, and others ability to detect lying. On the other side of deception, DePaulo et. al.'s (1991) study found that deceivers were most successful when they had both high motivation to succeed and high expectation for success. Along the same lines, Burgoon, Buller, and Guerrero (1995) showed that as sender skills improve, detection accuracy can decrease. Therefore, self-efficacy—or confidence—acts as a personal bias of both receiver and deceiver capability and will correlate positively towards successful task

achievement. It stands to reason that a receiver's biased perceptions of expected performance from themselves may yield likewise results.

Being aware of oneself and the capabilities possessed is a large determinant towards the control of job performance measures (aggressiveness, reward) and internal characteristics (satisfaction, depression, anxiety). Self-appraisal has been empirically researched and reviewed in children (Chase, 2001), students (Donen, 1999; Chung and Sedlacek, 1999), the depressed (Coyne and Gallo, 1998; Martin and Connoly, 1993), the elderly (Holohan and Holohan, 1999; Hanson and Mintz, 1997), the obese (Pinhey and Rubinstein, 1997), and is believed to be one of the greatest single influences in everything we do (Brouwer, 1964). Just as a deceiver has been shown to judge self-communication capabilities (DePaulo et. al., 1991), it, too, should be expected that the recipient will hold beliefs on self-communicative capabilities.

While McCornack and Park's "truth bias" is generalizable to the public as a whole, the belief is that individual perceptions create a self-biasing that inherently influence decisions as well (Bandura, 1977). Where the construct of suspicion arousal and the intensity therein is viewed as a truth/lie bias, so too can interpersonal constructs act as a bias; the difference lies in the fact that interpersonal biases can, and do, change often based on both the perceived environment and the actual environment (Bandura, 1986).

A research model is introduced here which seeks to account for these social foundations of decision-making when deciding whether a communication is deceptive or truthful. The model proposed by Burgoon (1986; see Figure 1) focuses on the interactive process itself, and though IDT's extensive applicability has been asserted (Buller and Burgoon, 1996), the model itself does not lend itself to foundations of human agency at a

level which can be studied. The proposed research model for this essay brings together both perception and reality while maintaining the distinctive effect each has on an outcome: in contesting perceptions and confronting reality, cognition of the self and the environment is irrevocably changed. It is from the review and conceptualization of the author that the research model in Figure 2 is put forward.

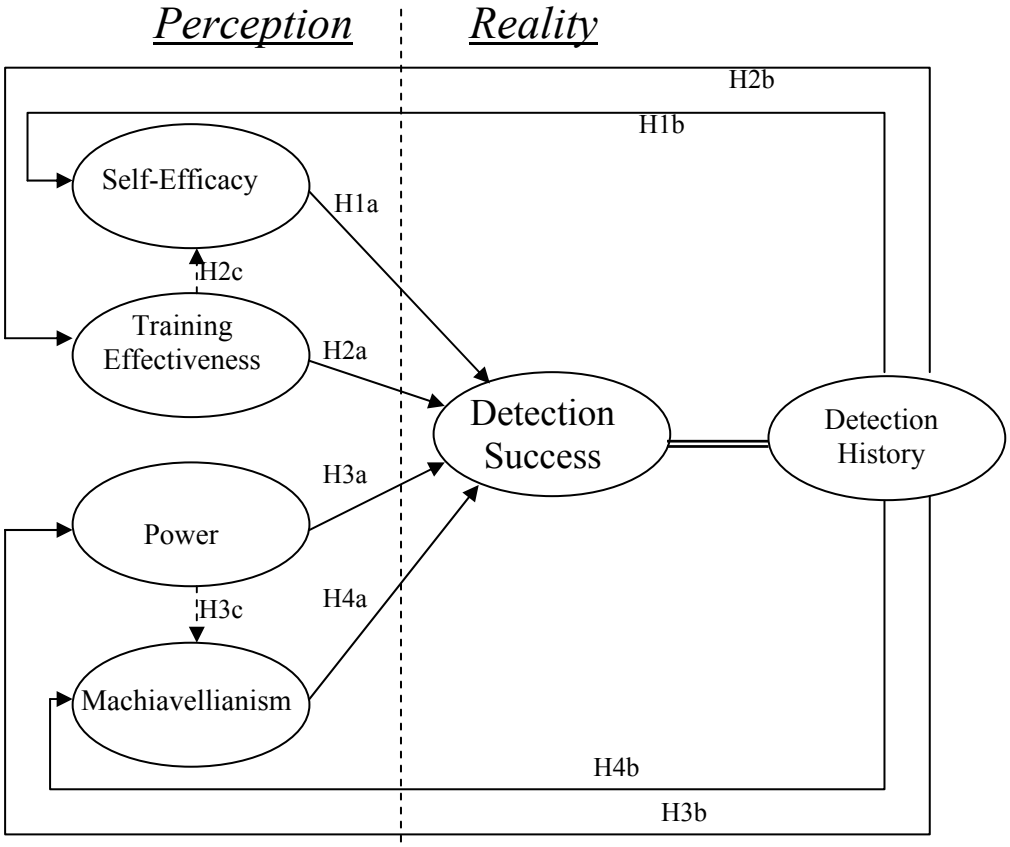


Figure 2. Research Model

Suspicion is a *perception* based on the perceived actions of interactants (Levine and McCornack, 1991). These perceptions often guide decision-making, consequentially determining reality. An assessment is made and a conclusion drawn; whether successful or not is not known until a confrontation is initiated and responded to. It is at this point

when human agency internalizes results, compares with previous perceptions, draws new conclusions, and then remodels future behavior.

Self-Efficacy

Guiding cognitive personal factors, behavior, and reciprocating causation with the environmental influence is self-efficacy (Bandura, 1986). In simplest terms, self-efficacy is belief in one's self and self-worth. It is the ability of an individual to be cognizant of one's self and an environment, then judge capabilities to organize and execute courses of action to achieve a certain performance level. Bandura (1986:390) identifies personal efficacy as "perhaps the single-most influential factor in determining an individual's behavior" because the individual internalizes their surroundings and then sets parameters on themselves based on their findings. It is this core belief upon which the foundation of human agency is built.

Self-efficacy is founded in social cognitive theory, specifically the concept of *triadic reciprocality* where social factors (environment), self-influences (personal), and outcomes (behavior) interact in a reciprocal fashion (Bandura 1986:23). These factors are believed to influence each other in a deterministic manner, in that each will produce effects in the other, and all exist and act on one another continuously (see Figure 3).

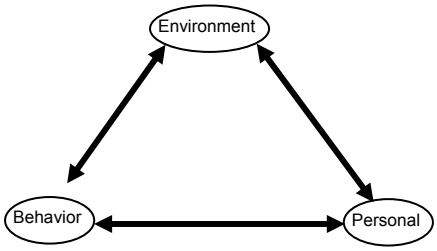


Figure 3. Triadic Reciprocality

When Bandura defined his social cognitive theory, he was extremely clear asserting "in the social cognitive view people are neither driven by inner forces nor automatically

shaped and controlled by external stimuli" (1986:18). Bandura further reasserts, "The effects that actions have are, in large part, socially mediated" (1986:205). Therefore the particular environment (including other individuals and bounded media) an individual interacts with will act as a major determinant on the cognition of personal factor and, in-turn, behavioral domains. The individual is placed in an action/reactionary role, where even as the individual elicits change, change reciprocates and causes the individual to re-evaluate their prior action, planned action, and the behavior required to achieve the desired end-state. Clearly, an individual's self-efficacy, and ultimately their perceptions and behaviors, affect judgment and following action.

However, Bandura further cautions against a search for an environmental "holy grail" as explanation for cause of behavior as "an idle exercise...because, in an interacting process, the one and the same even can be either an environmental stimulus, a response, or an environmental 'reinforcer' depending arbitrarily on when and on which side of the ongoing exchange one happens to look first in the flow of events" (1986:26). Therefore, generalities about human agency and caused response must be tempered with the fact that a human is in constant interaction with the environment, evaluating and exhibiting behaviors. Such is the case in a coercive power environment where such perceived behavior begets further coercive behavior (Patterson, 1976) where in other situations individuals display persistence (Bandura and Walters, 1963).

Examined further and more recently, individuals recognize and desire a steady social model in order to "develop and perform modeled behavior, as well as predict and act towards expected end results" (Schunk, 1999:222), exhibiting somewhat of a *social truth biasing* as a relational motivation to conform to relational role expectations (Buller and

Burgoon, 1996). Efficacy has been studied and shown as a highly causal factor of personal perception in disparate environments such as computer use (Compeau, Higgins, and Huff, 1999), neighborhood socioeconomic status (Boardman and Robert, 2000), and in position-related efficacy in sports (Weigand and Stockham, 2000), thus illustrating its considerable application. Shown dynamically, a definitive link correlating increased efficacy to increased performance has been shown to exist (Ellis and Taylor, 1983; Gist, 1986; Wood and Locke, 1987; Gist and Mitchell, 1992; Lindsley, Brass, and Thomas, 1995; Harrison and Rainer, 1997; Shea and Howell, 2000), while even job preference and outcome expectancy can be somewhat predicted (Riggs, Warka, Babasa, Betancourt, and Hooker, 1994).

Bandura's Social Cognitive Theory (1986) has further shown a great predictive power with respect to self-efficacy (Stajkovic and Luthans, 1998), especially when related to task performance (Wood and Locke, 1987; Bandura and Cervone, 1986). It follows then that cognition of perceived detection capability as a performance task will inevitably influence judgment and behavior. Therefore it is expected that:

Hypothesis 1a: Receiver perceived capability to detect deception will be positively correlated with detection success.

Because this is a dynamic relationship, reciprocation will affect future perceptions of performance capability, and therefore reported self-efficacy. What is more, feedback on actual deception detection performance, and therefore a realized cognition, will present a confrontation to personal belief, having an irretrievable affect on individual confidence and capabilities. In an interpersonal exchange, this alteration in human agency will correlate and present in both receiver and sender as proposed in IDT; however, the

longitudinal aspects of feedback seen through IDT as a "behavioral adaptation" (Burgoon, 1996:211) may have a more lasting, definitive affect on human agency.

In communicative research, and that on self-efficacy, reciprocation effects on reported self-efficacy have been either overlooked or largely ignored; Buller and Burgoon (1996) contend such is the case of reciprocal effects of deception. Bandura (1986) asserts that as knowledge, skills, and experience are gained over time, expectancy of task performance is created. When first developing a methodology for measuring self-efficacy, Bandura (1986) noted that self-efficacy ratings are more meaningful after feedback; yet feedback is a reciprocation treatment in and of itself. Confidence in one's perceptions, including personal efficacy, are culminated, constructed, and reconstructed from a history of perceptions, confrontations, and outcomes. How that confidence is modeled as a individual's capability for carrying out a task, be it a sender attempting to deceive or a receiver attempting to detect, changes respective to environment and time. Confidence may be gained, or perhaps even lost, but as a personality trait and basis for future decision-making will change only slightly until confronted and if possible, confirmed. Confirmation will affect efficacy and personal factors, and via triadic reciprocality (Bandura, 1986; see Figure 3), alter, even if slightly, future behavior and environmental influence.

Specific feedback can be learned about performance of a specific task or a feedback history can be gleaned from a historical performance record. A detection history is created as a culmination of deception detection performances and, when performance results are provided to the performer, realized as a confirmation of a receiver's attempts to discern between truth and falsehoods. Therefore, the connection between perception

and reality is reestablished as a receiver is presented with the knowledge of their successes or failures. The perception of success is replaced with the actual success itself and a corresponding reciprocal effect on perceived capability will follow. Therefore, it is expected that:

Hypothesis 1b: Receiver detection accuracy history will be positively associated with perceived capability to detect deception.

Training Effectiveness

Personal factors are manifested in behavior (Bandura, 1986) and provide a mechanism for social confrontation. Within these internal guiding influences are historical references of self-efficacy and regarded perceptions of the environment. For example, deceived receivers in a personal relationship may not want to believe that their partner is lying, even when suspicions are aroused (Levine and McCornack, 1991) or confirmation is provided (Stiff and Kim, 1992) as cognitive biases reduce detection accuracy (Buller and Burgoon, 1996; McCornack and Parks, 1986). At the opposite end of the biasing spectrum, when considering the historical effect of past performances in a personal relationship, deceivers and receivers alike may believe the other is deceitful based on prior relationships (McCornack and Levine, 1990).

Such is the case with the perceived effectiveness of training: a judgment of treatment based on both its possibility to improve performance and as a rating of its affect on performance. Supported by the idea that "knowledge of conditional relations thus enables one to predict, with varying accuracy, what is likely to happen if events occur (Bandura, 1986:182)," receivers judge sender (environmental) cues and base their behavior on previous events and following recourse. These previous events consist of

learned behavior through prior experiences and training. Training—to include instructor and curricula—that proves helpful and increases performance in a task is regarded positively and built upon as a basis for future decision-making; a training induction that has shown little to no improvement in performance may negatively affect self-efficacy and elicit a disregard for the training's validity or reliability (Bandura, 1986, 1982).

Bandura (1986:395) points to the fact that both skills and efficacy affect behavior, while perceived efficacy also affects the magnitude of effect training and skills can take on behavior patterns. DePaulo, Stone, and Lassiter (1985) relate deception and detection as skills that can be trained and are learned in early childhood which lead to strategies for employing each based on the outcome of prior effort successes. Task-specific training has shown a correlation to improvements in deception detection accuracy (deTurck, Harszlak, Bodhorn and Texter, 1990) thereby highlighting its validity as a method for improving deception detection success. Along these same lines, training effectiveness has shown to exhibit a high relationship with actual performance (Chou, 2001; Yi and Davis, 2001). But much like the aforementioned, Ahissar, Laiwand, and Hochstein (2001) measure progress improvement after training and "imply" effectiveness, but no actual measure of training effectiveness is reported from the trainee's point-of-view.

Where induced sensitivity measures have been shown to directly affect detection success (Biros, Zmud, and George, 2002), thereby raising suspicion of the receiver (McCornack and Levine, 1990), it is presented here that not only the training treatment, but the perceived effectiveness of the training treatment will increase receiver success. An increase in perception of detecting capability, thereby instilling confidence and improving self-efficacy, is also expected. The detection of success is a product of

increased belief in capability fostered by and built upon an increased knowledge of possible sender behavior. Therefore it is expected that:

Hypothesis 2a: Perceived training effectiveness will be positively correlated with detection success.

As seen in Bandura's (1986) theory of triadic reciprocality and model (see Figure 3), as training and learning directly influence action, an individual's belief in their own capability—self-efficacy—is influenced. Previous studies have shown a positive correlation between increased efficacy and increased performance (Bandura and Cervone, 1986; Locke, Frederick, Lee, and Bobko, 1984). Gist (1983) went on to show a marked performance improvement when a focus on training self-efficacy was included in a traditional training environment. It may then be possible to identify a relationship between the perception of training effectiveness and self-efficacy based on the realization of successful performance, or in this instance detection accuracy. As well, the following reciprocated effect of a performance history should allude to new perceptions of training effectiveness. Individuals learn differently, and the effectiveness of such training when realized with success will correlate with that student's perceived capability based upon a historical reference of success and failure. Therefore it is also expected that:

Hypothesis 2b: Detection accuracy history will be positively associated with perceived training effectiveness to detect deception.

Clearly, not only efficacy and training affect task performance, but both an interaction between perceived capability for conducting a task and perceived effectiveness of a training program contribute to the decision-making process. As Bandura (1986) has

identified a positive relationship which should exist between a perception of training that produces positive results and increased self-efficacy, it is therefore expected that:

Hypothesis 2c: Perceived training effectiveness will positively affect receiver perceived capability.

Perceived Power

Motivations influencing perceptions in interpersonal communication are important in understanding strategy, goals, and the performance success of both deceiver and receiver (Buller and Burgoon, 1996; O'Hair and Cody, 1994; deTurck et.al, 1990). Seen previously as a relational norming to social expectations, instrumental motivations can include "establishing, maximizing, and maintaining power or influence over the receiver" (Buller and Burgoon, 1996). The perceived power in a situation directly affects the decision-making process (Fincham, 1992), therefore, the construct of perceived power as an influencing agent in the interpersonal decision-making process for deceptive judgments is introduced here.

French and Raven (1959) put forth a model of interpersonal social power one social agent—"a person, a role, a norm, a group, or a part of a group (1959:151)"—holds over an individual. This model has been used extensively in writings on organizational politics and management struggles (Somech and Drach-Zahavy, 2002; Gibson, Ivancevich, Donnely, Konopaske, 2000; Mitchell, Agle and Wood, 1997; Lam, 1996; Rowe, 1989). Conceptualized were five power bases: *Reward*, *Coercive*, *Referent*, *Legitimate*, and *Expert*, which all act as a source of power for the social agent. A sixth base of *Informational* power was later added (Raven and Haley, 1982).

As an example of a base of power's influence, an individual ignorant in a specialty who is informed by another recognized as an expert in that specialty (and is placed in the organizational hierarchy as such) to follow and carry out requirements as requested will typically do so (Brass and Burkhardt, 1993). The expert may hold no direct authority over the individual, but the receiver perceives a source of power which contributes to their decision-making process. The same example can be likened to a deceptive communication, where a source agent in a position of hierarchal power informs a subordinate of forthcoming action; whether legitimate or not, the subordinate will be inclined to respect the source's power base and respond accordingly.

Most of the research accomplished has investigated relationships of these power bases to criterion variables for measure (Carson, Carson, and Roe, 1993). The construct of power has been reviewed from the viewpoint of persons involved in an interpersonal interaction, but not from third party observers and those outside the interaction, and thus those who rely solely on their perceptions of extant power in order to base a judgment.

A receiver cognizant of power in a sender will be biased and inclined to believe the sender's position and instruction, exhibiting a truth bias as seen before. Any perception of power will bias the receiver and render them less capable of successfully and accurately detecting either deception or truthfulness. Perceived power, therefore, should act as a biasing agent and return the same results as McCornack and Park's (1986) proposed "truth bias" and related studies (Millar and Millar, 1997; Stiff and Kim, 1992; McCornack and Levine, 1990) have shown. Therefore it is expected:

Hypothesis 3a: Perceived power (reward, coercive, referent, legitimate, expert, or informational) in a sender will be negatively correlated with detection success.

Perceived power influences actions in interpersonal relationships (French and Raven, 1959). Bandura (1986) identifies this as a mutual relationship, and therefore action will reciprocate perceptions just as with the *self-efficacy* and *training effectiveness* constructs. As confidence in an individual's ability to accomplish a task may be a reflection of their performance history, which in-turn directly affects the decision-making process, the acknowledgement of perceived power present in message communications will affect the decision-making process. Such is reason for studies in doctor-patient relationships (Bebko, 1990) where *perceptions* of power may not be explicit, but are assumed and reflected in patient health care.

Again, a connection between perception and reality is established as the receiver is presented with the knowledge of their success or failure. The longitudinal effect of history will surface as a receiver gains knowledge of the sender, perception will change and so to will the ultimate detection accuracy (Buller and Burgoon, 1996). As deceptive methods are confirmed, a receiver will perceive less relative power in the sender and consequentially will increase detection success. Until the sender earns the right to the receiver's placement of power, suspicion, and therefore negative cognition of the sender's actual power, will work towards the receiver's advantage at detecting future deception (DePaulo and DePaulo, 1989). Perceptions of power that contribute to a successful judgment will be regarded positively and used for future reference as a cognitive information-processing heuristic for making future decisions towards truthfulness (Buller and Burgoon, 1996). It is therefore expected that:

Hypothesis 3b: Detection accuracy history will be negatively associated with perceived power in a sender.

Deception has been identified as a "goal-driven, intentional act (Buller and Burgoon, 1996:216)", which gives credence to the notion of possible manipulation of a receiver in an interpersonal communication as a means in achieving a specific goal. As was shown in the previous example, a sender may abuse a receiver's perception of power in order to manipulate the receiver to achieve personal goals (DePaulo and DePaulo, 1989). Power itself can be viewed as an environmental stimulus in Bandura's (1986) model of triadic reciprocality. Once power is perceived, a receiver may alter not only their perceptions of a situation, but their core beliefs of self and their environment based on their enacted learning (Bandura, 1986:107) and predictive knowledge (Bandura, 1986:182) base for future decision-making.

A core belief relating power to perception is that of Machiavellianism which will be expanded further in the next section. Based off Nicolo Machiavelli's novel *The Prince* (1515), Machiavellianism is concept proposed by Christie and Geis (1959, 1970) that identifies the level an individual believes other people can be manipulated; people who score high are considered more "skeptical" and those who score low are believed more "naïve". Machiavellianism is considered a static characteristic trait that exists as a foundation for decision-making and therefore, unlike self-efficacy, is not easily swayed (Wrightsman, 1991; Christie and Geis, 1959).

However, as perceptions of power are identified and qualified, that foundation of human agency may be altered (Bandura, 1982). As power in a sender is perceived to increase, judgment is mediated as a result of biasing the situation (Buller and Burgoon, 1996); longitudinally, a conditioning of a person's beliefs based on the power perceived in an interpersonal communication should further bias receiver heuristics themselves as

receiver beliefs in the manipulation capability of others increases or diminishes. Machiavellianism has been shown as a significant predictor in perceptions of office politics (O'Connor and Morrison, 2001), therefore it is expected that:

Hypothesis 3c: Perceived power will negatively affect receiver beliefs that others can be manipulated in interpersonal environments.

Machiavellianism

As stated before, Machiavellianism is based off the novel *The Prince* (1515) and alludes to the ability of politicians and leaders to manipulate the economy and progress of nations via deceitful measures. The Machiavellian belief that a sender can readily manipulate a receiver in a situation has been correlated directly to deceptive environments: perceived ability to deceive (Spinney, 1998); level of distrust (Burks, Carpenter, and Verhoogen, 2000); and end-goal strategy (Shepperd and Socherman, 1997). As well, Machiavellian attitudes have shown a highly positive correlation to performance (Anselmi and Zemenek, 2000) and performance ratings (Deluga, 2001). However, a relation to the successful discernment of a deceptive communication, though, has not yet been identified in the literature.

When placed in the role of the receiver, an individual who presents with a high disposition to "using guile, deceit, and opportunism in their relations with others (Christie and Geis, 1970)" is considered a person of high Machiavellian character. This characteristic of Machiavellian nature greatly resembles what Buller and Burgoon (1996:218) identify in their Proposition 3: "Compared with truth tellers, deceivers engage in greater strategic activity designed to manage information, behavior, and image". It stands to reason that a receiver who believes themselves capable of manipulating other

persons in interpersonal situations will be more cognizant of such manipulating methods and strategic behavior and perhaps less susceptible to like deceptive measures. Therefore, it is expected that:

Hypothesis 4a: Receiver perceived beliefs that others can be manipulated in interpersonal situations will be positively correlated with detection success.

Burks et.al's (2000) study placed persons in roles of both sender and receiver of a trust game (Berg, Dickaut, and McCabe, 1995). Though not a communicative dyad per say, an interactive environment that provided reciprocity of action for both sides enabled a correlation between beliefs considered Machiavellian in nature and performance in the game based on the trust of both sides. It was found that "high Machs display considerable less trust than low Machs (Burks et.al, 2000:12)" thereby alluding to a predisposition of distrust, or lie biasing. Again, Buller and Burgoon (1996:276) state that "cognitive biases should reduce receiver's overall detection accuracy over the course of an interaction." This may seem contradictory to the previous hypothesis, where it could be construed that individuals with either high or low Machiavellian beliefs will exhibit a lie or truth bias, respectively; however Burks et.al's study did not place a person with a higher Machiavellian score relative to any norm, only that these persons were less trusting than those with low Machs.

Motivation guides performance-related behavior (Bandura and Schunk, 1981), so it may be possible that if motivated, receivers change their cognitive foundation in order to achieve a higher level of successful performance. As a history of unrecognized deception develops, the perception that people are easily manipulated may be realized in a

receiver's own manipulation as an affirmation of original beliefs and breed further distrust or as a revelation of a weakness not previously recognized (McHoskey and Hicks, 1999). As well, a person who displays a capability of detecting deception may longitudinally deconstruct original beliefs in manipulating others as a reflection of the success of their own manipulation and therefore distance themselves (Ickinger and Morris, 2001).

Bandura (1986) identifies that beliefs in self and the environment are products of experience and interaction, which then guide behavior. Langer (1989) pointed to "premature cognitive commitments" that a receiver makes about the sender's veracity, further asserting pre-cognitive biasing. Burgoon's (1986) IDT model identifies a real-time response as a behavioral adaptation to a communicative sender, so it stands to reason that this adaptation is guided by predisposed cognitive beliefs. The performance history of a task will then determine to some magnitude a person's beliefs, which in turn guide future behavior, and when that behavior is recognized and performance results reciprocated, human agency alters according to individual motivations once again. It is therefore expected that:

Hypothesis 4b: Receiver detection accuracy history will be negatively associated with receiver perceived beliefs that others can be manipulated in interpersonal situations.

Each of the previous hypotheses indicates a "positive-positive" and "negative-negative" relationship, whereas it is believed that the Machiavellian construct will illicit a "positive-negative" correlation. This last claim may seem counterintuitive, and even counterproductive, but such is the nature of the cognitive biasing (Buller and Burgoon,

1996; McCornack, 1992; McCornack and Parks, 1986). Although truth biasing has been elaborated on for the purposes of this study relative to power and manipulation, because the model is one of deceptive communication, it is believed that these constructs will hold true as the research thus far has indicated, and may point to possibilities why receiver detection results thus far have been mediocre.

Summary

This research effort proposes that as an actual history of detection accuracy surfaces, the receiver will either assert or doubt their beliefs and confidence at detecting deceptive communication. Performance history is constructed from past detection successes and failures and will play an active role in receiver cognition of self and future performance behavior.

Recognizing the relationships between perceptions of self-efficacy, power, training effectiveness, and Machiavellianism to actual performance, and the reciprocated effect of feedback on that performance, the research model is further refined to show positive/negative influences (see Figure 4). The purpose of this model is to clarify construct interactions and claims made thus far and act as the foundation for the hypothesized beliefs (see Table 1). This model also exists to delineate between human perceptions and actual measurements. It is upon this model of perceived interpersonal communication that the experiment methodology in Chapter 3 is based to measure the validity and reliability of claims made thus far.

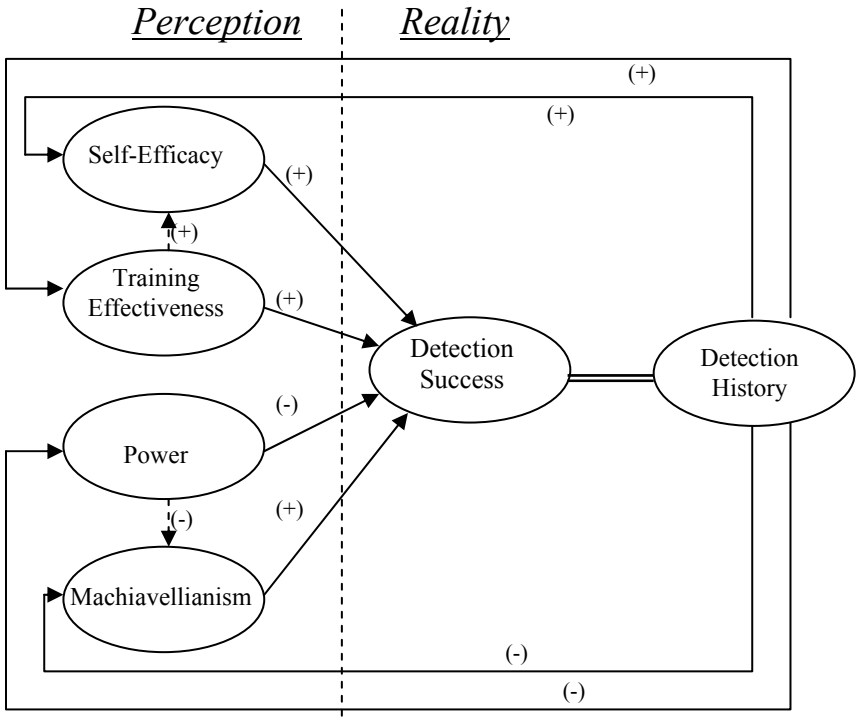


Figure 4. Revised Research Model

Table 1. Research Hypotheses

Hypothesis	
H1a:	Receiver perceived capability to detect deception will be positively correlated with detection success.
H1b:	Receiver detection accuracy history will be positively associated with perceived capability to detect deception.
H2a:	Perceived training effectiveness will be positively correlated with detection success
H2b:	Detection accuracy history will be positively associated with perceived training effectiveness to detect deception.
H2c:	Perceived training effectiveness will positively affect receiver perceived capability.
H3a:	Perceived power (reward, coercive, referent, legitimate, expert, or informational) in a sender will be negatively correlated with detection success.
H3b:	Detection accuracy history will be negatively associated with perceived power in a sender.
H3c:	Perceived power will negatively affect receiver perceived capability to manipulate others in interpersonal environments.
H4a:	Receiver perceived ability to manipulate others in interpersonal situations will be positively correlated with detection success.
H4b:	Receiver detection accuracy history will be negatively associated with receiver perceived ability to manipulate others in interpersonal situations.

III. Methodology

Overview

The preceding chapters identified the possibility for information manipulation and the responding need for individuals, especially military members, to be able to detect deceptive communications. Because communication is dynamic, perceptions of both communicants (sender and receiver) behavior are dynamic as well. The theory brought forth is that perceptions will influence and bias personal characteristics and performance, and more specifically that the perception of one's own—as well as another's—capability to detect deceptive communications will affect—and be reflective of—the displayed and realized capability as a quantitatively measured performance variable.

This chapter will present the methodology used to investigate the research hypotheses proposed in Chapter 2. Included are outlined descriptions of the research design, population under study, survey instrument, data collection, pilot study, and the actual experiment.

Relevant Population

Up to now, discussion of supporting research has been generalized to most of society. For the purposes of this research, the sample population will be concentrated to a military training installation in the Southeastern United States using 128 personnel enrolled in an introductory military communications career-track training curriculum. A total of 119 personnel opted to continue with the study; Table 2 shows the demographics collected for the group under study. Because the training program takes place in one location over a period of up to four months, this particular venue provides several military-oriented

Table 2. Demographic Data

Variables	AFCOT Students	Reference Percentage
Gender		
Male	103	86.6%
Female	16	13.4%
	119	**100%**
Rank		
2Lt	99	83.2%
1Lt	5	4.2%
Capt	4	3.4%
Maj	2	1.7%
LtCol	1	0.8%
Civilian	8	6.7%
	119	**100%**
Age		
Average (years)	28.0	
Years in Communications Career Field		
Average (years)	3.0	
Education		
Bachelor's Degree	112	94.1%
Master's Degree	6	5.1%
Doctoral Degree	1	0.8%
	119	**100%**
Duty Day on Computer		
0 – 25%	16	13.4%
25 – 50%	31	26.1%
50 – 75%	51	42.9%
75 – 100%	21	17.6%
	119	**100%**
Off Duty Hours on Computer		
None	6	5.0%
1 – 5 hours	44	37.0%
6 – 10 hours	32	26.9%
11 – 20 hours	19	16.0%
20+ hours	18	15.1%
	119	**100%**
Online Courses Taken		
None	37	31.1%
1	7	5.9%
2 – 5	43	36.1%
6 – 10	33	10.9%
10+	19	16.0%
	119	**100%**

personnel to be present for participation in the study over its duration. Participation was voluntary, though recommended by the director of the training course. To avoid compromising the study, participants were informed that this research was being collected in order train personnel on deception detection and then evaluate said training based on improvements in results. At the final treatment's conclusion, the true reasons for the study were debriefed to all subjects.

Research Design

In order to determine if support for the hypotheses identified in the previous chapter exists, an experiment was conducted which could both measure perceptions and test for performance accuracy as experiment observations. To validate the proposed hypotheses, a treatment set provided to the subjects consisted of deception detection training and performance feedback. The first perception measurement and performance judgment observations are to establish a baseline. Deception detection training is then provided as a treatment. A second observation in the form of a performance judgment is delivered. Feedback is the provided as a second treatment. The effect of that feedback (reciprocation) is measured at the end of the experiment timeline to identify any statistical differences from the initial observation. In its simplest form, construct causal analysis identifies this experiment treatment setup as:

Subject Group: ***O X O X O***
Control Group: ***O O O***

Campbell and Stanley (1975) identify this as a *True Experimental Design*: Pretest-Posttest Control Group Design. However, due to the longitudinal aspect required to prove causation and multiple treatments applied, the methodology proposed is a quasi-

experiment, specifically an Equivalent Time Samples Design (1975:43). Nonequivalence will be ruled out as pretest equivalence is shown between treatment and control groups (1975:47). For quasi-experimental designs such as this, it offers exceptional control in order to minimize sources of internal invalidity. This experiment design starts with an observation (O) at time zero, then replicates the above pretest-posttest design for sessions 1 and 2 and can be rewritten to look like:

Subject Group:	O_0	O_1	X_1	O_1	X_1	O_1	O_2	X_2	O_2	X_2	O_2
Control Group:	O_0	O_1		O_1		O_1	O_2		O_2		O_2

Of course, to prove causation and identify reciprocal effects this experiment demanded a longitudinal aspect. Self-efficacy can hardly be considered a personality trait (Bandura, 1986) and therefore holds the possibility to change over time as hypothesized in Chapter 2. However, Machiavellianism is believed to reside deeper within a person as part of their beliefs and has traditionally been measured as a steady-state trait (Burks et. al., 2000). Again, it is believed that a person's beliefs whether other people can be manipulated will change as they learn more about deception and can test their own capabilities to detect deceptive communications. The longitudinal aspect of this experiment is therefore imperative to proving any hypothesis related to personal perceptions and their alteration from one state to another, if possible.

The experiment was designed to accommodate training, scheduling, and technical requirements and limitations. The deception detection training lectures utilized for this experiment was developed by two deception detection experts at a large Southeastern university in conjunction with this research effort. The training was designed to be delivered in sequential sessions. A knowledge test was administered before and after

training to check for knowledge increase and retention. Each training treatment lasted no more than 1 hour and therefore did not severely impede the ongoing military training.

Judgment examples used to test task performance and accuracy were developed by a large Southwestern university and have been utilized in testing deception detection accuracy in previous experiments (Burgoon, Blair, and Moyer, 2002). Judgment responses were recorded via web-page with participants identifying the judgment as either "Truthful" or "Deceptive." Judgments consisted of different media types, including audio/video, audio only, and text. All judgments consisted of two civilians conducting an interview-style discussion; some of which the respondents were asked to lie and in others tell the truth. Judgments were rated on difficulty and placed in a mixed order to minimize testing skewness under longitudinal observation. Additional military examples were created by Air Force Institute of Technology graduate students to be used as sample scenarios during training.

Four graduate student deception detection researchers conducted all training treatments and administered all observation tests and surveys. Training was scheduled for different times with different instructors in order to ensure no instructor bias took place. A complete experiment timeline is provided as a visual reference in Figure 5.

In order to minimize awareness, suspicion, and the warning effect of the experiment, an initial session to gather demographics and uncontaminated perceptions was setup a week before testing with detection judgments. This initial set of collected data would serve as the baseline for all subjects. To prevent test and survey inundation and test for knowledge retention, each training session (to include all associated treatments and observations) was separated by a two-week time period. This requirement limited the

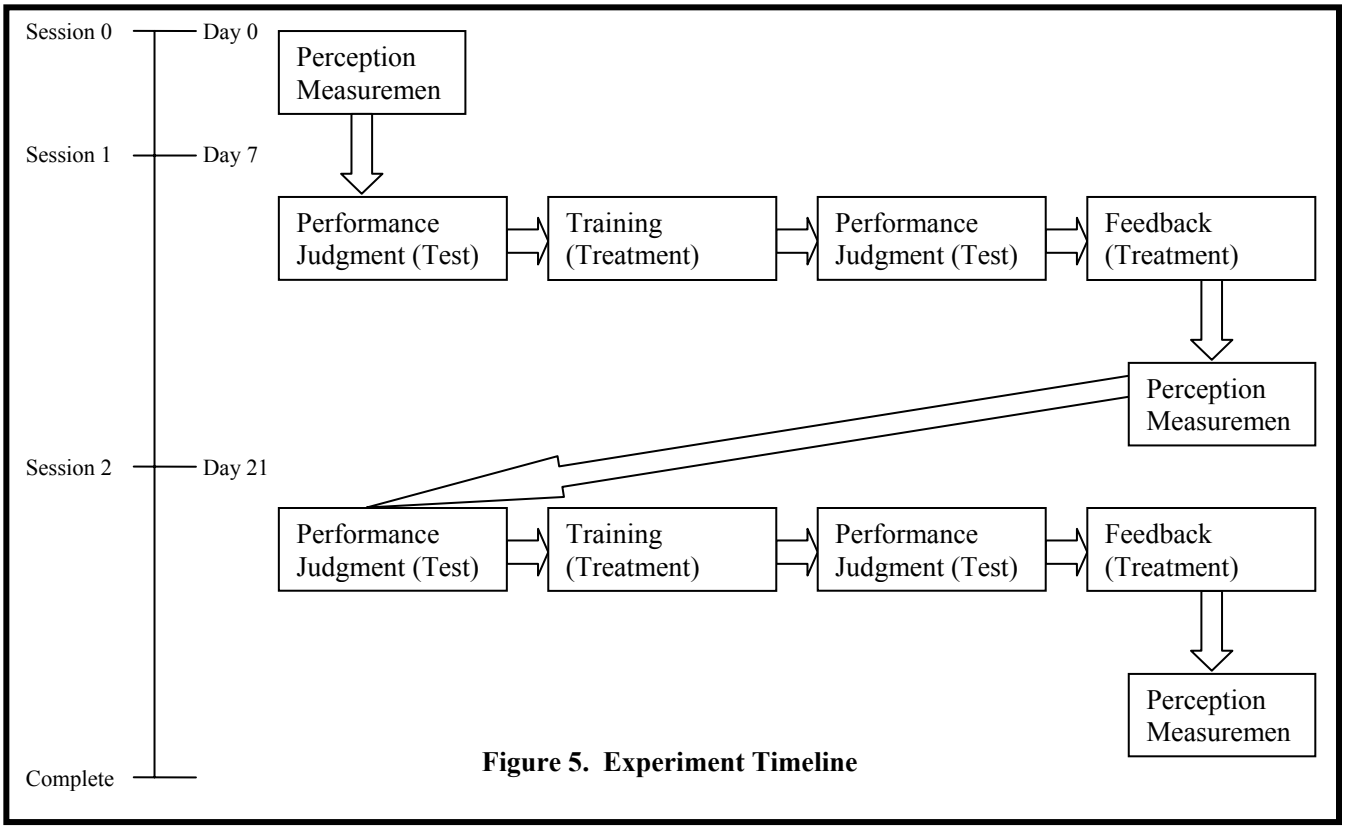


Figure 5. Experiment Timeline

number of participants eligible for the study, and therefore 8 classes of approximately 16 students each satisfied the scheduling limitation (a technical requirement limiting class size to no more than 20 participants per class was therefore satisfied and not an issue). 2 classes (N=28) were randomly selected to act as the control group (observations only) while the remaining 6 classes (N=91) were selected to act as the subject groups.

On all observation tests and surveys, subjects were asked to provide the last four digits of their social security number in order to track individual performance characteristics, mediating effects of treatments, and statistically significant changes which could then be attributed to one of the hypothesized constructs. Group characteristics could then be taken into consideration as well so each class was assigned a predetermined group reference number, which was also included in each measurement.

Survey Development

All four survey instruments for this study are based off previous instruments used repeatedly in social measurement studies and experiments and have shown both high reliability and validity. The survey component of this research was developed to be web-based in order to ease data collection and examination. The web-site was created to foster a sequential format and further minimize errors in data collection. Each survey was provided with an instruction set and completed in the presence of one of the administrators in order to ensure honesty, individual effort, and to answer any questions that may have been raised. Each instructor was given a list of exact survey procedures and timelines to follow. Again, both group reference number and the last four digits of a subject's social security number were used to mark individual performance and perceptions for longitudinal study.

Self-Efficacy

The self-efficacy measure is based off the methodology prescribed by Bandura (1986) and has shown both highly valid and reliable results in other research (Wood and Locke, 1987; Bandura and Cervone, 1986). Wood and Locke's model was chosen as it is more adept at correlating efficacy to specific task performance, whereas other models such as Riggs, Warka, Babasa, Betancourt, and Hooker (1994) are geared towards measuring general efficacy beliefs and expectancy scales.

Bandura (1977) classifies self-efficacy measurements in two arenas: magnitude (SEM) and strength (SES). With respect to magnitude, subjects were first asked to indicate whether they could achieve an identified level of attainment; subjects were allowed to respond with a "yes" or "no". Subjects were then asked to identify their

degree of confidence in their ability to perform at that level; subjects were allowed to respond with a numerical value between "0" (impossible) and "100" (absolute surety).

Specifically, student subjects were asked to "estimate (their) personal capability to discern whether someone is telling the truth or lying and to record (their) capability as a proportion of truths and deceptions felt that (they) could accurately detect". It is noted here that this measure was clarified with all subjects as a measure of overall accuracy—detecting both "truths and deceptions". Because research has repeatedly shown people's ability to detect deceptive communications to only be roughly 50% accurate, magnitude values were set from 33% (1 in 3) to 100%. Wood and Locke (1987) found the strongest relation to exist when a percentage was linked to performance, and ceiling effects compensated for by limiting the maximum possible performance level at 100%. Values were presented in a stepwise order to make it easier for subjects to relate estimated ability to any simple number of communications (i.e. *1* in *3*; *1* in *2*; *2* in *3*; *3* in *4*; *all*).

Both SEM and SES scales were set with the exact same proportions. Subjects were asked whether they believed they could achieve the level of accuracy ascribed (SEM), and to estimate their degree of confidence in their ability to perform at that level (SES). Unlike other studies measuring efficacy in multiple skill sets, this instrument was designed to only measure self-efficacy relative to individual deception detection. SEM was defined as the total number of positive responses (yes); SES was defined as the mean confidence rating for all items. Both items were correlated to performance accuracy measurements to show causation over longitudinal study.

As subjects are observed and receive treatments (training/feedback), the longitudinal aspect of this study is expected to identify changes following Bandura's (1986) claim that

personal perceptions interact and react to behavioral and environmental actions and consequences. Efficacy should react as a dynamic and manipulative human characteristic rather than merely a static observable personality trait, and statistically significantly so.

Machiavellianism

The Mach measure for this study is based off an instrument first developed and scored by Christie and Geis (1959, 1970). The original instrument scale is based on the writings of Machiavelli (1515) and though old, the instrument has consistently shown high levels of validity (via factor analysis), reliability ($\alpha = 0.86$), and relevant application towards personal predisposition of condoning such strategies. The Mach scale continues to elicit results according with other personality assessment tools (Fehr, Samson, and Paulhus, 1992). The newest Mach IV model employs a Likert-type scale with and is traditionally scored for an individual not as a results of means or variances, but an additive score which then correlates to the respective individual's predisposition to using guile, deceit, and opportunism in their relations with others (Christie and Geis, 1970). The Mach IV scale has been used to identify social deficit areas (Sullivan and Allen, 1999) and even operationalized in an experiment manipulating the trust of both sender and receiver (Burks, et.al, 2000) and determining suspicion (Levine and McCornack, 1991).

Throughout literature the Mach IV has been utilized as a static display of individual perception, a personality trait that does not change, at least not statistically significantly so. This study intends to take two disparate longitudinal measurements of Machiavellianism and identify not only how this perception affects task performance, but if treatment affects such individual perceptions.

Traditionally the Mach scale has been scored via 7-point self-rated scale, tallied up, then an arbitrary 20 additional points added for a total score of 40-160 possible. For the purposes of this study, a comprehensive score will be ignored and the arbitrary 20 points not figured into an individual's Mach score, as it is not directly pertinent to this research. A 5-point scale will be used in order to facilitate standardization throughout the survey as each other measurement also utilizes a 5-point Likert scale. This alteration should not have a negative on effect on the results of the scored Mach as a relative measurement is exactly what is to be examined, rather than compiled Mach score.

Lastly, as this research is part of a larger cooperative effort, the planned experiment is utilizing other instruments to measure various constructs and theories. This instrument was combined with Rotter's (1967) interpersonal trust scale in order to consolidate time and space for the experiment. The Mach IV scale was reused in its entirety with the questions randomly ordered and presented with the interpersonal trust scale. The two scales are very closely related and it is expected that zero negative affect from this step should arise as the Mach IV has repeatedly shown a capability to predict distrust (Burks et. al., 2000).

Again, in order to garner an unbiased measurement this observation was scheduled for the initial session. As Machiavellianism has typically been referred to as a personality trait, it was decided to wait to administer the follow-on measurement until Session 2 and then determine if any statistically significant change was noted. By this time in the experiment, the subjects will have had two training sessions, four judgment tests, and feedback on performance thus far. An additional factor considered was to minimize the amount of surveys the participants were subjected to.

Training Effectiveness

The training effectiveness instrument is based directly off the 20-question Communication Training Impact Questionnaire (CTIQ) developed by DeWine (1987) which is widely used to measure individual perception of training impact. DeWine's survey was developed to correspond to Kilpatrick's (1967) research on improvements in job behavior (third level) and assesses behavioral changes as a result of training. As this particular research is focused on individual perceptions, quantitatively measuring these changes in behavior—and therefore the responses to such a survey—fit perfectly with the goals of this effort. The CTIQ has shown high reliability ($\alpha = 0.88$) and validity scores (via oblique factor analysis and scree test), particularly for college students (Lester and Bishop, 2001). As the sample for this experiment is predominantly recent college graduates, it is expected that these high coefficients will lend further credence to the claims of this research endeavor.

Throughout the 5-point Likert scaled instrument, DeWine (1987) refers training back to *this skill*, which enables generalizability of the survey and applicability to other areas. In order to make the instrument as specific as possible, *this skill* was identified as *deception detection* and substituted throughout the questionnaire. For example:

"After this training program I would perform this skill without practicing."

—now reads:

"After this training program I would detect deception without practicing."

This survey was prepared and delivered in its entirety, including both perceptions on relation of training to job and skill performance. Because this survey could not be administered until at least one training session was completed, this survey was scheduled

for Session 1 and again at Session 2. Checked against the knowledge posttest (actual), subjects could provide their assessment of training (perceived) at these two times and further validity for the influence of perception on performance could be identified.

Power

Perceived power in deception was measured via a strength scale, much the same as the aforementioned instruments measure perceptions via a Likert-style scale. However, this construct directly measured an individual's perception of power exerted in the interpersonal dyad of communication while watching as a third party observer.

This measurement was taken via Swasy's (1979) Power Scales. Swasy based the development of his instrument off French and Raven's (1959) social power model and identified survey questions specific to each of the identified power types. The result was a 31-question instrument based on a 5-point Likert scale that has shown both high validity and reliability at identifying perceived power in a situation.

The Power Scale instrument identifies two parties in an interactive dyad—"A" and "B" and queries the subject towards the perceived power exerted one over the other. The terms "respondent" and "questioner" were substituted for "A" and "B" respectively in order to clarify roles in the deceptive communication judgment examples used to test the subjects for detection accuracy. All 31 questions, and therefore all six power types, were included in this survey in order to identify any perception of power present.

This item must be specific to a particular interpersonal communication; i.e. a reliable assessment of power in a group of interactions among different senders and receivers will only confound results as power me exist in one communication, yet not in another. Therefore, when completing this questionnaire subjects were asked to recall the last

judgment and make inferences towards perceived power based on this test observation. During the last judgment each instructor clarified roles of personnel in the test example, that of the questioner and the respondent.

This survey could not be administered until at least one judgment test was completed. To keep all surveys on the same schedule, this survey was scheduled to measure the perceived power from the last judgment posttest for Session 1 and again at Session 2. Therefore, feedback treatment was given on all judgments except for this last one, the survey observation completed, and then subjects were given feedback on this final judgment at the end of the session.

Pilot Study

A pilot study was carried out approximately three weeks before the initial experiment. The pilot study was conducted with 19 volunteer Air Force Institute of Technology graduate students in a campus computer lab on Wright-Patterson Air Force Base, Dayton OH. The pilot study included a deception detection training session, a judgment posttest, and a survey resembling the final all-inclusive survey of Session 2. Goals of the pilot study were to: (1) check the validity of the current test structure, (2) check the validity of the current survey structure, (3) gather feedback on the test and survey, and (4) verify the technical solution.

All testing was setup via computer-based media. Due to limitations in volume of available deceptive scenario examples and time to conduct testing, six judgment tests were administered in order to base deception detection performance and accuracy. Responses were gathered via web-page and a feedback section made available. The pilot

study group was labeled Group 0. All data collection for the pilot group took place under this header on the website, which was then removed and replaced with radio buttons for Groups 1-4 for future data collection.

As both pilot and experiment involved use of government computers, permission to use specific facilities capable of accommodating the required network bandwidth and housing a minimal sample size and were coordinated. Military networks do not allow streaming content so all audio/video content was housed and referenced locally. The technical solution was proven solid as the web-based system administered and recorded data as prescribed. Test segments (audio/video in digital format and HTML text) delivered locally without flaw and few minor recommendations were reported with the testing segment of the pilot study.

Though useful remarks were received from the pilot group, time restrictions did not enable a full analysis of survey reliability. The survey's format was adjusted in accordance with notable remarks to make it more readable and understandable.

The greatest source of contention arose from the Power Scale survey. Originally the survey used identifiers "sender" and "receiver", terms common to personnel familiar with interpersonal communication sociology and deception detection research, however not with the pilot group. As well, the final judgment was a brief audio only clip, therefore connecting any type of perceived power to either participant created discontent within the pilot group and, consequentially, the group was asked to skip over said measurement and continue with the remainder of the survey.

The research group took notes of verbal recommendations and changes were made in accordance to suggestions from the pilot group. Few additional problems were noted.

Permission to Conduct Research

This experiment involved the detection by—but not the deception of—military personnel and conducted observations and experimentations in accordance with human experimentation requirements (AFI 40-402). An exemption was sought after in order to use Department of Defense personnel as volunteers for deception detection research. This exemption was granted by the Air Force Research Laboratory Human Effectiveness Directorate 26 November 2002 and assigned control number FWR 2003-0021-E (see Appendix A).

Experiment

The experiment was designed in its entirety to follow the research design and experiment timeline (see Figure 5). A web-based collection of hypertext markup language pages was developed centralize demographic information (see Appendix B), surveys (see Appendix C), and test (see Appendix D) administration while also enabling a sequential procedural format that could be managed locally. Data could then be collected and analyzed much easier and quicker than had the subject's responses been paper-based. This Deception Detection System was made available via the worldwide web (http://en.afit.edu/env/dds/) in order to ease subject access. It was setup to operate from the Air Force Institute of Technology as was the database that would eventually store subject response data. Consequentially, it was a mandatory requirement for the experiment that each participant have access to the Internet in order to partake in the deception detection experiment and complete the necessary surveys.

Where Session 0 collected data to establish an untainted foundation for participants, a training lecture, two knowledge tests, two judgment tests, and a single survey were administrated at each following session. Survey observations were scheduled as shown below (see Table 3) to gather data pertinent to the research design.

Table 3. Instrument Schedule by Session

Session 0	Self-Efficacy, Machiavellianism
Session 1	Self-Efficacy, Perceived Power, Training Effectiveness
Session 2	Self-Efficacy, Perceived Power, Training Effectiveness, Machiavellianism

Session 0

Session 0 established the baseline for recording observations. Research participants were informed that an Air Force Office of Scientific Research study project into deception was ongoing and that they would be the subject research group. Subjects reported demographics (see Appendix B) via the web-page, then—after completing a disassociated task—were hyperlinked to and completed the Session 0 survey.

Session 1

Session 1 introduced the participants to the knowledge and judgment testing portion. Subjects were summarily briefed on the day's events which would last for 2.5 hours. In sequential order, subjects first received a 12-item knowledge pretest, then a 6-item judgment pretest. Training was administered for approximately 50 minutes and followed by a 10 minute break; instead of training, the control group was given a 30 minute break before returning. Subjects followed up with a 12-item knowledge posttest (items in scrambled order from pretest), a 6-item judgment posttest, and were given feedback to their performance on the first 11 judgments. Referencing the 12th judgment for the power

measure (questions 1-31), subjects were linked to the survey with the self-efficacy measure and 51-item instruments for perceived power and training effectiveness. All participants were asked to be as honest as possible with their answers thanked for their time before release.

Due to other ongoing research areas associated with this experiment, performance accuracy feedback was given to all participants, including the control group. This treatment was unavoidable, and it will be made clear its affect in both the data analysis and conclusions for this paper.

Session 2

Session 2 continued in enhancing participant knowledge. As with the start of Session 1, subjects were summarily briefed on the day's events which would last for 3.0 hours. Again, in sequential order, subjects first received a 12-item knowledge pretest, then a 6-item judgment pretest. Training was administered for approximately 50 minutes and followed by a 10 minute break; instead of training, the control group was given a 30 minute break before returning. Subjects followed up with a 12-item knowledge posttest, a 6-item judgment posttest, and were given feedback to their performance on the first 11 judgments. Referencing the 12^{th} judgment for the power measure, subjects were linked to the survey with the self-efficacy measure and 71-item instruments for perceived power, training effectiveness, and Machiavellianism. All participants were asked to be as honest as possible with their answers thanked for their time before release. At the completion of this final session, all subjects were debriefed on the background of the study and were given time for questions and answers.

Summary

This chapter presented a methodology for procuring data correlating theory to deception detection performance. Specifically, a research design was operationalized to an experimental model which could quantitatively measure performance; this performance can then be correlated to data recorded on participant perceptions via web-enabled surveys. The instruments in question queried participants for their personal perceptions relative to task-specific self-efficacy, Machiavellianism, perceived power, and perceived training effectiveness. Surveys, treatments (training and performance feedback), and performance tests were administered to subjects groups at specified intervals so longitudinal measurements could be obtained and recorded for later analysis. Finally, this chapter concluded with a complete run-down of the procedures used in the experiment and instrument reliability which lends further credence to the plausibility of data to be analyzed in the following chapter.

IV. Results

Overview

The previous chapter identified the methodology for acquiring data in order to support hypothesized relationships. This chapter presents an analysis of data collected during the experiment and interprets the results. Instrument reliability and experiment validity are discussed and each hypothesis proposed in Chapter 2 is analyzed in order to determine its contribution to the resulting overall model. Parametric statistical methods were used to base data reliability and validity, and are based on the adequate normality of the data and residuals (see Appendix E). ANOVA testing was run to identify pretreatment group equivalency and, with Tukey-Kramer tests, insignificance between groups at pretreatment and then significance at post-treatment. Cronbach's Alpha was run to illustrate inter-item and instrument reliability based on the consistency of the measurement. Pearson's correlation coefficients were run to identify significant contributory correlations between constructs and the response—performance accuracy.

Instrument Reliability

Instrument reliability for the self-efficacy instrument was determined using multivariate analysis to identify a Cronbach's Alpha for the SES much like the Likert-scale interval responses of the other surveys in this study. A definitive reliability was attempted in Wood and Locke's (1987) experiment to relate self-efficacy to academic performance, but due to the SES offering such low initial levels of reliability, an average inter-item correlation was opted for. In contrast, the SES reliability coefficients produced in this study's survey are quite high (see Table 4) and will therefore be continued to the

other sessions. SEM is a single item, and therefore a reliability coefficient cannot be computed.

Perceived Power, Training Effectiveness, and Machiavellianism instrument items were scored for positive and negative effects and then analyzed using multivariate factor analysis. Factor loading results were as expected, with most questions significantly loading on the overall construct. Again, it was hoped that a thorough factor analysis could be conducted from the results of the pilot study but time limitations accelerated the experiment and all questions were left on the administered surveys for experiment subject groups. All instrument reliability ratings were conducted on the group as a whole (i.e. both treatment and control groups) in order to clarify the worthiness of each instrument. These other measuring instruments yielded alphas well within acceptable parameters and comparable to previous studies (Christie and Geis, 1970; DeWine, 1987; Swasy, 1979).

Instrument reliability analysis yielded the following for the entire item sets are provided in Table 4. Some individual item-loadings for the self-efficacy measure were weaker than others (< 0.70) but because internal consistency for the entire set was greater than 0.70, no items were dropped. All inter-item loadings for the other instruments were well above 0.70 as well, thereby contributing to the reliability of each session's survey instrument.

Table 4. Instrument Reliability

Instrument	**Session 0**	**Session 1**	**Session 2**
Self-Efficacy	$\alpha = .83$	$\alpha = .71$	$\alpha = .74$
Machiavellianism	$\alpha = .82$	--	$\alpha = .79$
Perceived Power	--	$\alpha = .90$	$\alpha = .88$
Training Effectiveness	--	$\alpha = .79$	$\alpha = .82$

Experiment Validity

The design for this experiment is intended to lend as much credibility and validity to the research effort as possible. Because both treatments and observations are required, the *Quasi-Experimental Design*: Equivalent Time Samples Design (Campbell and Stanley, 1975:40) was chosen to minimize internal invalidities. The following will identify measures taken in the design and operationalization of the experiment to control validity. Campbell and Stanley (1975) identify several sources of a possible compromise in quasi-experimental design, each of are identified below.

History is a source which becomes more plausible as the separation between observations is extended. Two types of observations were conducted in this study: performance testing and perception instrument. Performance tests were conducted within two hours of each other and can therefore be considered "a trivial problem" (Campbell and Stanley, 1975:7). Surveys were administered with a maximum of a two-week lapse between same-style observations in order to identify changes in what are considered static traits, and therefore measurement within the same two-hour period would expect to elicit insignificant results. Along the same lines, because *maturation* is a source dependent on time and the changes to the participant over that time, the short time between observations minimizes this source to the point that the only maturation comes from the deception detection training treatment.

Testing is a confounding source as participants tend to do well the more times they take a test. Though these performance tests were of the same nature, different scenarios were employed throughout the experiment at each session (for a total of 24 scenarios). To further control this source, instructors remained in the room with participants to

discourage open discussion and reactivity. As identified in the previous chapter, instructors followed a set of procedures throughout the administration of testing, training, and instruments, further limiting this factor.

Instrument decay is a source concerned with varying conditions in the measuring instrument. The surveys remained unchanged between observations and are therefore not subjective to this rival hypothesis; however, performance accuracy was derived from examples which—though the exact same for all—changed from session to session. Some test experiments appeared to be particularly difficult for participants, such as those in less rich media (text), and may act as a factor of invalidity here. Of a last note, Campbell and Stanley identify that "A change in observers between O_1 and O_2 could cause a difference (1975:9)." Instructors were swapped between participant classes in order to limit instructor bias of training treatments between participant groups.

Regression effects are noted as selected groups converge on a mean. Though this is exactly what the research model proposes will happen, participants were not segregated or *selected* based on performance accuracy results. Groups were assigned based on their class structure in order to minimize regression, as well as refrain from interfering with the participant training curriculum already in progress. As well, as identified in Chapter 2, humans, even experienced interrogators, typically detect deception about 40-60% of the time (Kalbfleish, 1985; Kraut, 1980), so a regression towards this mean performance rating almost seems inevitable. The research model proposes somewhat to the contrary, but clearly regression of the group will not be a source of internal invalidity.

Mortality becomes a factor, especially in longitudinal studies, as subjects drop out from the study. Because this experiment was authorized by the local military unit

commander, this source of invalidity is nearly completely removed. A language barrier with a few (*N=2*) foreign national participants invalidated their input; at the beginning of Session 2 they were dropped from the experiment and further training treatments. All of the above sources of internal validity were manifested equally between treatment and control groups, thereby lending further validity to the experimental research design.

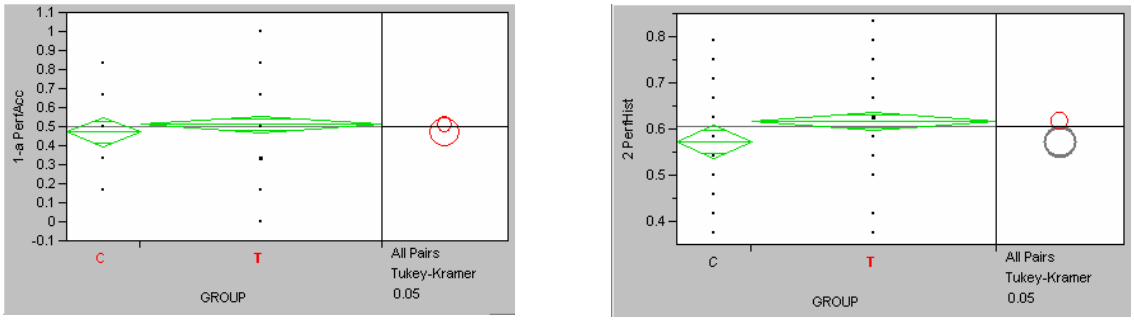
External validity as an interaction between treatments (training and feedback) and generalizability to other social constructs is limited. Though the demographics are more suited to military officer personnel, the main source of external invalidity comes from the detection scenarios themselves. The examples placed participants in a third-party observatory role which therefore does not include the participant in the interpersonal dyad, which is exactly what previous research alludes to. Military requirements on human research severely limit studies in this area (Code of Federal Regulations, 2002), thus participants were limited to an observatory role. Chapter 1 identified email as the communicative media of choice via computer, so applicability of text documents in chat format to results to other media areas may also be limited.

In order to determine pretest equivalence between the treatment and control groups as well as the validity of the instruments used to measure the hypothesized constructs, comparisons via ANOVA paired difference test of the means for item responses and Tukey-Kramer tests were conducted and to show pretreatment statistical insignificance (see Appendix F, Figure 15 and Appendix G, Figure 16). Any difference will be most pertinent in the Session 0 initial deception detection self-efficacy and Machiavellianism constructs, and as shown (see Appendix F, Table 8 and Appendix G, Table 9), was insignificant ($p >> 0.05$). The instruments and experiment appear to show very good

pretest equivalence with minimum pretreatment variance/difference between groups. With the control measures in place for the experiment, validity is not considered a confounding factor for this study.

Results

The results of the experiment are extremely positive. A statistically significant difference in performance accuracy was discovered between the treatment and control groups, identifying a definitive change in performance (see Figure 6).



Session 1 – Test #1 Performance

Session 2 – Performance Accuracy History

Figure 6. Comparative Performance History

Performance was measured at different points in the experiment in order to correspond to the difference measures required. For example, the perceived power construct pertains to a specific interpersonal communication dyad and therefore was correlated and regressed on this single event, whereas the Machiavellianism measure was regressed on all-inclusive results (immediate and historical) in order to generate group statistical relevance for this construct. The collected data identify a distinct difference ($p = 0.04$) between the performance of the treatment and control groups where none existed at the initial performance testing. The fact that there exists a statistical significance

between the initial performance accuracy score and the overall score after four tests lends even further significance to the results.

The following sections provide a construct-by-construct analysis of each proposed hypothesis to identify any correlation or causation which possibly contributed to this difference. Pearson correlations (see Table 5, p.60) were conducted on the proposed model to highlight relationships. Those relationships that correlated the strongest are boldfaced with an asterisk (*) to identify the correlation's level of statistical significance.

Table 5. Pearson Correlation Analysis

TIME 1	Self Efficacy (SES)	Self Efficacy (SEM)	Training Effectiveness	Power	Mach	Performance	Performance History
Self Efficacy (SES)	1.000						
Self Efficacy (SEM)	**0.700****	1.000					
Training Effectiveness	0.110	0.060	1.000				
Power	-0.041	-0.126	0.002	1.000			
Mach	-0.065	-0.122	-0.050	-0.066	1.000		
Performance	0.123	-0.002	0.032	-0.125	0.105	1.000	
Performance History	**0.286****	-0.018	0.055	-0.148	0.077	**.768****	1.000

TIME 2	Self Efficacy (SES)	Self Efficacy (SEM)	Training Effectiveness	Power	Mach	Performance	Performance History
Self Efficacy (SES)	1.000						
Self Efficacy (SEM)	**0.647****	1.000					
Training Effectiveness	**0.195***	0.139	1.000				
Power	**-0.200***	-0.113	-0.150	1.000			
Mach	0.028	-0.075	-0.055	0.096	1.000		
Performance	0.156	-0.101	**0.275****	-0.044	-0.023	1.000	
Performance History	0.384**	**0.281****	**0.200****	-0.176	-0.028	**0.598****	1.000

* Correlation is significant at the .05 level (2-tailed)
** Correlation is significant at the .01 level (2-tailed)

It should be fairly apparent, though reassuring nonetheless that correlations of *SES to SEM* are high as this construct measures self-efficacy and differs only by scale and magnitude. The high correlation of *Performance to Performance History* points to the fact that the performance accuracy construct is mathematically related to performance history and therefore covaries.

A multiple least regression was conducted to evaluate the research model's predictive nature with path analysis (see Table 6) to identify strength of causation. Those construct relationship paths showing statistical significance to the fit model are italicized and highlighted to identify the regressed factors contributing significantly to the response.

Table 6. Path Analysis Coefficients and T-Statistics

Path	Coeff	T-Stat
Time 1		
H1a. Self-Efficacy (SES) to Performance	0.262	1.91
H1a. Self-Efficacy (SEM) to Performance	-0.198	-1.35
H1b. Performance History to Self-Efficacy (SES)	*0.424*	*3.23*
H1b. Performance History to Self-Efficacy (SEM)	-0.025	-0.20
H2a. Training Effectiveness to Performance	0.031	0.68
H2b. Performance History to Training Effectiveness	0.036	0.60
H2c. Training Effectiveness to Self-Efficacy (SES)	0.051	0.95
H2c. Training Effectiveness to Self-Efficacy (SEM)	-0.009	-0.20
H3a. Power to Performance	-0.104	-1.36
H4a. Mach to Performance	0.043	1.14
Time 2		
H1a. Self-Efficacy (SES) to Performance	*0.189*	*2.03*
H1a. Self-Efficacy (SEM) to Performance	-0.158	-1.55
H1b. Performance History to Self-Efficacy (SES)	*0.781*	*4.46*
H1b. Performance History to Self-Efficacy (SEM)	*0.612*	*3.15*
H2a. Training Effectiveness to Performance	*0.114*	*3.06*
H2b. Performance History to Training Effectiveness	*0.210*	*2.19*
H2c. Training Effectiveness to Self-Efficacy (SES)	*0.108*	*2.13*
H2c. Training Effectiveness to Self-Efficacy (SEM)	0.082	1.50
H3a. Power to Performance	-0.054	-0.47
H3b. Performance History to Power	-0.184	-1.92
H3c. Power to Mach	0.113	1.03
H4a. Mach to Performance	-0.004	-0.24
H4b. Performance History to Mach	-0.030	-0.30

It is recognized that similar structural model studies (Biros et. al., 2002; Compeau, 1999) utilized partial least squares regression analysis with a jackknife procedure in order to identify significance between constructs where normality in residuals from the mean are not within acceptable tolerances. This study's sample has shown good normality throughout (see Appendix E) and therefore parametric methods of analysis were used for simplicity.

Hypothesis 1

Hypothesis 1a predicts a positive correlation between perceived capability (self-efficacy) and performance while Hypothesis 1b predicts a positive correlation between detection history and perceived capability to detect deception—the reciprocation component (see Figure 7).

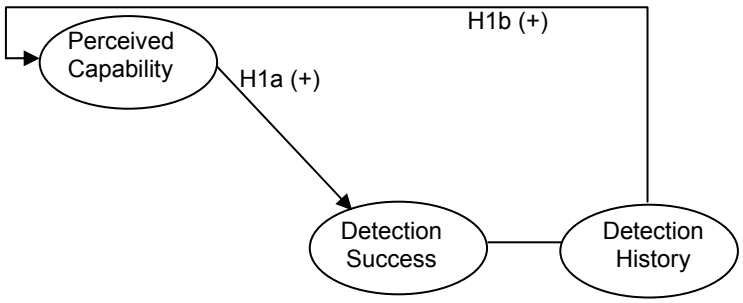


Figure 7. Hypothesis 1 Model

A paired difference test was run to identify if a significance between the self-efficacy measures at each session (see Appendix H, Figure 16). As can be seen, a high intersession significance was exhibited. What makes the results even more significant is that reported self-efficacy decreased after the first session, then increased after the second

session, and each change is significant from the whole, further illustrating a regression to a mean and the significance of a detection history on future confidence ratings.

A review of the correlation in Table 5 and path analysis in Table 6 show that a moderate relationship ($p < 0.06$) existed between self-efficacy and performance and was made stronger by feedback with led to more accurate perceptions of capability. The performance history component exhibited a strong correlation from the onset (0.286 at $p < 0.01$) and was only made stronger as the study progressed (0.384 at $p < 0.01$). Path analysis indicate a great deal of direct effect between performance history and self-efficacy (p_{1b} = 0.781-*SES* and 0.612-*SEM*). The findings of Hypothesis 1 indicate a strong positive relationship between self-efficacy and performance accuracy. As well, the findings indicate a positive relationship from performance history on self-efficacy, further illustrating the theorized effect of reciprocated causation so that as self-efficacy is increased, so too is performance accuracy.

Hypothesis 2

Hypothesis 2 made predictions about the perceived training effectiveness on performance (see Figure 9). Hypothesis 2a predicts a positive correlation between

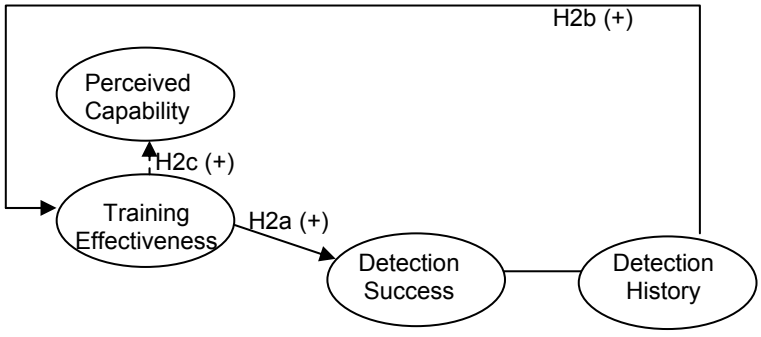


Figure 8. Hypothesis 2 Model

perceived training effectiveness and performance accuracy and Hypothesis 2b predicts a positive correlation between detection history and perceived training effectiveness—the reciprocation component. Hypothesis 2c goes on to predict that the construct of perceived training effectiveness will also have a positive affect on self-efficacy.

A review of the correlations in Table 5 and path analysis in Table 6 show that in the first longitudinal set, very little correlation between the perceived effectiveness of the training and performance was present; however in the second set a very high correlation (0.275 at $p < 0.01$) between the two constructs. Reciprocation loaded high as well in the second correlation set (0.200 at $p < 0.01$). Path analysis yielded highly significant coefficients for explaining variance in the performance due to perceived training effectiveness ($p_{2a} = 0.114$ at t-stat = 3.06) while the historical effect contributed once again even higher on the construct ($p_{2b} = 0.210$). The relationship to self-efficacy was much stronger and more significant in the second set (0.195 at $p < 0.05$) at a corresponding positive path coefficient of 0.108 to the SES measure.

A paired difference test did not indicate a statistical significance in opinion on training effectiveness between the two sessions (see Appendix H, Figure 17), which does contribute to the inter-instructor reliability of the study. The increase in mean alludes to a higher positive rating of the second training session, but does not conclusively support the notion that the second session's training was perceived as more effective.

The findings of Hypothesis 2 indicate a strong positive relationship between perceived training effectiveness and performance accuracy and the reciprocated causation of performance history on that perception, so that as the perceived training effectiveness is increased, so too will performance accuracy. As well, a moderately strong positive

relationship exists between perceived training effectiveness and self-efficacy, so that as the perceived effectiveness of training is increased, so too will self-efficacy.

Hypothesis 3

Hypothesis 3 made predictions about the perceived power present in an interpersonal communication on performance (see Figure 9). Hypothesis 3a predicts a negative correlation between perceived power and performance accuracy and Hypothesis 3b predicts a negative correlation between detection history and perceived power—the reciprocation component. Hypothesis 3c goes on to predict that the construct of perceived power will also have a negative affect on Machiavellianism.

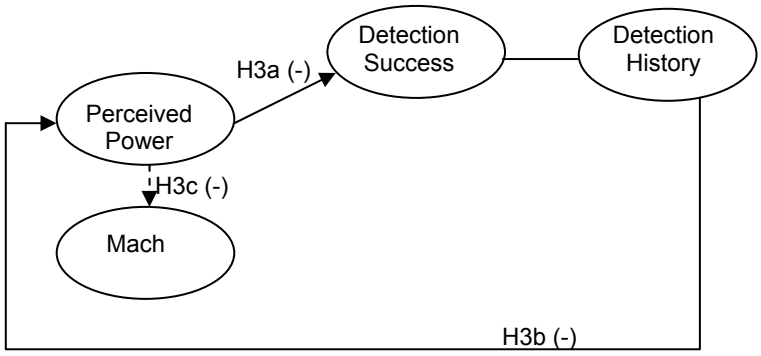


Figure 9. Hypothesis 3 Model

A review of the correlations in Table 5 and path analysis in Table 6 do not indicate that a statistical significance exists between perceived power and performance accuracy, nor in the history reciprocation to power. Machiavellianism did not load significantly either against power; as a matter of fact, it loaded positively in the first set and negatively the second time, which may be indicative of the change in Mach scores from Session 0 to 2 (see Appendix H, Figure 18).

The findings of Hypothesis 3 indicate that the perceived power observed in an interpersonal communication is not a factor in performance, nor is the reciprocation of performance feedback a factor on perceived power. Therefore this construct cannot be considered as a significant contributor to the proposed model.

Hypothesis 4

Hypothesis 4a predicts a positive correlation between Machiavellian perception and performance while Hypothesis 1b predicts a positive correlation between detection history and Machiavellianism—the reciprocation component (see Figure 10).

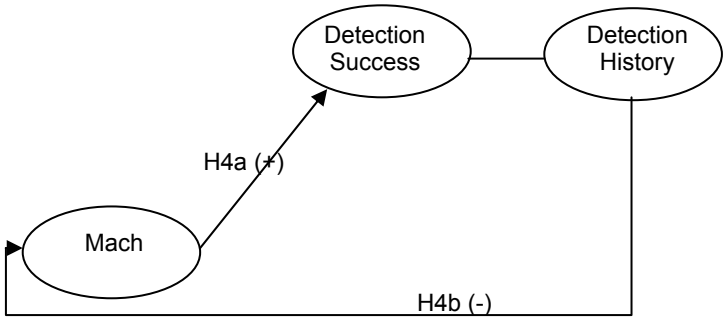


Figure 10. Hypothesis 4 Model

A review of the correlations in Table 4 and path analysis in Table 5 do not indicate that a statistical significance exists between Machiavellianism and performance accuracy, nor in the history reciprocation to Machiavellian perceptions. In fact, the Mach scores of participants correlated least significantly with performance of all constructs measured. A paired differences test was run on the two longitudinal Mach scores to identify if the participant ratings differed significantly at the second measure (see Appendix H, Figure 18). Though a significant difference between the two Mach scores existed (t-stat = 4.19), the Machiavellianism construct did not exhibit a significant correlative relationship with

history or performance, or any other construct, and therefore neither path can be considered a direct contributory factor to performance.

Model Analysis

Figure 11 illustrates the evaluated structural model with significant paths (H1a, H1b, H2a, H2b, H2c) boldfaced. With only the significant constructs identified for the model, an additional regression analysis was accomplished to identify the model's capability for explaining error, which resulted in an $\boldsymbol{R^2 = 0.166}$ for performance accuracy. This value is higher than other studies (Biros et. al., 2002; Compeau, 1999) have reported for model fitness, though slightly lower when compared to controlled laboratory studies of efficacy's affect on performance (Wood and Locke, 1987; Bandura and Cervone, 1986).

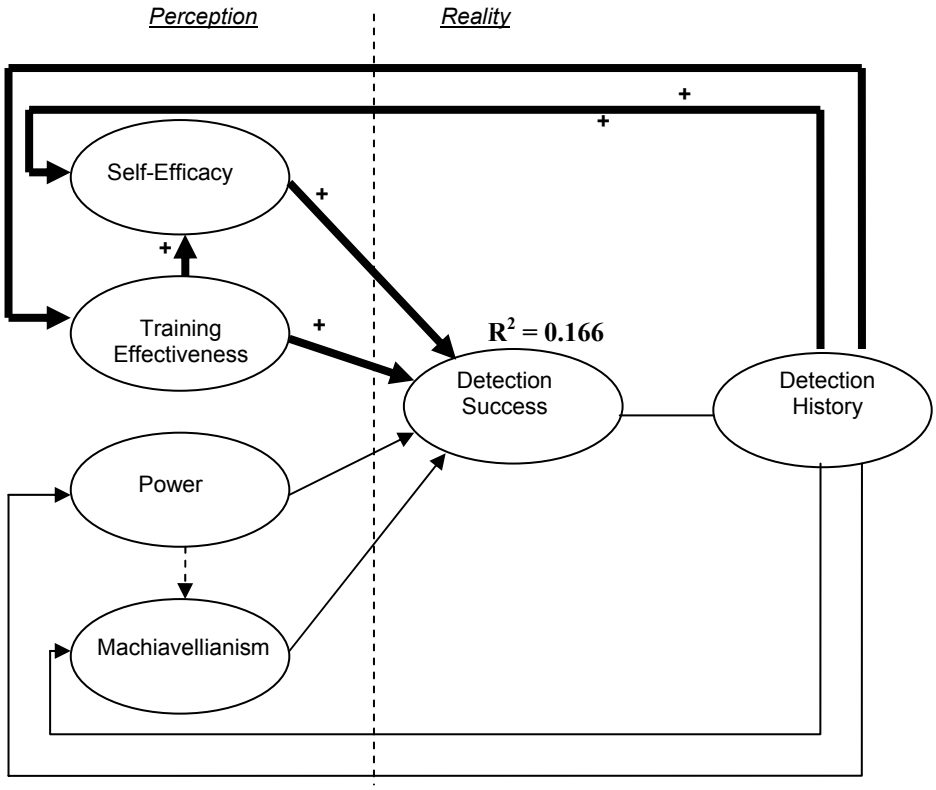


Figure 11. Evaluated Structural Model

Summary

A significant difference in performance between control and treatment groups was observed (see Figure 6). The findings from this data analysis identify some significant findings relative to the proposed model, its constructs, and hypotheses quantitatively operationalized as direct causal factors to this difference in performance. Specifically, Hypotheses 1a and 2a are supported as self-efficacy and perceived training effectiveness directly act as positive causational factors on performance. Hypotheses 1b and 2b garner support as positive reciprocation from performance history on these factors. Hypothesis 2c is supported as a positive indirect relationship between these factors. The remaining hypothesized constructs and structural relationships involving perceived power and Machiavellianism were not supported with the results of this quasi-experimental study. The following chapter will discuss and interpret the results of this study and their impact to academic, private practice, and the military.

V. Discussion

Review

Information is not only a key enabler, but a strategic target of manipulation (Zmud, 1988). As technology evolves and facilitates the communications transition from face-to-face to computer-mediated, recognizing when information is purposely manipulated is of extreme importance to organizations. People are not inherently good at detecting manipulated and deceptive communications (DePaulo and DePaulo, 1989; Kalbfleish, 1985, Zuckerman and Driver, 1985; Kraut, 1980), yet research has shown cognitive characteristics which can improve task performance (Wood and Locke, 1987; Bandura and Cervone, 1986).

The focus of this research was on identifying cognitive characteristics which enhance a person's deception detection performance. Specifically, understanding personal cognitive characteristics that affect individual deception detection accuracy in a computer-based environment, if these characteristics and relationships change longitudinally, and if these longitudinal changes in turn alter future individual deception detection accuracy, are the research questions to be answered here.

Based on four constructs, a model consisting of ten hypotheses was developed relating perceptions to quantitative performance and reciprocating paths in Chapter 2. A methodology and experiment for operationalizing the model was presented in Chapter 3 and corresponding data analysis conducted on the results in Chapter 4. 119 United States Air Force personnel (civilian and military) attending communications training participated in this longitudinal experiment over three sessions; a summary of the findings of this quasi-experimental effort is provided in Table 7. This chapter further

discusses the findings of this study, their contribution to academic research, their significance to practice and relevance to the Air Force, limitations of this study, and recommendations for future research.

Findings

Table 7. Summary of Findings

Hypothesis	Finding
H1a: Receiver perceived capability to detect deception will be positively correlated with detection success.	***Supported***
H1b: Receiver detection accuracy history will be positively associated with perceived capability to detect deception.	***Supported***
H2a: Perceived training effectiveness will be positively correlated with detection success	***Supported***
H2b: Detection accuracy history will be positively associated with perceived training effectiveness to detect deception.	***Supported***
H2c: Perceived training effectiveness will positively affect receiver perceived capability.	***Supported***
H3a: Perceived power (reward, coercive, referent, legitimate, expert, or informational) in a sender will be negatively correlated with detection success.	Not Supported
H3b: Detection accuracy history will be negatively associated with perceived power in a sender.	Not Supported
H3c: Perceived power will negatively affect receiver perceived capability to manipulate others in interpersonal environments.	Not Supported
H4a: Receiver perceived ability to manipulate others in interpersonal situations will be positively correlated with detection success.	Not Supported
H4b: Receiver detection accuracy history will be negatively associated with receiver perceived ability to manipulate others in interpersonal situations.	Not Supported

As predicted in *H1a*, self-efficacy had a large significant effect on deception detection performance. Of even greater significance was the causal effect of *H1b*—reciprocation of detection history—on reported self-efficacy. These findings are consistent with Bandura's (1982, 1986) claim that self-efficacy directly affects task performance. The fact that both paths were shown to have a consistent and direct effect over the entire longitudinal study only reinforce this stance. Once given feedback, self-efficacy is a strong predictor of task performance success.

Wood and Locke (1987) allude to the fact that self-efficacy scale measurements are more salient when feedback is given, however, this study goes a step further to directly relate efficacy to a particular task—deception detection—and monitor changes over time when feedback is given. As was stated earlier, the original plan of this study was to prevent the control group from receiving feedback. Due to the fact that this study was part of a larger research effort, this treatment mechanism could not be avoided; some interesting results emerged if analyzed from an exploratory point of view.

The correlation between performance history feedback to self-efficacy was quite high ($r = 0.384$), and even more so among the control group ($r = 0.586$). The training treatment group did show a significantly higher history of success over the control group and both showed a high causation on performance success and feedback affect, but the control group's feedback correlated higher (more accurately to actual performance) after each session. This consistent overestimation of capability may point to an overconfidence of ability spurred by training, thus creating an efficacy bias which takes past performance only slightly into account.

Though the two reports on training effectiveness did not differ significantly from one session to the next, it is clear that the second session's performance results correlated much higher with perceptions ($r = .275$), and explained much more of the variance in the purported model ($p_{1a} = 0.031$ versus $p_{2a} = 0.114$). Clearly, the group performed more successfully in the second session which consequentially increases Pearson's correlation coefficient and strengthened the analyzed path for *H2a*. Both training sessions were perceived positively (mean = 3.38*(Session 1)* and 3.4-*(Session 2)* on Likert-5 scale) which suggests their active use as a basis for future decision-making (Bandura, 1986).

The positive and significant relationship prescribed in H2b between performance history and perceived training effectiveness (p_{2b} = 0.210 at t-stat = 2.19) underpin Bandura's (1986) claim of individual development of enactive learning and predictive knowledge by actively using training which improves performance and positively regarding its usefulness.

10 of the 20 items in the training effectiveness instrument pertained directly to skill assessment (the other 10 are job related); when regressed on performance the correlation and path coefficients are even stronger (r = 0.345; p_{2a} = 0.130 at t-stat = 3.94). The relationship between performance and skills training versus overall training as stronger may be because this training was tied to a specific skill which was then tested immediately after the training treatment. This improvement may be due to the training itself, as the perception of training effectiveness did not increase significantly, or can possibly be attributed to the correlation with self-efficacy to perceived training effectiveness as supported in *H2c*.

None of the hypotheses associated with perceived power (*H3a*, *H3b*, and *H3c*) or Machiavellianism (*H4a* and *H4b*) indicates a relationship to performance, nor a change due to prior performance history. Power—and the specific measures for each base (reward, referent, informant, coercion, expertise, and legitimate)—did load negatively on each performance task, but not significantly. Perceived power did correlate significantly with the self-efficacy scale (r = - 0.200) in the second session which suggests that persons reporting a higher efficacy perceived lower exhibited bases of reward (-0.203), referent (-0.185), and coercive (-0.211) power present; the other bases did not load significantly

here either. These results may point to an inverse relationship between self-efficacy and perceived power in others which may be more prominent in an interpersonal dyad.

A one-way ANOVA and Tukey-Kramer analysis was conducted on all demographic factors and regressed on the hypothesized model constructs. No factor loaded significantly on the constructs from the theoretical model (see Figure 4), nor did any demographic factor segregate itself significantly from the remaining population in question.

Limitations

This study is based on deception in a computer-mediated environment and seeks to what perceptions affect judgment. Overall, the participants performed better than expected with the treatment group performing significantly better than the control (see Figure 6); a detection rate of 61% places this group at the upper bound of previous study's performance rates (Burgoon, Buller, and Woodall, 1996; Kalbfleish, 1985; Kraut, 1980). This study was limited in several ways because it was not independent, but part of a larger research effort. Though this study showed the enormous significance of feedback on efficacy, a more accurate measurement could be attained when controlled; by withholding reciprocation from a group, the difference in reported efficacy will most likely hold more value when compared to the treatment group.

A limitation to this study exists within the sampling population in that only military-oriented communications personnel were participants. From the demographics, it is clear that a far greater proportion of the sample is college-educated men in their early 20's just beginning their career in the Air Force. This may be representative of the military

population but is far from representative of the general public. As well, the subjects were involved in an extended (3-4 month) training program so perceptions of efficacy and training program effectiveness be not equate to personnel in operational positions.

The training sessions themselves are a limiting factor to this study as different training may provide more value when associated with skill performance. The second training session was rated slightly higher than the first session, yet performance accuracy in the second session was much higher. This possibility was discussed in Chapter 3 as a confounding factor in *test-retest* experiments but was countered with using different examples throughout the judgment tests. In concordance with the quasi-experimental research design, all participants were given feedback immediately after testing, so, therefore, a rating of training effectiveness was made after learning what the result of the test was. As stated before with self-efficacy, a more accurate measurement of training effectiveness may have been obtained if ratings could be compared in a cross-sectional study between a group that is given feedback before rating and one that is given feedback after rating. Regardless of the testing instrument, it may be that certain types of training are not only perceived more useful, but actually are.

Taking observations at almost every possible point in an experiment is not only tedious to the participant, but can quickly become a source of history and instrumentation invalidity (Campbell and Stanley, 1966: 40). Because this study was part of a greater effort, additional survey questions were added to the instruments of this survey which further lengthened the web-based questionnaire. Other than immediate database input, this was a main driving factor for making the survey web-based rather than paper-based.

Limitations related to the instruments themselves were noted during the pilot study and readdressed during the experiment with participant feedback. The training instrument asks the participant questions relative to their job and for participants in an extended training program, this is somewhat of a cognitive disconnect from the job they will be returning to. The power instrument drew the most consternation in the pilot study, and again in participant feedback on this main study. Ragins and Sundstrom (1990) refined Swasy's (1979) instrument to be more readable and contain fewer questions (from 31 to 15 items) while maintaining construct reliability, though it doesn't appear that the length of the survey was the only limiting source.

With respect to the developed examples, participants again associated a cognitive disconnect trying to assign power bases to individuals when: 1) acting as an observer, and 2) not given nature of the relationship being observed. By placing the human subject in a third-party observatory role, the subject is making a judgment that is less relevant to a real-life situation such as if operating from a computer console and a deceptive email were received. As well, participants found it limiting to their judgment of perceived power in a situation when the example consisted only of a dyadic interview and no background on the situation.

A final limitation of this study occurs within the testing procedure itself. Participants were asked to make a judgment toward the veracity of a communication which by the nature of the testing mechanism itself introduces a lie bias. Suspicion is aroused and participants are placed in a situation where a decision must be made. Not to mention, in the examples themselves it is understood that there may be a deceptive measure taking

place which elicits further behavior between sender and receiver, and as a third party observer, biasing is unavoidable.

Contributions to Research

The results of this study further knowledge on interpersonal communications and the positive influence of self-efficacy and the perceived effectiveness of training on detecting deceptive measures in a computer-mediated environment. Many studies have asked a subject observer to determine if a deceptive communication occurred (Millar and Millar, 1998; DePaulo and DePaulo, 1989; DePaulo et.al, 1985) while other studies have placed personnel within the communicative dyad (Burgoon et.al, 1996; Burgoon and Buller, 1994; McCornack, Levine, Solowczuk, Torres, and Campbell, 1992). Though each may divulge results which may further the understanding of "how" people deceive and "how" people detect, this study delves deeper into cognitive foundation as a method of modeling enacted behavior.

This study is novel to academic research in that it quantifies the reciprocation effect task performance history has on perceptions of oneself (self-efficacy) and the environment (training effectiveness). It operationalizes Bandura's (1986) concepts of enacted learning and predictive knowledge and provides evidence of the positive causal effect feedback has on self-efficacy; where the effects of self-efficacy and reciprocation are linked directly to task performance.

As Gist (1983) was able to show that self-efficacy training increased performance, this study showed that training effectiveness correlated positively with self-efficacy, which indirectly therefore increases task performance as well. Positive perceptions of the

effectiveness of training, regardless of the training itself, were found to be associated with higher levels of performance accuracy.

Most importantly, this research introduces both an apt model which displayed a high degree of causation after longitudinal study and a reliable instrument for measuring self-efficacy and training effectiveness related to the task performance of deception detection. As this study focused on military personnel, the model and instruments could provide insights into other populations and other self-rated task performances when compared to actual performance in an experimental situation.

Implications for Practice

This study contributes to the management of organizations and self, specifically to task performance. The main finding to take from this study is that perceptions often guide and respond to reality. As a manipulation of perception, deception is a purposeful act meant to alter perceptions and therefore judgment, and ultimately performance. Deception can occur in meetings, over email, at social functions, and will most likely have negative ramifications on the work environment.

This study showed that confidence in one's ability to detect deceptions and the perceived effectiveness of a training program focused on detecting deceptive measures positively affected deception detection performance. Based on the average success rates for detecting deception, managers would do well to recognize the relationship between historical performance and self-efficacy to future performance in order to empower employees to detect deceptive measures early and prevent the possibility of a catastrophic strategic information manipulation.

Managers also need to be aware of the value of positive feedback when concerning a deceptive attack. Positive reinforcement will build confidence which should create vigilance in the form of increased future performance accuracy. The person who receives positive feedback yet does not increase their performance rate at detecting deceptive measures in a computer-mediated environment may be harming the organization by not learning from past mistakes and accepting positive feedback at more than face value.

Any type of security training, such as deception detection, must be perceived as effective, which coincides to an acceptable performance rate of success which is determined by the manager. If performance fails to meet expectations, the training will be perceived negatively and eventually ignored. Confidence in the program and ability may be shaken and performance success can decline. Retention and vigilance are requisites for future performance based off training; therefore, the training method itself may contribute to the perception of effectiveness. Managers will be responsible for assigning priority to a training program and will need to understand subordinate beliefs about and in the program.

Aside from deception detection, the fact that confidence in ability is so highly based upon prior performance, which in turn directly affects future performance, illustrates an advantageous cycle of social foundation that managers can affect. Unlike classical scientific management techniques or new research into cues and heuristics which are focused on maximizing physical efficiency and the study of each grain of detail involved, an emphasis on confidence building and effective training programs specific to a skill or task can yield significant improvements in desired performance.

Managers should recognize that future task performance depends a great deal on subordinate's prior performance history and confidence built from that history. A continued lack of performance, though confidence remains high, may point to a subordinate who is resistant to the work, management, or environment. Taking into account the positive relationship between confidence and performance, management will expect more from the subordinate who exhibits a high degree of confidence relative to a skill. Managers must be mindful of the individual who retains confidence even after given poor feedback, which could mean resilience or denial, yet future performance will be the ultimate deciding factor. Feedback linked to performance can affect the efficacy and confidence relative to that performance, whereas feedback which does not directly tie in with a specific task will in all likelihood have no effect on the subordinate's confidence and future performance, but may act as detrimental perception of management.

A lack of confidence though task performance remains high may be the direct result of a lack of feedback needed from management. Management that does not provide accurate feedback to the high performance worker endangers the worker's confidence in their ability, and consequentially, their future performance. However, the manager who administers feedback to personnel that is directly related to task and results increases the probability of future performance successes in subordinates.

Training is of paramount importance to organizations as executives, managers, and supervisors fight to retain personnel and their experience and expertise, two qualities not easily replaced. For a training program to be effective, it must be perceived as effective and value-added. This study showed how training directly affected perceptions of

effectiveness related to a job, and more specifically to the skill requirements of the job. As well, as training is viewed as more effective, it improves confidence in ability and subsequently tends to improve performance.

Implications for Air Force

This study's possible implications to the Air Force are no different than those of commercial and private industry, except that human lives are more often at stake. Manipulations of information on a battlefield can create perceptions quite different from reality, which is the whole purpose of camouflage and concealment—deception. Detecting these deceptive measures is often relegated as a technological issue and the human component left to the vices of an intelligence assessment. What this study has shown is that deceptive measures can be detected with accuracy by humans and that when provided positive feedback, chances for future successful detections of deception are increased as well.

Military leaders are required to be decision-makers, whether to continue with an expensive program at a consultant's advice or to shift cavalry to prevent an assault on a flanking position. Recognizing and dealing with a situation requires a decision which can be interpreted as a performance success or failure based on the outcome of that decision. That leader's confidence in their skill and ability in that situation is a direct reflection of past successes in similar situations, and the more confident, more decisive leader often is more successful, whereas the less confident leader whose performance history reflects fewer successes will often continue to be less successful. It is the leader who recognizes,

acknowledges, learns from, and rises above past failures to maintain their confidence who increases their chances of future successes and creating a successful performance history.

Military units spend a great deal of their time training and conducting exercises in preparation for wartime operations. Training that has proven successful will be perceived as effective and adopted by the military personnel responsible for carrying out a mission. As training continues to contribute to success, confidence will be placed in the program and personally increased in the soldier, sailor, airman, and marine. Consequentially, chances for success are greatly increased versus the strategy that perceived as risky and more life-threatening with a greater chance for failure. It is this confidence and positive believe in purpose and duty that greatly drives military personnel to go beyond their means and successfully accomplish their assigned mission.

Future Research Recommendations

Feedback was shown as a large determinant on reciprocated efficacy judgments. Because this study was part of a larger effort, future research focused more on the affect of feedback can compare control groups who do not receive feedback on performance compared to treatment groups who do. This feedback component need not be only about quantitative performance, but could be delivered in the form of a qualitative analysis of subject action and response.

Managers are not always honest with their feedback, sometimes for positive reasoning so as to push their subordinates to work harder, and other times for negative purposes such as self-gain. It would have been interesting to perform a manipulation check and actually provide deceptive feedback about performance in order to check the

negative effect on efficacy and following performance success. All the feedback from this study was completely honest and given immediately following testing so a manipulation check may provide further insights into the real effectiveness of feedback and perceived training effectiveness.

Media richness was not a focus of this study, but was a considerable factor in scenario development for testing. Text examples were considered the most difficult, followed by audio-only and then audio/video examples. Examples were pseudo-randomly mixed in order to assure no 6-item test was significantly more difficult than the other. Deceptive measures in text exhibit few indicators of deception and are highly dependent on the transcription. As the text examples showed by far the lowest accuracy rates (~25%), this area deserves a great deal of concentrated research due to the fact that email and chat are such predominant forms of communication in government and public sectors and will continue to be.

Conclusions

Results of this study show that perceptions based upon historical references guide future behavior in deception detection. Though prior research has shown people are not inherently good at detecting deceptive communications, this study developed a model which showed positive results with increased performance success. Analysis showed that self-efficacy and perceived training effectiveness are positively related to each other and to performance success. As a performance success history was created, feedback on that history caused positive changes in reported efficacy, which in turn positively affected future performance accuracy.

The focus of this research was on identifying cognitive characteristics which enhance a person's deception detection performance. The results indicate that skill-specific self-efficacy and perceived training effectiveness alone could not predict future performance success for this population. Additional environmental, behavioral, and personal cognitive factors require further research towards understanding successful deception detection characteristics.

Appendix A: Approval Letter

DEPARTMENT OF THE AIR FORCE
AIR FORCE RESEARCH LABORATORY (AFMC)
WRIGHT-PATTERSON AIR FORCE BASE, OHIO

26 November 2002

MEMORANDUM FOR AFIT/ENV
ATTN: Dave Boris

FROM: AFRL/HEH

SUBJECT: Approval for the Use of Volunteers in Research

1. Human experimentation as described in exempt Protocol Request (03-21) FWR 2003-0021-E, "Reality: A Longitudinal Experiment in Judgment Performance ", may begin.

2. In accordance with AFI 40-402, this protocol was reviewed and approved by both the Wright Site Institutional Review Board (WSIRB) Chairman on 18 November 2002, the AFRL Chief of Aerospace Medicine on 20 November 2002. A copy of the meeting minutes showing final approval will be forwarded.

3. Please notify the undersigned of any changes in procedures prior to their implementation. A judgment will be made at that time whether or not a complete WSIRB review is necessary.

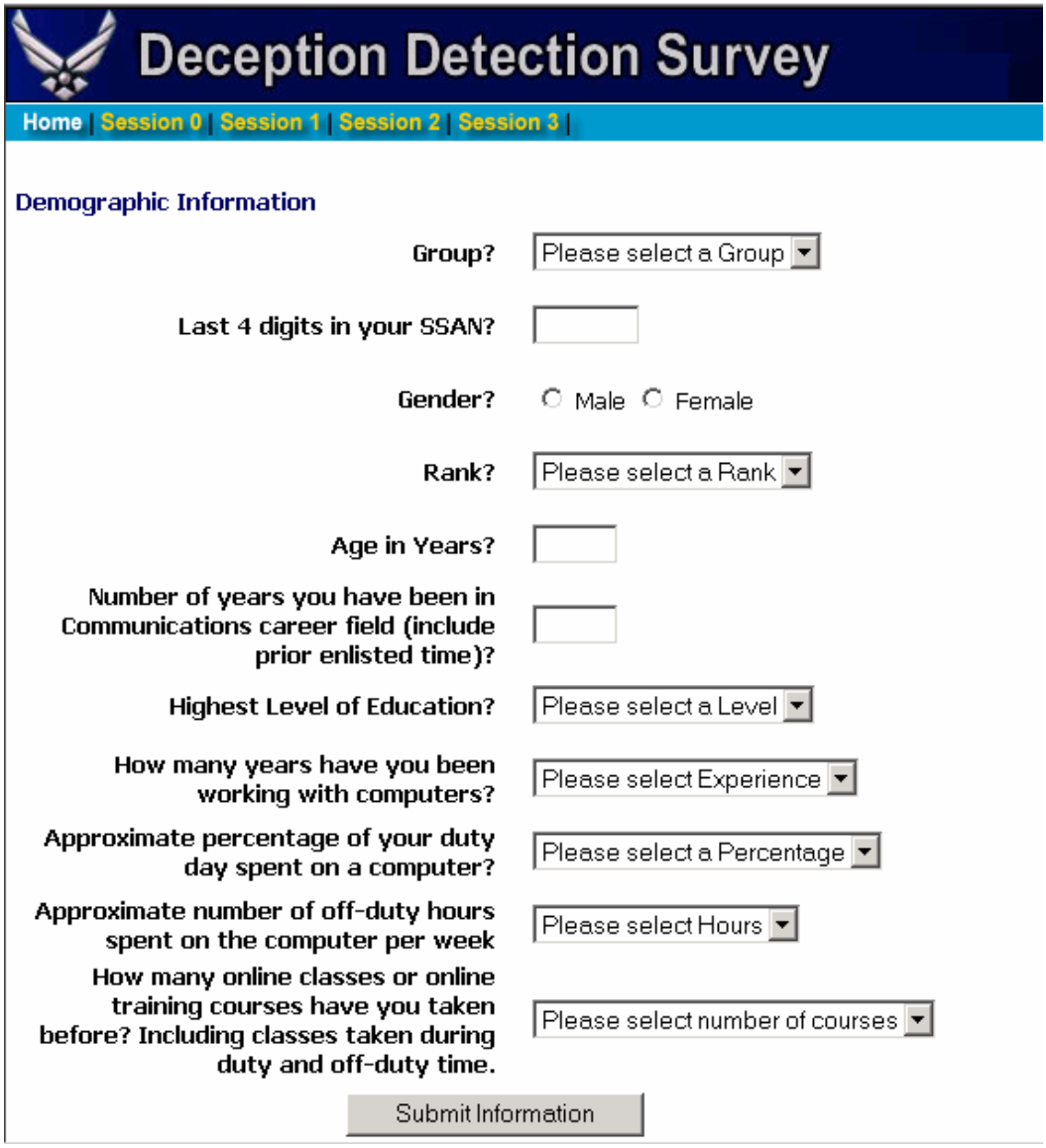
"Signed" 26 November 2002
HELEN JENNINGS
Human Use Administrator

Appendix B: Demographic Questions

Items

Gender
Rank
Age
Years in communications career field?
Highest level of education?
Years working with computers?
Percentage of duty day spent on computers?
Hours of off-duty spent on computers?
Number of online training courses taken?

Screen Shot



Appendix C: Survey Questions

Self-Efficacy Items

Scale: "Indicate whether or not you believe you can achieve that level of accuracy."

(Yes) or (No)

1. Accurately detect 33% of truths and deceptions
2. Accurately detect 50% of truths and deceptions
3. Accurately detect 67% of truths and deceptions
4. Accurately detect 75% of truths and deceptions
5. Accurately detect 100% of truths and deceptions

Magnitude: "Identify the degree of confidence you have in your ability to perform at that level."

(0) to (100)

1. Accurately detect 33% of truths and deceptions
2. Accurately detect 50% of truths and deceptions
3. Accurately detect 67% of truths and deceptions
4. Accurately detect 75% of truths and deceptions
5. Accurately detect 100% of truths and deceptions

Perceived Power Items

"With regards to the deception detection test you just completed, answer the following questions as honestly and to the best of your ability with the provided scoring method."

(1) Strongly Disagree to (5) Strongly Agree

1. If the respondent does not do as the questioner suggests, the questioner will punish the respondent.
2. In this situation the respondent's attitudes are similar to the questioner's.
3. The questioner has a lot of experience and usually knows best.
4. The questioner has the ability to reward the respondent (in some manner) if they do as the questioner suggests.
5. Because of the questioner's position he has the right to influence the respondent's behavior.
6. The questioner might do something which is unpleasant to those who do not do as the questioner suggests.
7. I trust the questioner's judgment in this situation.
8. In this situation the respondent is dependent on the questioner's willingness to grant good things.
9. The respondent will seriously consider the questioner's request because it is based on good reasoning.

10. If the respondent does not comply with the questioner, the respondent will not be rewarded.
11. If the respondent does not do as the questioner suggests, the respondent will not receive good things from the questioner.
12. In this situation, the respondent doesn't know as much about what should be done as the questioner does.
13. The information provided by the questioner about this situation makes sense.
14. Being similar to the questioner is good.
15. The respondent had better do as the questioner suggests in order to prevent something bad from happening to themselves.
16. The only reason for doing as the questioner suggests is to obtain good things in return.
17. The respondent is obligated to do as the questioner suggests.
18. The questioner knows best in this situation.
19. The respondent would like to act very similar to the way the questioner would act in this situation.
20. The questioner's knowledge usually makes him/her right.
21. It is the respondent's duty to comply with the questioner.
22. The respondent wants to do as the questioner suggests only because of the good things the questioner will give the respondent for complying.
23. The questioner can harm the respondent in some manner if the respondent does not do as the questioner suggests.
24. The respondent trust the questioner's judgment.
25. In general, the questioner's opinions and values are similar to mine.
26. The questioner is intelligent.
27. In this situation the respondent's behavior is similar to the questioner's.
28. Something bad will happen to the respondent if the respondent doesn't do as the questioner requests and the questioner finds out.
29. The questioner's expertise makes him/her more likely to be right.
30. The information the questioner provided is logical.
31. The respondent wants to be similar to the questioner.

<u>Training Effectiveness Items</u>
"With regards to the detection of deception and your course intruction thus far, answer the following questions as honestly and to the best of your ability with the provided scoring method."

(+)32. I use deception detection skills regularly on the job.
(+)33. After this training program I would detect deception without practicing.
(-)34. I didn't learn deception detection skills in the training program, so I had to learn it on the job.
(-)35. I detect deception differently on the job because work conditions don't permit me to perform it the way I learned in this training program.
(-)36. I detect deception differently on the job because deception detection doesn't work the way I learned it in training.

(-)37. I detect deception differently on the job because my supervisor told me to do it differently.
(-)38. I never perform deception detection skills on the job.
(-)39. Deception detection isn't part of my job.
(-)40. I get help to detect deception because I didn't learn it in the training program.
(-)41. I don't detect deception on the job because the skill is too difficult for me.
(-)42. I don't detect deception on the job because the skill comes up so rarely that I forgot how to do it.
(-)43. I don't detect deception because I'm assigned a different job.
(+)44. I learned to detect deception well in this training program because the program was effective.
(-)45. Deception detection could be learned from a manual or an instruction sheet as easily as in this training program.
(-)46. I had trouble learning deception detection because this training program was confusing.
(-)47. Deception detection would have been easier to learn with more reference materials.
(+)48. Because of learning deception detection, I feel more comfortable about doing my job.
(+)49. Because of attending this training program, I feel better about the USAF.
(+)50. After attending this training program, I am interested in attending other deception detection training programs.
(+)51. I think my participation in this training program will help me to advance in the USAF.

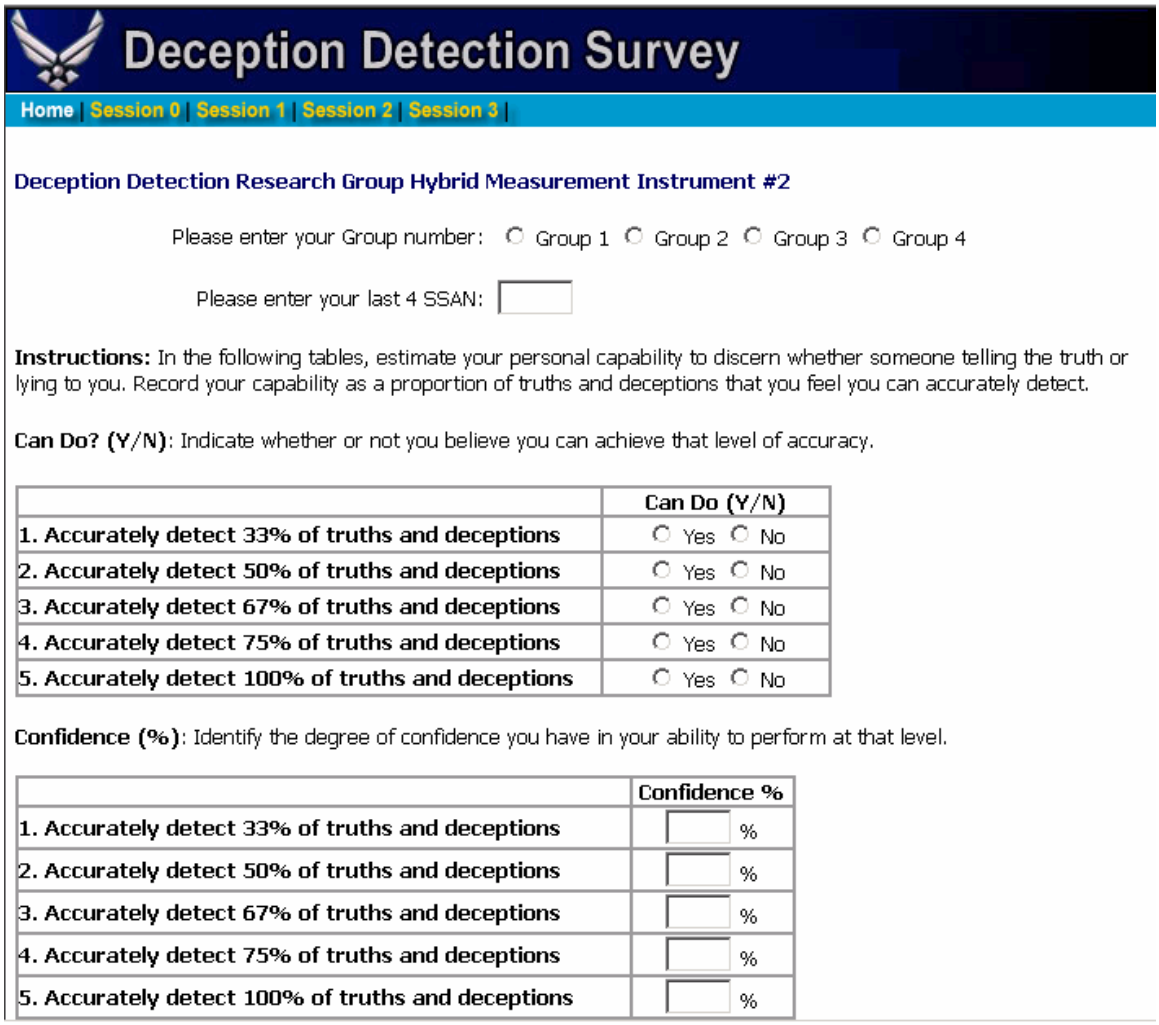
Machiavellianism Items

"Answer the following questions as honestly and to the best of your ability:"

(+)3/54. Most people forget more easily the death of their father or mother than the loss of their property.
(-)5/56. There is no excuse for lying to someone else.
(-)6/57. Honesty is the best policy in all cases.
(-)7/58. Most people who get ahead in the world lead clean, moral lives.
(+)8/59. It is wise to flatter important people.
(-)9/60. One should take action only when sure it is morally right.
(+)10/61. The biggest difference between most criminals and other people is that the criminals are stupid enough to get caught.
(-)12/63. The saying, 'there's a sucker born every minute' is wrong.
(-)16/67. All in all, it is better to be humble and honest than to be important and dishonest.
(-)19/70. Most people are basically good and kind.
(+)22/73. Never tell anyone the real reason you did something unless it is useful to do so.
(+)28/79. It is hard to get ahead without cutting corners here and there.
(+)29/80. Generally speaking, people won't work hard unless they're forced to do so.
(+)30/81. It is safest to assume that all people have a vicious streak and it will come out when they are given a chance.

(+)31/82. People suffering from incurable diseases should have the choice of being put painlessly to death.
(-)32/83. It is possible to be good in all respects.
(+)34/85. The best way to handle people is to tell them what they want to hear.
(-)35/86. Most people are brave.
(+)36/87. Anyone who completely trusts anyone else is asking for trouble.
(-)44/95. 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.

Screen Shot



Please evaluate each statement using the following scale:

1 = Strongly Disagree
2 = Disagree
3 = Indifferent
4= Agree
5= Strongly Agree

NOTE: The scale moves from **strongly disagree** to **strongly agree** as you move from **1** to **5** or **left** to **right**.	<--Disagree 1	2	Indifferent 3	4	Agree--> 5
With regards to the deception detection test you just completed, answer the following questions as honestly and to the best of your ability with the provided scoring method.					
1. If the respondent does not do as the questioner suggests, the questioner will punish the respondent.					
2. In this situation the respondent's attitudes are similar to the questioner's.					
3. The questioner has a lot of experience and usually knows best.					
4. The questioner has the ability to reward the respondent (in some manner) if they do as the questioner suggests.					
5. Because of the questioner's position he has the right to influence the respondent's behavior.					
6. The questioner might do something which is unpleasant to those who do not do as the questioner suggests.					
7. I trust the questioner's judgment in this situation.					
8. In this situation the respondent is dependent on the questioner's willingness to grant good things.					
9. The respondent will seriously consider the questioner's request because it is based on good reasoning.					
10. If the respondent does not comply with the questioner, the respondent will not be rewarded.					
11. If the respondent does not do as the questioner suggests, the respondent will not receive good things from the questioner.					
12. In this situation, the respondent doesn't know as much about what should be done as the questioner does.					
13. The information provided by the questioner about this situation makes sense.					
14. Being similar to the questioner is good.					
15. The respondent had better do as the questioner suggests in order to prevent something bad from happening to themselves.					
16. The only reason for doing as the questioner suggests is to obtain good things in return.					
17. The respondent is obligated to do as the questioner suggests.					
18. The questioner knows best in this situation.					
19. The respondent would like to act very similar to the way the questioner would act in this situation.					
20. The questioner's knowledge usually makes him/her right.					
21. It is the respondent's duty to comply with the questioner.					

22. The respondent wants to do as the questioner suggests only because of the good things the questioner will give the respondent for complying.	○	○	○	○	○
23. The questioner can harm the respondent in some manner if the respondent does not do as the questioner suggests.	○	○	○	○	○
24. The respondent trust the questioner's judgment.	○	○	○	○	○
25. In general, the questioner's opinions and values are similar to mine.	○	○	○	○	○
26. The questioner is intelligent.	○	○	○	○	○
27. In this situation the respondent's behavior is similar to the questioner's.	○	○	○	○	○
28. Something bad will happen to the respondent if the respondent doesn't do as the questioner requests and the questioner finds out.	○	○	○	○	○
29. The questioner's expertise makes him/her more likely to be right.	○	○	○	○	○
30. The information the questioner provided is logical.	○	○	○	○	○
31. The respondent wants to be similar to the questioner.	○	○	○	○	○
With regards to the detection of deception and your course intruction thus far, answer the following questions as honestly and to the best of your ability with the provided scoring method.					
32. I use deception detection skills regularly on the job.	○	○	○	○	○
33. After this training program I would detect deception without practicing.	○	○	○	○	○
34. I didn't learn deception detection skills in the training program, so I had to learn it on the job.	○	○	○	○	○
35. I detect deception differently on the job because work conditions don't permit me to perform it the way I learned in this training program.	○	○	○	○	○
36. I detect deception differently on the job because deception detection doesn't work the way I learned it in training.	○	○	○	○	○
37. I detect deception differently on the job because my supervisor told me to do it differently.	○	○	○	○	○
38. I never perform deception detection skills on the job.	○	○	○	○	○
39. Deception detection isn't part of my job.	○	○	○	○	○
40. I get help to detect deception because I didn't learn it in the training program.	○	○	○	○	○
41. I don't detect deception on the job because the skill is too difficult for me.	○	○	○	○	○
42. I don't detect deception on the job because the skill comes up so rarely that I forgot how to do it.	○	○	○	○	○
43. I don't detect deception because I'm assigned a different job.	○	○	○	○	○
44. I learned to detect deception well in this training program because the program was effective.	○	○	○	○	○
45. Deception detection could be learned from a manual or an instruction sheet as easily as in this training program.	○	○	○	○	○
46. I had trouble learning deception detection because this training program was confusing.	○	○	○	○	○
47. Deception detection would have been easier to learn with more reference materials.	○	○	○	○	○

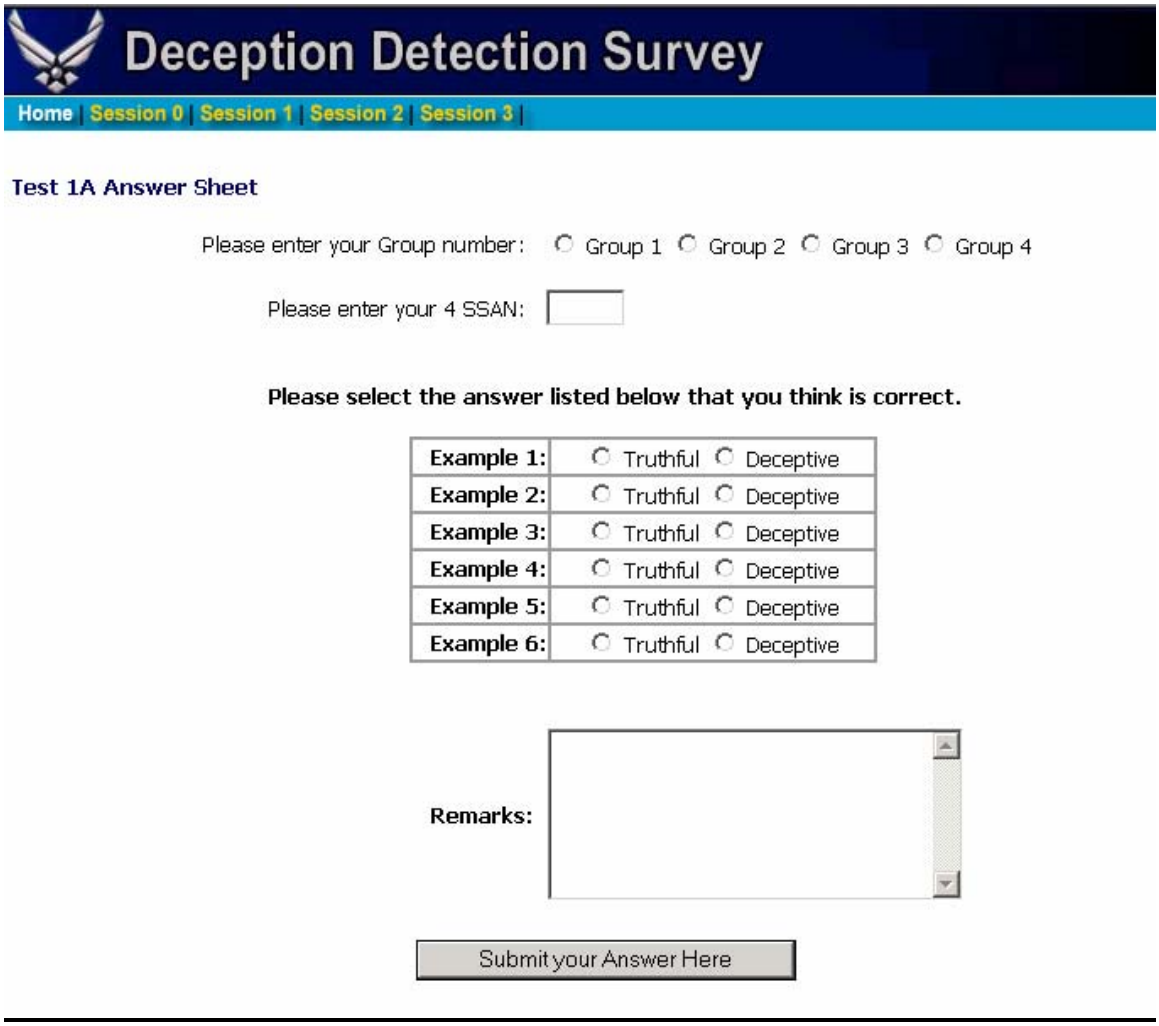
48. Because of learning deception detection, I feel more comfortable about doing my job.	○	○	○	○	○
49. Because of attending this training program, I feel better about the USAF.	○	○	○	○	○
50. After attending this training program, I am interested in attending other deception detection training programs.	○	○	○	○	○
51. I think my participation in this training program will help me to advance in the USAF.	○	○	○	○	○
Answer the following questions as honestly and to the best of your ability:					
52. Most elected officials are really sincere in their campaign promises.	○	○	○	○	○
53. Most idealists are sincere and usually practice what they preach.	○	○	○	○	○
54. Most people forget more easily the death of their father or mother than the loss of their property.	○	○	○	○	○
55. Most repairmen will not overcharge even if they think you are ignorant of their specialty.	○	○	○	○	○
56. There is no excuse for lying to someone else.	○	○	○	○	○
57. Honesty is the best policy in all cases.	○	○	○	○	○
58. Most people who get ahead in the world lead clean, moral lives.	○	○	○	○	○
59. It is wise to flatter important people.	○	○	○	○	○
60. One should take action only when sure it is morally right.	○	○	○	○	○
61. The biggest difference between most criminals and other people is that the criminals are stupid enough to get caught.	○	○	○	○	○
62. Even though we have reports in newspapers, radio, and T.V., it is hard to get objective accounts of public events.	○	○	○	○	○
63. The saying, 'there's a sucker born every minute' is wrong.	○	○	○	○	○
64. Most students in school would not cheat even if they were sure of getting away with it.	○	○	○	○	○
65. Most salesmen are honest in describing their products.	○	○	○	○	○
66. This country has a dark future unless we can attract better people into politics.	○	○	○	○	○
67. All in all, it is better to be humble and honest than to be important and dishonest.	○	○	○	○	○
68. The judiciary is a place where we can all get unbiased treatment.	○	○	○	○	○
69. Parents can usually be relied on to keep their promises.	○	○	○	○	○
70. Most people are basically good and kind.	○	○	○	○	○
71. If we really knew what was going on in international politics, the public would have reason to be more frightened than they now seem to be.	○	○	○	○	○
72. In dealing with strangers one is better off to be cautious until they have provided evidence that they are trustworthy.	○	○	○	○	○
73. Never tell anyone the real reason you did something unless it is useful to do so.	○	○	○	○	○
74. Most experts can be relied upon to tell the truth about the limits of their knowledge.	○	○	○	○	○
75. Using the honor system of not having a teacher present during exams would probably result in increased cheating.	○	○	○	○	○

76. Many major national sports contests are fixed in one way or another.	○	○	○	○	○
77. Most people answer public opinion polls honestly.	○	○	○	○	○
78. Most people can be counted on to do what they say they will do.	○	○	○	○	○
79. It is hard to get ahead without cutting corners here and there.	○	○	○	○	○
80. Generally speaking, people won't work hard unless they're forced to do so.	○	○	○	○	○
81. It is safest to assume that all people have a vicious streak and it will come out when they are given a chance.	○	○	○	○	○
82. People suffering from incurable diseases should have the choice of being put painlessly to death.	○	○	○	○	○
83. It is possible to be good in all respects.	○	○	○	○	○
84. It is safe to believe that in spite of what people say most people are primarily interested in their own welfare.	○	○	○	○	○
85. The best way to handle people is to tell them what they want to hear.	○	○	○	○	○
86. Most people are brave.	○	○	○	○	○
87. Anyone who completely trusts anyone else is asking for trouble.	○	○	○	○	○
88. A large share of accident claims filed against insurance companies are phony.	○	○	○	○	○
89. Hypocrisy is on the increase in our society.	○	○	○	○	○
90. The future seems very promising.	○	○	○	○	○
91. In these competitive times one has to be alert or someone is likely to take advantage of you.	○	○	○	○	○
92. Most parents can be relied upon to carry out their threats of punishments.	○	○	○	○	○
93. The United Nations will never be an effective force in keeping world peace.	○	○	○	○	○
94. Fear of social disgrace or punishment rather than conscience prevents most people from breaking the law.	○	○	○	○	○
95. 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.	○	○	○	○	○
96. Most people would be horrified if they know how much news that the public hears and sees is distorted.	○	○	○	○	○

Submit

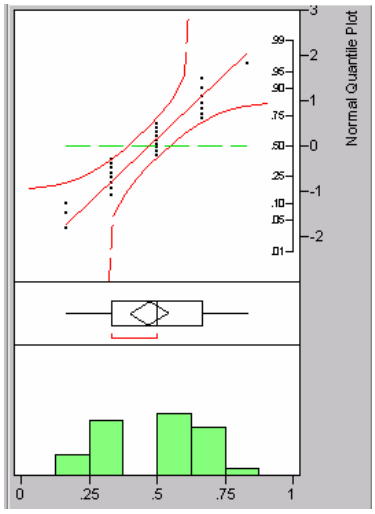
Appendix D: Judgment Test

Screen Shot



Appendix E: Data Normality Analysis

Control Group - Pretreatment



Treatment Group - Pretreatment

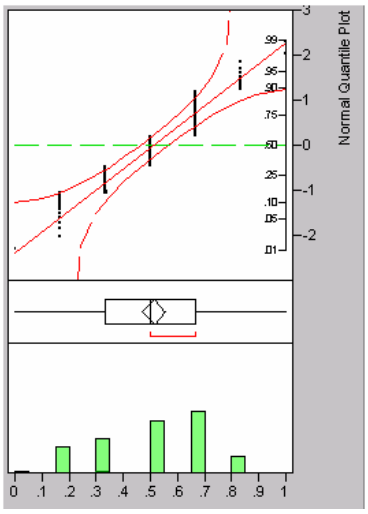
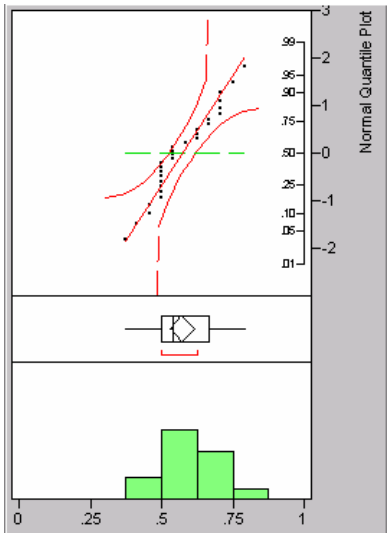


Figure 15. Pretreatment Normality Performance Plots

Control Group - Post-treatment



Treatment Group - Post-treatment

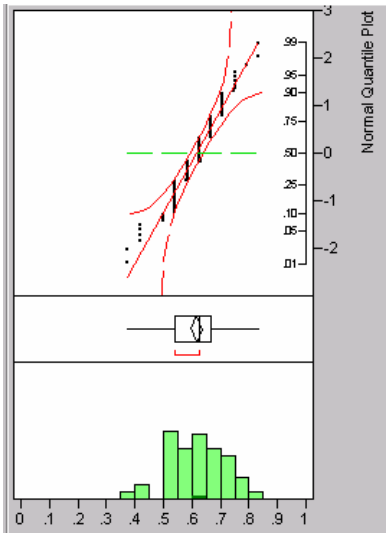


Figure 16. Post-treatment Normality Performance Plots

Appendix F: Self-Efficacy Instrument Validity Analysis

Table 7. Self-Efficacy Item Scores

Statement Item	Session 0 Treatment	Session 0 Control
(SEM) 1. Accurately detect 33% of truths and deceptions	.98	.96
(SEM) 2. Accurately detect 50% of truths and deceptions	.90	.89
(SEM) 3. Accurately detect 67% of truths and deceptions	.67	.61
(SEM) 4. Accurately detect 75% of truths and deceptions	.26	.25
(SEM) 5. Accurately detect 100% of truths and deceptions	.03	.00
(SES) 1. Accurately detect 33% of truths and deceptions	.90	.84
(SES) 2. Accurately detect 50% of truths and deceptions	.79	.74
(SES) 3. Accurately detect 67% of truths and deceptions	.60	.56
(SES) 4. Accurately detect 75% of truths and deceptions	.43	.39
(SES) 5. Accurately detect 100% of truths and deceptions	.26	.19

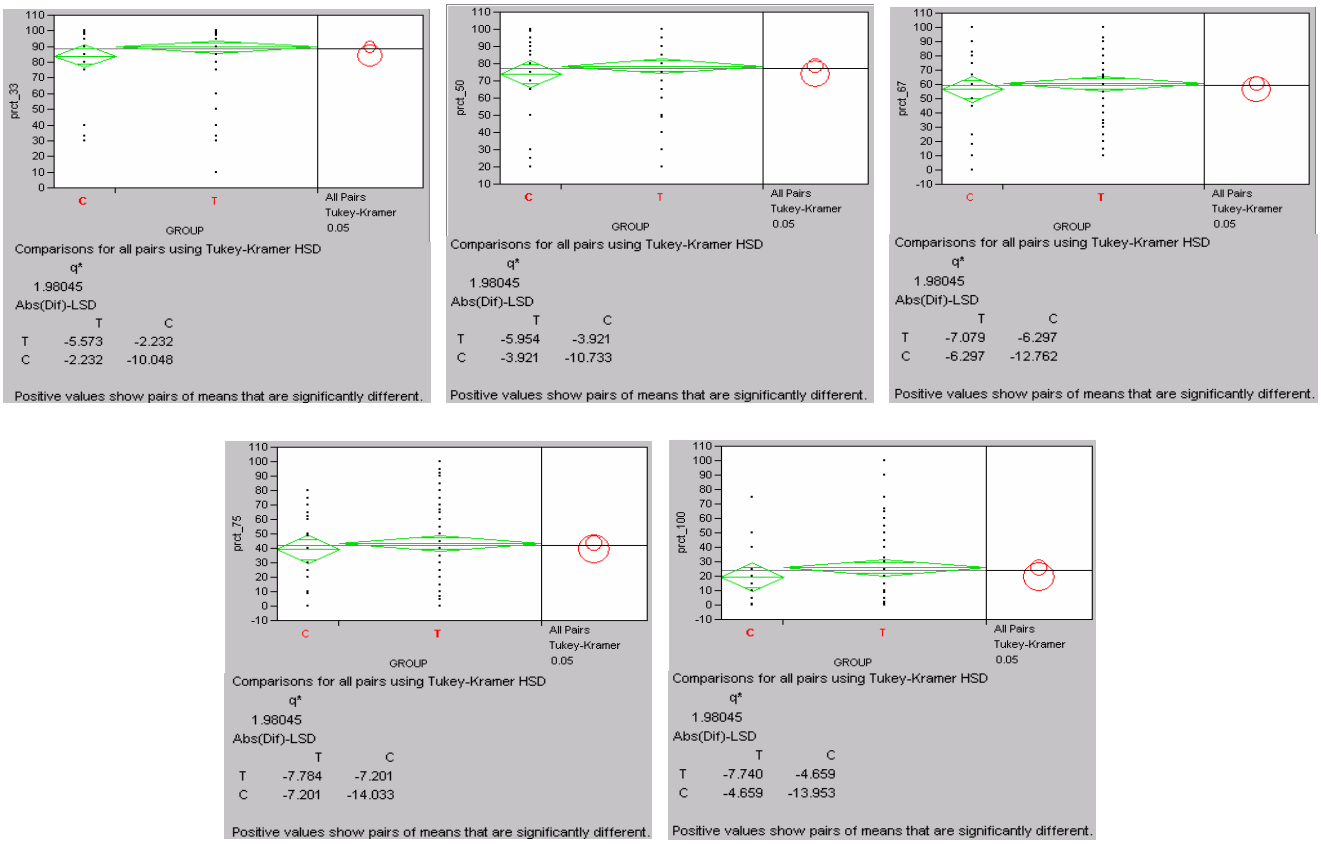


Figure 17. Self-Efficacy Item Equivalency Tests

Appendix G: Machiavellianism Instrument Validity Analysis

Table 8. Mach Item Scores

Statement Item	Session 0 Treatment	Session 0 Control
(+)3/54. Most people forget more easily the death of their father or mother than the loss of their property.	2.1	2.0
(-)5/56. There is no excuse for lying to someone else.	2.9	2.5
(-)6/57. Honesty is the best policy in all cases.	2.9	2.5
(-)7/58. Most people who get ahead in the world lead clean, moral lives.	3.6	3.7
(+)8/59. It is wise to flatter important people.	2.5	2.7
(-)9/60. One should take action only when sure it is morally right.	2.8	2.7
(+)10/61. The biggest difference between most criminals and other people is that the criminals are stupid enough to get caught.	2.2	2.1
(-)12/63. The saying, 'there's a sucker born every minute' is wrong.	3.6	3.4
(-)16/67. All in all, it is better to be humble and honest than to be important and dishonest.	1.6	1.5
(-)19/70. Most people are basically good and kind.	2.4	2.1
(+)22/73. Never tell anyone the real reason you did something unless it is useful to do so.	2.7	2.6
(+)28/79. It is hard to get ahead without cutting corners here and there.	2.8	2.6
(+)29/80. Generally speaking, people won't work hard unless they're forced to do so.	2.6	2.6
(+)30/81. It is safest to assume that all people have a vicious streak and it will come out when they are given a chance.	2.6	2.5
(+)31/82. People suffering from incurable diseases should have the choice of being put painlessly to death.	3.3	3.0
(-)32/83. It is possible to be good in all respects.	2.8	2.7
(+)34/85. The best way to handle people is to tell them what they want to hear.	2.5	2.1
(-)35/86. Most people are brave.	3.2	3.1
(+)36/87. Anyone who completely trusts anyone else is asking for trouble.	2.9	2.9
(-)44/95. 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.	2.4	2.2

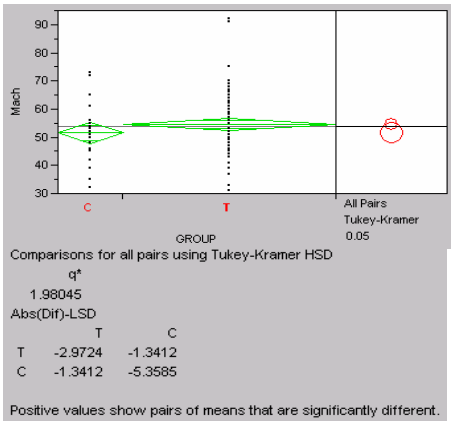


Figure 18. Mach Item Equivalency Test

Appendix H: Intersession Paired Difference Results

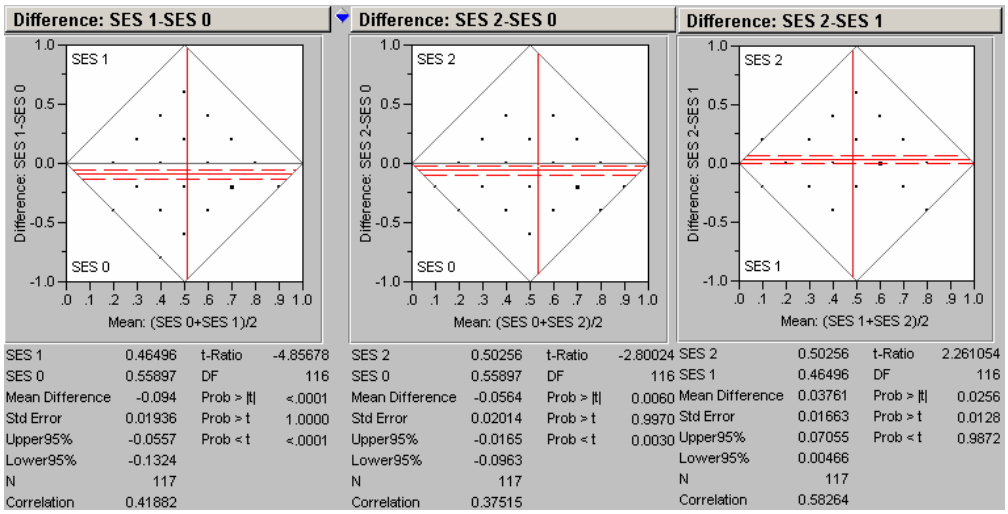


Figure 16. Paired Difference Results on Self-Efficacy

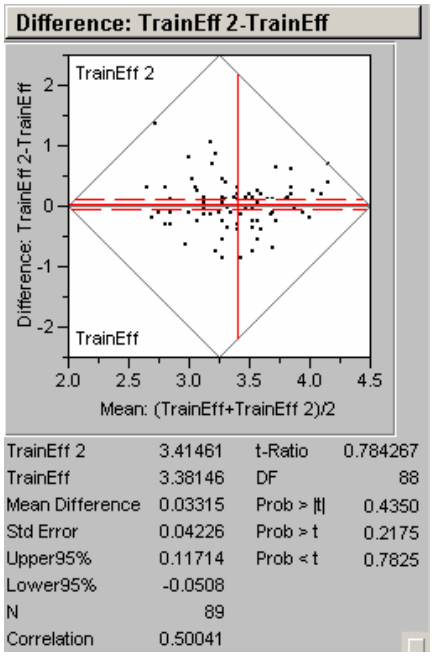


Figure 17. Paired Difference Results on Training Effectiveness

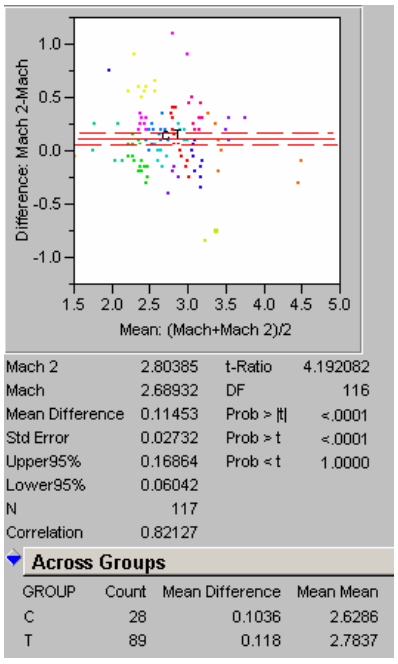


Figure 18. Paired Difference Results on Machiavellianism

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Vita

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14. ABSTRACT

Government reliance on computer-mediated information has transformed it from "enabler" to "target" which now demands the detection of manipulated and deceptive measures a primary security objective. As people are not inherently good performers at detecting deceptive communications, this study draws on interpersonal deception theory and social cognitive theory to measure personal perceptions that influence decisions operationalized as the successful detection of a deceptive measure. Department of Defense personnel participated in a longitudinal experiment that measured detection performance before and after training and feedback treatments. Self-efficacy and perceived training effectiveness emerged as dominant factors in predicting performance. The most significant finding was the reciprocated effect of feedback on performance history as it clearly governed self-reports of self-efficacy and training effectiveness, which in turn positively influenced future deception detection accuracy. This suggests the cognitive foundation for future decision-making can be altered and performance predicted as a result. Furthermore, while personal beliefs influence behavior, realized performance will direct personal beliefs which in turn further influence future behavior. It is recommended that continued research on the effect of honest feedback and effects of media richness be investigated when regarding computer-mediated information.

15. SUBJECT TERMS

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