CONDITIONED SUPPRESSION AS AN INDICATOR OF DECEPTION; A TOOL OF INTERROGATION

By

JOHN JOSEPH GALLAGHER IV

Bachelor of Arts

Oklahoma State University

Stillwater, Oklahoma

2001

Submitted to the Faculty of the
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Thesis Approved:

Thesis Advisor

Dean of the Graduate College

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CHAPTER I

INTRODUCTION

The search for an accurate and reliable way to detect deception has occupied the attention of many researchers and criminologists since the beginning of modern civilization. Freud (1905) said, "No mortal can keep a secret. If his lips are silent, he chatters with his fingertips..." This statement by Freud (1905) has since been supported by research on self control, which suggests people have a limited ability to control their overt behavior and internal changes in bodily functions, especially when consciously attempting to control it (Bashore & Rapp, 1993; Rosenfeld, Nasman, Whalen, Cantwell, & Mazzeri, 1987; Zhou, Yang, Liao, & Zou, 2000/2001). Overtime, deception detection techniques have adapted to incorporate new indicators of deception.

In the past several decades, the polygraph has been used as a tool for detecting deception. However, research has shown that the polygraph has a low validity and reliability (Bashore & Rapp, 1993; Clede, 1998; Kleinmuntz & Szucko, 1982). Recently, electroencephalograms (EEGs) have been studied with the hopes of locating a specific cognative process that can indicate deception (Bashore & Rapp, 1993; Lawson and Pratarelli, 2000; Rosenfeld, Nasman, Whalen, Cantwell, & Mazzeri, 1987; Sabbatini, 1997; Zhou, Yang, Liao, & Zou, 2000/2001). An accurate means of detecting deception using EEGs has not yet been found, however, Lawson and Pratarelli (2000) have found several spectral EEG components that detect concealed information. The polygraph and

EEG are two methods used to detect deception. The deception detection method addressed in this study used a conditioned suppression technique.

Estes and Skinner (1941) found that when rats were reinforced for pressing a lever and then paired a tone (CS) with an electric shock (US), the rats would suppress responding during the CS, even though the lever press was still reinforced. The goal of this thesis is to use the conditioned suppression technique outlined by Estes and Skinner (1941), to detect deception through behavioral responses from truthful and deceptive participants who are presented pictures related and not related to the scenarios they enact.

Conditioned Suppression

This section defines and outlines the procedure of conditioned suppression. Conditioned suppression can be defined as a combination of operant and classical conditioning in which classical conditioning is measured indirectly by its ability to disrupt ongoing operant behavior (Mazur, 1990; Parke & Locke, 1999). Operant conditioning can be described as one type of associative learning in which there is a contingency between the response and the presentation of a reinforcer. In other words, learning occurs when a response made leads to a consequence, such as rewards in response to a lever press. Classical conditioning can be described as learning to transfer a natural response from one stimulus to another previously neutral stimulus, or in other words, learning which occurs with the pairing of stimuli (Parke & Locke, 1999).

Conditioned suppression is a procedure that is sometimes called conditioned emotional response (CER). This type of conditioning is usually studied behaviorally, as the effects of a conditioned aversive stimulus on operant behavior, maintained by a schedule of reinforcement (Reynolds, 1968). In most conditioned suppression designs the

subjects are rats, and the unconditioned stimulus (US) is an aversive event such as a brief electric shock. The conditioned suppression technique is used by first establishing an emotional response to the conditioned stimulus (CS). This is most often done by pairing a tone (CS) with electric shock (US). The unconditioned response to shock may include several different behaviors. The animal may jump, squeal, and temporarily stop what it was doing before the shock occurred. The measure of conditioning in this situation is the suppression of ongoing behavior when the CS is presented. So that ongoing behavior can be measured reliably, a separate task on which the subject will respond to at a fairly steady rate is included in this procedure. Most frequently hungry rats are given the opportunity to press a lever, and occasionally a lever press will result in the delivery of a food pellet. It is fairly easy to schedule the delivery of a food pellet in such a way that the animal will press the lever slowly but steadily, now and then earning a bit of food (Mazur, 1990).

The reflex elicited by painful stimuli is the suppression of ongoing behavior. It is therefore possible to measure the strength of association between a neutral CS (tone) and a painful US (electric shock) by measuring how much an animal's behavior is reduced in the presence of the CS compared to its absence. If an animal is trained to perform some repeated measurable behavior, such a pressing a lever in order to obtain food rewards, then the strength of a conditioned emotional response to a separately learned tone-shock association can be determined. Conditioned suppression can be determined by measuring the reduction in the animal's rate of lever pressing when the tone (CS) is presented. The measure of the extent to which the CS suppresses responding is called the suppression ratio (Annau & Kamin, 1961; Mazur, 1990).

The suppression ratio is the number of responses during the CS and during an equivalently long non-CS period, then computing the suppression ratio as CS/(CS + non-CS). A suppression ratio of 0.50 indicates that no suppression (half of the total responses emitted during the CS). Any value below 0.50 indicates suppression, with zero indicating total suppression. The suppression ratio can also be expressed as a/(a + b). The term "a" is the number of responses during the CS, and "b" is the number of responses in a comparable period of time immediately prior to the occurrence of the CS (Annau & Kamin, 1961).

Conditioned Suppression in Humans

This section shows how the conditioned suppression technique outlined by Estes and Skinner (1941) can be used to establish conditioned suppression in humans for the purpose of detecting deception. Research exists showing that the parasympathetic nervous system (PNS) is difficult if not impossible for an individual to control consciously and lying has been associated with decreases in response times (Spence, Farrow, Herford, Wilkinson, Zheng, & Woodfuff, 2001). Also, conditioned suppression has been established in humans using techniques similar to Estes and Skimmer's (1941) procedure (Arcediano, Ortega, & Matute, 1996).

When a subject is attempting to conceal information or lie, his her responses slow. For example, if a subject is trying to conceal the truth it is possible to detect deception by a computer-based program that measures elapsed time between a subjects responses, interresponse times, during an operant task such as a lever press. The assumption is that a suspect has been pre-exposed to a "criminal" act, (US). The unconditioned response, (UR), is the innate emotional response to the US. The emotional response could be fear

or anxiety (UR). The assumption is that the UR (fear or anxiety) has been paired to the US ("criminal" act). Next the US is paired to a CS (pictures from the "criminal" act). The pairing of the US to CS takes place during the "criminal" act. During a learned task such as a lever press, as in Estes & Skinner's (1941) conditioned suppression experiment that used rats, the expected result would be an increase in response time after the presentation of the CS (pictures from the "criminal" act). The significance of the conditioned suppression technique used in this thesis can be seen in the level of suppression in deceptive instances versus non-deceptive instances.

Overview of Deception Detection Methods

According to Trovillo (1939), the purpose of deception is to mislead. The earliest form of deception detection can be found in the Ayur-Veda, a Hindu text outlining specific guidelines to detect if someone is being deceptive (Trovillo, 1939). The Ayur-Veda method of deception detection dates to about 900 B.C. During this time deception detection was left up to the gods. The Ayur-Veda describes various torture techniques used on subjects that were believed to be lying. If a subject survived the torture it meant that he/she was judged by the gods to be truthful. This was called the Ordeal method, in which a subject went through some ordeal, such as some method of torture (Lea, 1866/1973). It was not until the 16th century that more scientific approaches to detecting deception were searched for. Galileo in 1581 invented an apparatus that could measure the human pulse and Hales in 1733 created an apparatus that could measure human blood pressure. (Clendening, 1931).

Modern investigators, just as their predecessors, have the task of detecting deception when interrogating potential criminal suspects in investigations. Intelligence and law enforcement agencies need to gain accurate and relevant information. Getting reliable information allows an agency to utilize resources efficiently. Reliable information combined with efficient utilization can increase an agency's ability to prevent criminal acts or other acts of aggression. Deception detection has fundamentally been the cornerstone in gaining this quality of information. From psychologist/psychiatrists viewing body language and eye movement to scientist utilizing EEGs and polygraphs, lie detection as a function of overt behavior as well as changes in internal aspects such as the sympathetic autonomic nervous system (SANS) has been the predominate ways to detect deception.

The Polygraph

This section focuses on how the polygraph is used to detect deception and describe a potential limitation to its design. Credited as the original lie detector is the Larson Polygraph, built in 1921 for Berkley Police Chief August Vollmer (Clede, 1998). Today, polygraphs customarily measure changes in blood pressure, chest breathing patterns, and Galvanic skin response (perspiration). The Applied Physics Lab (APL) at Johns Hopkins University conducts polygraph studies using statistical comparisons of the signals recorded during an examination. APL claims an interpretation accuracy of over 95%; however, to gain a stable baseline the investigator has to ask questions that are designed to get truthful responses, (non-emotional responses). So, all the responses after the baseline are interpreted based on the initial baseline.

In the annual polygraph report to congress, DODPI, summarizes its executive affairs and projects future programs. The DODPI for approximately 20 years used the polygraph for deception detection (1999). Recently however, the DODPI has been conducting and supporting studies that utilize different means of deception detection other than the polygraph. Other methods, such as voice recognition and thermal imaging, as well as the traditional polygraph are used for counterintelligence cases, foreign counterintelligence, counterintelligence operations, and other security issues. The purpose of DODPI is to deter and detect involvement with foreign intelligence and espionage, involvement in terrorism, deliberate failure to protect classified information, damaging government information systems, clandestine operations and defense systems.

The research division of DODPI is currently engaged in research topic, such as. voice stress detection, thermal imaging during examination, P300 scalp profiles, Vagal Tone Monitor/ARIS, remote sensing of emotion and stress using Laser Doppler Vibrometry, among others. These projects are all directed toward the detection of deception. The methods used vary however they all search for the same thing, deception.

A criticism of polygraph examinations concerns the wording of questions used to obtain a baseline (Barland, Honts, and Barger, 1989). Barland, Honts, and Barger (1989) studied the accuracy of decisions made by examinees that could identify them as guilty or not guilty of enacting a "mock" crime was conducted. Examinees were asked if they had committed espionage or sabotage "against the United States." Many of the experienced examiners who participated in the study believed that because examinees had participated in a "mock" crime and had not committed any act "against the United States," the wording of the relevant questions was inappropriate (Barland, Honts, & Barger 1989).

The examiners believed that the question wording might have reduced, even more, the psychological significance of the acts that examinees did commit. This could contribute to low accuracy rates for identifying deception in examinees.

The Electroencephalogram

This section outlines the history of the electroencephalogram (EEG) development and discusses limitations, such as cost effectiveness. In 1929, a German psychiatrist named Berger (1929) found that it was possible to record the small electric currents generated on the brain, without opening the skull, and to depict them graphically onto a strip of paper. Berger (1929) named this new form of recording as the electroencephalogram. This electric activity changed according to the functional status of the brain, such as in sleep, anesthesia, hypoxia (lack of oxygen) and in certain nervous diseases, such as in epilepsy (Sabbatini, 1997).

Walters (1957) was impressed with the possibilities of the EEG activity over the brain surface. He invented a complex device called the toposcope in 1957 (Sabbatini, 1997). It had 22 cathode ray tubes (CRT) each of them connected to a pair of electrodes attached to the skull. The electrodes (and their corresponding tubes) were arranged in a geometrical array, such that each tube was able to depict the intensity of the several rhythms which compose the EEG in a particular area of the brain (the frontal, parietal and occipital lobes, etc.). In the initial tests Walters (1957) asked his subjects to perform several mental tasks. The results were that the EEG rhythms were altered in different ways. He was the first to show that the alpha rhythm (present during a resting state) disappears from almost all the frontal, parietal and occipital lobes, during a mental task that demands awareness, being substituted by a faster rhythm, the beta waves. It was

apparent to neurologists that the toposcope could be a great help to locate epileptic foci (the points where a convulsion originates in the brain, due to a local lesion, tumor or functional alteration). However, it was very complex and expensive and it did not achieve commercial success or widespread use (Sabbatini, 1997).

The use of computers to process brain signals opens up an infinite number of ways of extracting useful information. Once the digitized EEG channels are stored into a computer's memory, powerful mathematical techniques can be developed to analyze the signals. One way to view brain activity is called spectral analysis. This is a mathematical technique which is able to show the frequency components of a wave (i.e., how much of each of the pure waves alpha, beta, theta, delta, etc.) are present and mixed in a single channel recording.

Farwell (1995) who runs the Brain Wave Institute in Fairfield, Iowa, patented the Brain Wave Fingerprinting technique in 1995, which has attracted the attention of the FBI and CIA as a better way to detect spies. Iowa judges have allowed the admittance of brainwave fingerprinting data into court cases, even though Iowa is a state where the polygraph is outlawed (North Carolina Wesleyan College, 2000).

Farwell and Donchin (1991) examined crime-related scenarios and participants with a criminal past history to explore whether the P300 could be a reliable indicator of deception. The P300 is a specific type of electrical brainwave that activates when a person sees a familiar object (Lawson, 2001; Farwell & Donchin, 1991; Zhou, Yang, Liao, & Zou, 2000/2001). These brainwaves are called event related potentials (ERPs). In the P300 test, a subject wears a headband of electrodes and faces a computer screen. In similar tests, a subject wears a helmet of electrodes, and experts try to make

interpretations from a record of what areas of the brain activate or receive intensive blood flow. For example, if a murder suspect is claiming an alibi, then their P300 wave will not activate when they are shown the murder weapon. However, if suspect does recognize the murder weapon the P300 wave will activate. The technology is promising in that the research indicates the brain stores visual images.

Concealed information can be detected through EEG spectral components (Lawson & Pratarell, 2000; Zhou, Yang, Liao, & Zou, 2000/2001). While EEG research on detecting deception is promising the cost and training needed to operate and maintain EEG equipment is high. This is a limitation According to the EEG Spectrum Inc. of Encino, California (2003) the average cost of operating EEG equipment is $120.00 per session, usually lasting 30 minutes, and $600.00 for mapping the brain. The cost of operating an EEG is relative to location; the costs vary from state to state. EEG certification training classes averages $900.00 per class.

Voice Recognition

Voice recognition is a relatively new method of detecting deception. Bell Jr. and McQuiston (1970), Army intelligence officers at the time, developed what they called the Psychological Stress Evaluator (PSE) in 1970. Its purpose was to detect levels of significant emotional stress from human voiced utterances. Voice recognition devices measure physiological manifestations of psychological stress. Just as the polygraph, voice recognition methods of detecting deception need a procedure to differentiate between stress caused by lying and stress caused for any other reason (Department of Defense Polygraph Institute Research Division, 1995). Voice stress analysis measures an inaudible micro-muscle tremor that is superimposed on the voices of all warm-blooded

animals, including dogs and cats. The tremor varies according to the amount of stress. The more stress, the fewer tremors. Unlike the polygraph, the PSE signal-processes the raw input of a voice. Vocalization is recorded and played back, or taken off the radio or television. It is possible to stress analyze a voice without the subject being present or even knowing about it.

These various means of deception detection are useful tools in the search for fact and information needed in law enforcement investigations as well as maintaining security. The conditioned suppression model used in this study could add to effectiveness of gaining quality information and in detecting deception.

Statement of the Problem

The principle focus of this thesis was to examine the potential use of a conditioned suppression technique to distinguish truthful and deceptive participants who were presented stimuli related and not related to enacted scenarios. A central aim was to use Estes and Skinner's (1941) conditioned suppression technique to detect deception using pictures connected to a simulated "criminal" act. Picture stimuli were used over word stimuli due to findings in ERP research where familiar visual stimuli activated the P300 brainwave (Lawson, 2001; Farwell & Donchin, 1991; Zhou, Yang, Liao, & Zou, 2000/2001). Also, picture stimuli may have practical applications over other stimuli in the criminal justice system and intelligence community.

A secondary problem was the design of the scenarios. The design of the experimental scenario to recreate a "criminal" act was of key concern so as to test the reliability of the measure being used. Barland, Honts, and Barger (1989) suggested that

participants could believe they had not committed any true criminal action because they had participated in a "simulated" criminal act, and that the design had no real consequences. Therefore, a weak pairing of US to CS would of transpired in the scenario, thus, when presented with stimuli (CS) from the simulated "criminal" act, the participants would not respond as hypothesized.

The simulated "criminal" scenarios used in this study were based off a typical Key-Pin terrorist cell system. This model was chosen for its sound design in avoiding authorities and inspiring secrecy among its members. In this system a cell member has little to no knowledge about other members. One individual, who usually does not have direct knowledge of the information being delivered, handles communication between members. Members usually have few faces to remember and detailed data exists only at the highest echelons or with the specific member carrying out the task. If one member is caught there is little information that can be extracted (Kelley, 1982).

Another concern with the study was participants with more experience with criminal actions could show less variation in IRT. McCarthy and Stewart (1998) conducted a study on graduated desensitization. In this study the participants were 95 adult offenders who were categorized according to the type of offence (personal or property) and the level of offending involvement (low or high). The results of the experiment indicated offenders' excuse acceptance varied as a function of their level of involvement in crime. Low involvement property offenders reported higher excuse acceptance than did high involvement property offenders. For personal offence situations, low involvement offenders reported higher excuse acceptance than did high involvement offenders. These findings support the graduated desensitization hypothesis (McCarthy &

Stewart, 1998). This study indicates that the more experienced the suspect is the more desensitized he/she is to the CS.

Hypothesis

The study described in subsequent chapters of this thesis examined the effect of concealed information on the behavioral component of variations in interresponse times (IRT). The hypotheses in this study is derived from assumptions gathered through the literature review on both animal and human conditioned suppression studies (Estes & Skinner, 1941; Lyon & Millar, 1969; Rescorla 1969; Arcediano, Ortega, and Matute 1996). IRT was expected to increase when experimental participants were presented with stimuli from the simulated "criminal" act (CS+) (Estes & Skinner, 1941; Rosenfeld, Nasman, Whalen, Cantwell, & Mazzeri, 1987; Zhou, Yang, Liao, & Zou, 2000/2001), and that there would be no significant change in IRT in control participants across stimuli.

H_1: Experimental group participants' interresponse times (IRT), relevant to experimental stimuli (CS+), will show difference compared to CS- stimuli.

H_2: Control group participants' interresponse times (IRT) will show no significant variations across trials.

Benefits of the Study

The current thesis is important in that it expands the existing knowledge base concerning the use of conditioned suppression as a tool for detecting concealed information. Other benefits are as follows: 1) the technique and design used in this study

design is inexpensive. All one needs is a slide projector and a simple computer that can measure IRT. 2) Unlike polygraphs and event related potentials (ERP) that require extensive training to utilize effectively, the technique and design used in this study is simple to operate. This means that every law enforcement agency can utilize the design. Federal, state, county and city agencies can have access to the same measure allowing for a standardization of technique. 3) The design and technique is based off of 60 years of psychological research. The research begins with Estes and Skinner's (1941) experimental study using conditioned suppression. 4) The design is language independent. The underlying assumptions and theories that drive this design are not restricted by language biases. 5) The design can easily be transferred to other forms of presentation, such as digital imaging instead of a slide projector. 6) With the advent of the portable computer, this system also can become portable. 7) Finally, when using an EEG the technician has to consider if the subject is left or right handed because of the way the brain processes information. The deception test used in this study is independent to handedness.

CHAPTER II

REVIEW OF THE LITERATURE

The purpose of this literature review is to describe (a) the assumption behind conditioned suppression, (b) deception detection studies, (c) depth of processing (d) cross-cultural issues in deception detection, and (e) studies in cultural frictions.

Definition and Significance of Conditioned Suppression

Conditioned suppression can be defined as a combination of operant and classical conditioning in which classical conditioning is measured indirectly by its ability to disrupt ongoing operant behavior. Operant conditioning can be described as one type of associative learning in which there is a contingency between the response and the presentation of a reinforcer. In other words, learning occurs when a response made leads to a consequence, such as rewards in response to a lever press. Classical conditioning can be described as learning to transfer a natural response from one stimulus to another previously neutral stimulus, or in other words, learning which occurs with the pairing of stimuli (Parke & Locke, 1999).

Mostly behavioral theorist uses associative learning. "Ivan Pavlov, B.F. Skinner and John B. Watson developed the central ideas of learning" (Parke & Locke, 1999). Many researchers have studied and used conditioned suppression techniques using variables such as latent inhibition, configural learning, associative learning, aversive

stimuli, and others, as well as technological approaches like the polygraph and brain wave monitors such as EEG equipment.

Conditioned Suppression in Animals

In an experiment by Estes and Skinner (1941), rats were reinforced for pressing a lever on a variable interval (VI) schedule of reinforcement. A tone (CS) would come on for five minutes, and then be terminated along with the delivery of an electric shock (US). The results were that the rats would suppress responding during the tone (CS), even though lever pressing was still reinforced during this time. Skinner and Estes (1941) attributed the suppression to the generalized effects of punishment. The study by Estes and Skinner (1941) laid the foundation for future conditioned suppression studies.

Some of the earliest studies on conditioned suppression used rats as the subjects. Rescorla (1969) conducted 2 experiments, which indicate that negative contingencies between CS and shock set up conditioned inhibitors. In the first experiment 48 male Sprague-Dawley rats were used. The inhibition was measured by retardation in the subsequent acquisition of a conditioned emotional response (CER) to the CS. Stimuli with greater negative CS-US contingencies were more retarded in CER acquisition; various control procedures were employed. In the second experiment 32 Sprague-Dawley rats were used. CS with a history of greater negative relations to shock were more disruptive of the CER normally elicited by a 2nd CS. Taken together, the experiments support the general hypothesis that CS-UCS contingency is an important factor in fear conditioning.

A study by Lyon & Millar (1969) maintained the key-pecking behavior of 2 pigeons on a 2-min fixed-interval schedule of reinforcement. The interval was divided

into 4 30-sec periods, and an Estes-Skinner (1941) conditioned suppression procedure was superimposed on the 2nd, 3rd, and 4th 30-sec periods of the reinforcement. Suppression was obtained during the 2nd 30-sec interval. However, a complete loss of suppression was obtained when the CS was presented during the last 30-sec period prior to reinforcement. Results were that the severity of conditioned suppression on fixed schedules of reinforcement is determined in part by the temporal relationship between the CS onset and the presentation of reinforcement. This study suggests that a fixed schedule of reinforcement has limitations when attempting to establish conditioned suppression.

Kremer, Napieraia and Haude (1978) analyzed the suppression of visual observing by rhesus monkeys produced by conditioned aversive visual stimuli. In this study nine rhesus monkeys were used in a visual observing situation to determine the influence of conditioned aversive visual stimulus. Sets of neutral visual stimuli were selected on the basis of cumulative frequency and cumulative duration of observing during a pretest phase of the experiment. Three subsets of stimuli (low, medium, and high) were formed indicating the level of observing during the pretest. A portion of the "medium" category of slides then served as conditioned stimuli in a classical conditioning procedure by being paired with electric shock. Following conditioning the entire set of stimuli were again presented in a visual observing situation.

Results showed a significant decrease in both frequency and duration of observing of the slides with conditioned aversive qualities, relative to non-shock control slides. Findings support an aversion-produced suppression of observing relatively un-confounded by methodological, procedural, and other differences existing among

previous reports on the role of fear or anxiety in this context (Kremer, Napierala, & Haude, 1978).

Kremer, Napierala, and Haude's (1978) study indicates that when there is conditioning (CS) to a negative stimuli, event, there is a tendency for a suppression of response to the pre-CS. This enforces the hypothesis that there will be suppression based on the emotional intensity of the pre-CS when presented with stimuli connected with the pre-CS. However, the experimenters used rhesus monkeys for the participants. Behavioral theorists often use animals for experiments that have a strong potential for cross species generalizations. The assumption here is that a similar effect can be seen in humans. While animals some time show great potential for cross generalizations to human behavioral models, there is no substitute for human participants.

Conditioned Suppression in Humans

A general assumption in classical conditioning research is that a common learning process is inherent in non-human animals and human learning (Miller, 1997). However the vast majority of data from studies are from research on animals. This is partially because the lack of convenient behavioral preparations for use with humans.

In a study by Arcediano, Ortega, and Matute (1996) conditioned suppression was established in humans using a paradigm similar to those used in animal research. In this procedure participants learn to press a space bar as part of a video game. Classical conditioning was superimposed on the space bar pressing response. While the participants pressed the space bar a yellow background appeared on the monitor and was immediately followed by a bright flashing light. On other occasions a blue background appeared and was not followed by the bright flashing light. Similar to the electric shock

used in rat studies, the bright flashing light was meant to suppress the space bar pressing. The result was the yellow background with the bright flashing light did produce suppression of the space bar press.

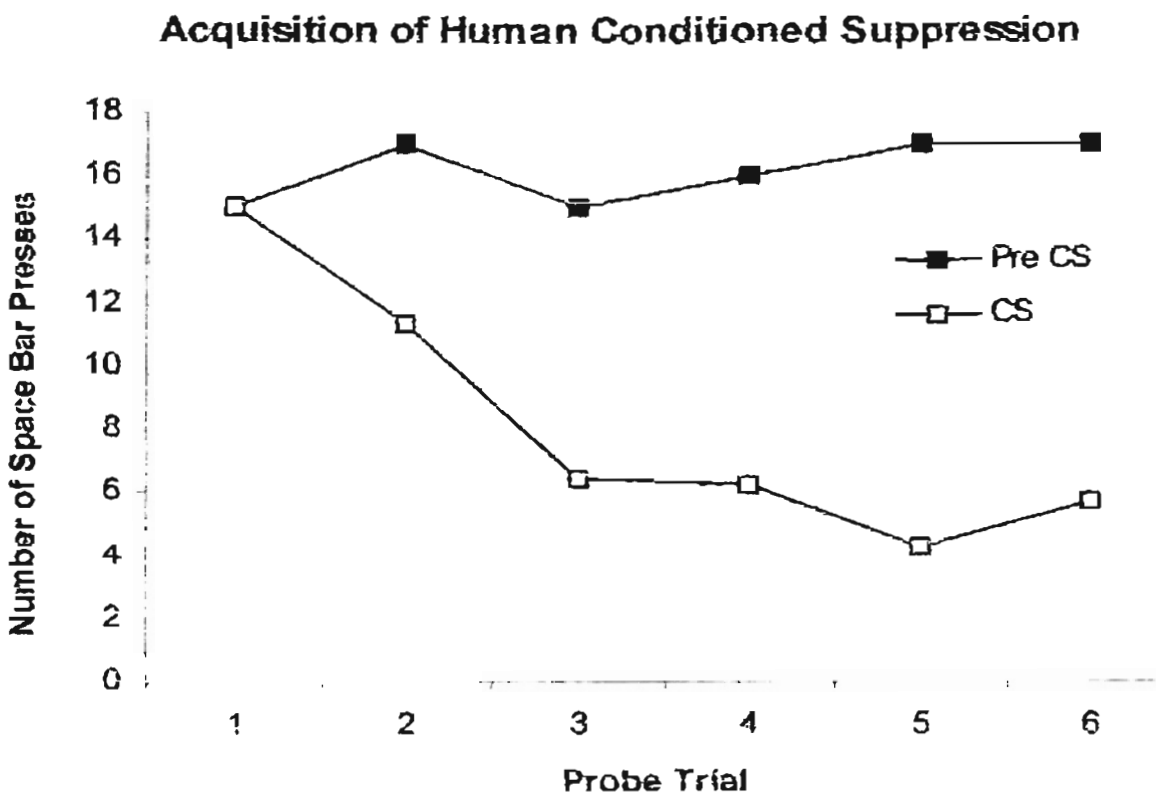

Figure 1. Conditioned Suppression Acquisition; Arcediano, Ortega, and Matute (1996). *A behavioral preparation for the study of human Pavlovian conditioning.* Quarterly Journal of Experimental Psychology, 49B, 270-283.

The results of the study are consistent with the idea that common learning are processes that are inherent with non-human animals and human classical conditioning. This thesis uses the assumption that models that produce conditioned suppression in animal can be used to create conditioned suppression in humans. The study by Arcediano

et. al. (1996) shows promise in conditioned suppression research in humans, as shown in figure 1.

Gross (1995) from the University of California, Berkley, studied the effects of emotional suppression. In his study there were three levels. The participants were assigned to watch amusement, neutral, or sadness films. Within each level there were to conditions, suppression and a non-suppression condition. In the suppression condition the participants were asked to watch the film but to try and inhibit their expressive behavior. In the non-suppression condition they were just asked to watch the film. All subjects saw all the films.

During the sessions participants' behavioral and physiological responses were recorded. The findings suggest that during an emotional state, such as being amused or sad, when responses to the emotions that either emotional state would elicit, participants' physiological state significantly altered. These findings indicate that consciously attempting to suppress an emotion leads to uncontrollable altered physiological states within the body (Gross, 1995).

Gross's (1995) study shows that conditioned suppression can be established in humans. He measured physiological and behavioral changes in the subjects. The behavioral aspect of this study corresponds to the basis of the proposed study of conditioned suppression, in which suppressed responses are measured not with physiological measures but a mixture of operant and classical conditioning.

Electroencephalogram Research

Lawson (2001) studied deception in humans utilizing an EEG technique using event related potentials (ERP). In this study there was an experimental and a control

condition. He used the techniques to detect deception in humans after conditioning them to a deceptive act. The deceptive act was designed as an act of espionage in which the participants, in the experimental group, were asked to covertly enter a room and take pictures of files locked in a draw, in which they were provided a key. After the act the participant was taken into a room where they took part in a deception test. They were asked to press a button in response to stimuli, pictures, which were presented on a screen in front of them. The ERP measured Alpha waves in accordance with the stimuli presented. The findings were that both behavioral and spectral EEG differences between deceptive and non-deceptive participants exist.

In a 1999 study titled, *Experimental study of lie detection with P300 (brain wave pattern as shown on an EEG)* participants took part in a simulated crime. In the experiment 20 males between the ages of 28-30 years where assigned a crime situation and a control group. The simulated crime group were told seven aspects of a simulated burglary/robbery and asked to reproduce the steps orally and in action. Subjects received EEG examinations two to three days later. They were shown eight simulated crime pictures and 32 other pictures during the EEG examination. The subject's latency period, amplitude, and area of P300 wave, during the simulated crime picture presentation were measured. The findings revealed that the subjects in the simulated crime group showed variations in the P300 wave when shown a picture that resembled the simulated crime. The control group showed no significant variations (Zhou, Yang, Liao, & Zou, 2001). Another study by Zhou, Yang, Liao, & Zou, (2000) similar to the above study, titled, *A comparative study of event-related potentials between simulated crime condition and*

criminal field visiting condition in lie detection, analyzed the possibility of using P300 in lie detection.

Thirty subjects were used between the ages of 17-20 years. There were three groups, a simulated larcenous crime group, a larcenous crime field-visiting group, and a control group. Subjects in the simulated crime group were required to participate in the process of a larceny. Subjects in the criminal field-visiting group were told to visit the larcenous criminal field and the subjects in the control group were not involved in any simulated crime activity and had no access to the crime field.

During lie detection, subjects were asked to judge target, crime related and unrelated photos, eight crime related, 32 non-crime related while the subject's P300 data was being recorded. The latent periods, amplitudes and the area of P300 were compared to those of subjects in other groups. A 100% correct rate of discrimination in individual data analysis was found. The conclusions of the study suggest that P300 data are good indicators of lie detection (Zhou, Yang, Liao, & Zou, 2000).

Processing Depth

This section focuses on depth of processing. Depth of processing is important for the strength of the CS to US paring during the conditioned suppression procedure. A study by Nabi (1999) suggest that emotion type, expectation of the message containing reassuring information, argument strength, persistence of peripheral cues, emotional intensity and emotional placement within a message are expected to mediate information processing depth, message acceptance or rejection, and information recall (Nabi, 1999). In this study Nabi (1999) looked at different emotional moods as motivators related to

depth of processing and memory recall. It was found that negative stimuli had a strong relationship to depth and level of processing as well as recalling information.

This finding plays an important role in the conditioning aspect of the conditioned suppression model used in this study in that the level of involvement is directly related to the level of processing. If the condition does not produce significant emotional conditioning then the deception measure will not be accurate.

Cross-Culture Deception Detection

This section deals with cultural aspects of deception. This conditioned suppression technique used in this thesis does not utilize language in the deception test, thus avoiding one aspect of cultural differences. However, differences in perspectives across cultures are important to deception detection techniques when dealing with international crime/terrorism.

Culture is viewed as how people are organized socially according to local conceptions. Concepts such as age, gender, power, time, and self, are all historically rooted according to the environmental pressures the society evolved. These ideas and perspectives are passed down to successive generations. A culture uses their own ideas and beliefs as a center point of reference when identifying with other cultures. Religion, social organization and history, language, among many others must be dealt with in cross-cultural communication (Elashmawi, 2001; Nisbett, Choi, Peng & Norenzayan, 2001; Tinsley, 2001; Yurtsever, 2001).

Cultural differences in perception are important aspects of how deception is defined. In an article by Bond and Atoum (2000) titled, *International Deception,* reports international deception using Americans, Jordanians, and Indian participants. Americans,

Jordanians and Indians were videotaped while lying and telling the truth, the resulting tapes were judged for deception by other Americans, Jordanians and Indians. Results showed that lies could be detected across cultures. They can be detected across cultures that share a language and cultures that do not share a language.

There was no general tendency to judge a person from other countries as deceptive. In fact, they often judge foreigners to be more truthful than their compatriots. There is, however, some evidence for a language-based ethnocentrism where perceivers judging the deceptiveness of a series of people from the same multilingual culture. Ancillary results reveal that people from diverse backgrounds reach consensus in deception judgment and that motivation can impair a liar's ability to achieve communication goals (Bond & Atoum, 2000).

Culture in general is important, however, the underlying principles that make up a specific culture need to be analyzed. A criminal's values and morals play an important role in the ability for one to detect deception. As discussed earlier, a subject with more experience in criminal actions may react with less variation to the stimuli connected to the criminal action (McCarthy & Stewart, 1998).

The Security Dilemma

For some time there has been the question of what poses the real threat to domestic and international security. For some scholars it is domestic, from within a nation or culture, for others the dilemma comes from the clashing of civilizations as they grow and begin to influence one another. These influences can be described as culturally based sources of friction. Bond and Atoum (2000) suggested that perceptions vary cross-culturally and these variations can influence the perception of deceit. Cultural differences

in perceiving deception, based on specific cultural values and beliefs, is an important concept to consider when designing a deception test that can be used cross-culturally.

Huntington's (1997) clashes of civilizations article analyze the implications of civilization clashes. Shown in figure 2 is Huntington's (1997) vision of the world divided into eleven civilizations. He addresses the issues surrounding why there will never be one single civilization. The ideas of culture, custom, religion and language are analyzed as frictional factors that prevent the melding of civilizations (Huntington, 1997).

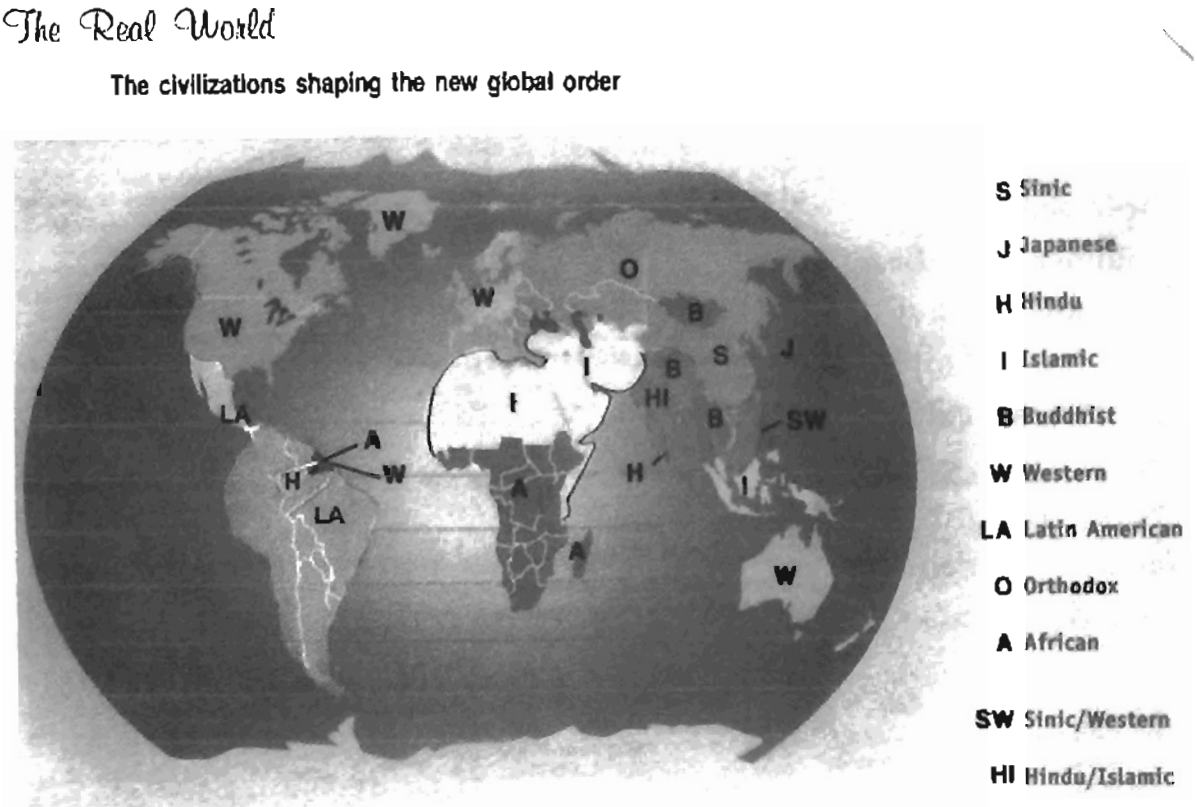

Figure 2. Huntington's Civilizations of the World; Huntington, S. P. (1997). *The many faces of the future: Why we'll never have a universal civilization.* Annual Editions Global Issues, 17th ed. McGraw-Hill, 13-16.

Huntington (1997) describes civilization clashes as the root of phenomenon such as international terrorism. Qadir (1999) in an article titled, *Civilisational clashes*, points out that Huntington (1997) spent too much time on religious differences and overlooked important aspects of political and economic relativism along with basic cultural differences (Qadir 1999). By analyzing these aspects he points out that there is a high likelihood that conflict will be within these civilizations rather than between them. The eleven civilizations described by Huntington (1997) are the (S) Sinic, (J) Japanese, (H) Hindu, (I) Islamic, (B) Buddhist, (W) Western, (LA) Latin America, (O) Orthodox, (A) African, (SW) Sinic/Western, and (HI) Hindu/Islamic.

No matter where the security threat comes from, between or within civilizations, between or within nations, there will be a need for a reliable technique to gather information and detect deception.

CHAPTER III

DESIGN AND METHODOLOGY

Design Overview and Assumptions

Participants were divided into either an experimental group, which participated in a simulated "criminal" act and then concealed information related to the criminal act during a lie detection test, or a control group, which participated in a non-crime scenario and did not conceal any information during the lie detection test. The use of scenarios to simulated criminal and non-criminal activity has recently become conventional to deception research (Farwell & Donchin, 1991; Lawson & Pratarelli, 2000; Zhou, Yang, Liao, & Zou, 2000/2001). Also, the scenarios used in this study were similar to those used in Lawson's (2001) deception study using ERPs, which produced significant results.

The simulated "criminal" act consisted of committing an act of espionage, while the non-criminal scenario consisted of running an errand task that did not include any deceptive manipulations. Although stimulus items for both groups were identical, all participants were examined concerning the espionage case. Thus, participants in the experimental group were guilty of the crime in question while participants in the control group did not have any knowledge of the simulated "criminal" act. Experimental participants were instructed to conceal any information concerning the simulated "criminal" act, while control participants were instructed to be truthful to all stimuli. The examiner presented herself as not having any knowledge of whether participants were deceptive or non-deceptive.

The present thesis is based on two assumptions involving deception and the development of a tool to accurately measure this phenomenon. Deception is assumed to involve both a set of mental processes that influence the committing of a deceptive act and the deceptive act itself. Thus, mental processes related to planning strategies, determination of personal gain, and personal relevance are perhaps crucial to deception, although such processes may not occur while an individual is actually committing a deceptive act. Accordingly, a valid measure of deception should take into account both mental processes that give rise to committing a deceptive act and the knowledge of the deceptive act itself.

The present experiment accounted for mental processes associated with the deceptive act by having experimental participants participate in an espionage scenario. Law enforcement authorities have the difficult task of apprehending and extracting information from criminals. Criminals, especially those affiliated with crime syndicates, are difficult to identify as well as disinclined to provide information about themselves and their illegal activities (Kelley, 1982). Terrorist organizations/cells operate in similar ways, both operating in secrecy with criminal behavior. The design of an experimental scenario to recreate a "criminal" act is of key concern so as to test the reliability of the measure being used. Non-deceptive participants (control group) were given a scenario similar in terms of the detail instructions, number of people the participant interacted with, and the length of the scenario, but which did not contain any deceptive manipulations such as being illegal in nature, secrecy, and having serious consequences if caught.

A second assumption of this thesis is that an accurate measurement of deception must involve the testing of first-hand knowledge. Such knowledge should have been processed at a deep level processing because of its first-hand relevance to the individual. Craik and Lockhart (1972) and Nabi (1999) suggested that the depth of processing plays an important role in the conditioning aspect of the conditioned suppression technique used in this study in that the level of involvement is directly related to the level of processing. The present thesis attempted to approximate field situations by having participants experience relevant information first-hand using the simulated "criminal" and errand scenarios.

Day one: Experimental Group

Experimental participants took part in a simulated "criminal" scenario (Appendix B). First, the experimental (criminal) group filled out a consent package (Appendix A). As part of the scenario participants were instructed to proceed to another location in a nearby building and proceed to a set of locked file drawers said to contain various schematics and pictures that identified informants (two face images). Participants were then instructed to unlock a file drawer, locate and remove any documents or pictures located in a file named "DOOM Project," photograph them with a small pocket digital camera, and return the documents to their correct folder. Participants were then instructed to take an envelope marked "confidential" from an office desk inside the room.
As participants exited the corridor in the building, they encountered a confederate, posing as a janitor, who asked them casually why they were in the building. From the corridor, participants were instructed to exit the building and proceed to a nearby park.
Participants were coached to only reveal that they were doing research for Dr. Abramson.

From the building, subjects were instructed to approach a confederate wearing a black baseball cap located at the park. After a verbal exchange the participants gave the confederate the envelope labeled "confidential." Participants were instructed to conceal any information about the scenario but to remain truthful about all other information during the deception test, which took place the following day. The deception test was the same for both the experimental group and the control group.

Day one: Control (errand) Group

The control participants took part in an errand scenario (Appendix C). The control group participants were given a pen, envelope, and piece of paper, and told to go to the campus library. Once in the library, participants went to the third floor to find a journal titled, *Behaviour* with the call number 151.305 B419, and book titled, *Regret*, with the call number 152.4 L257r, where they wrote down information from these materials. Participants found a face image, 4 x 5 picture of a female, Appendix D, picture FI1, inside the book *Regret*. While the participants were finding the journal and book, a confederate, who, after making a verbal exchange, gave each participant a face image, 4" x 5" picture of a male, Appendix D, picture FI2, which they placed in the envelope.

Once the participants finished writing down information from the library materials and placed the face images in the envelope, they proceeded to a clock tower located on campus. Participants then approached a confederate wearing a black hat holding a blue basketball and gave the envelope to the confederate. Participants were instructed to remain truthful about all information during the deception test, which took place the following day. The deception test was the same for both the experimental group and the control group.

Day Two: Deception Test

Day two consisted of a computer-based deception test designed to measure variations in interresponse times (IRT). The apparatus design used in this study can be seen in figure 3. A set sequence of pictures, both linked to the simulated "criminal" act and neutral pictures linked to the errand act, were put into a slide projector that was connected to a computer. Specific hardware and software are discussed later. The picture selection and arrangement were the same for the experimental and control groups.

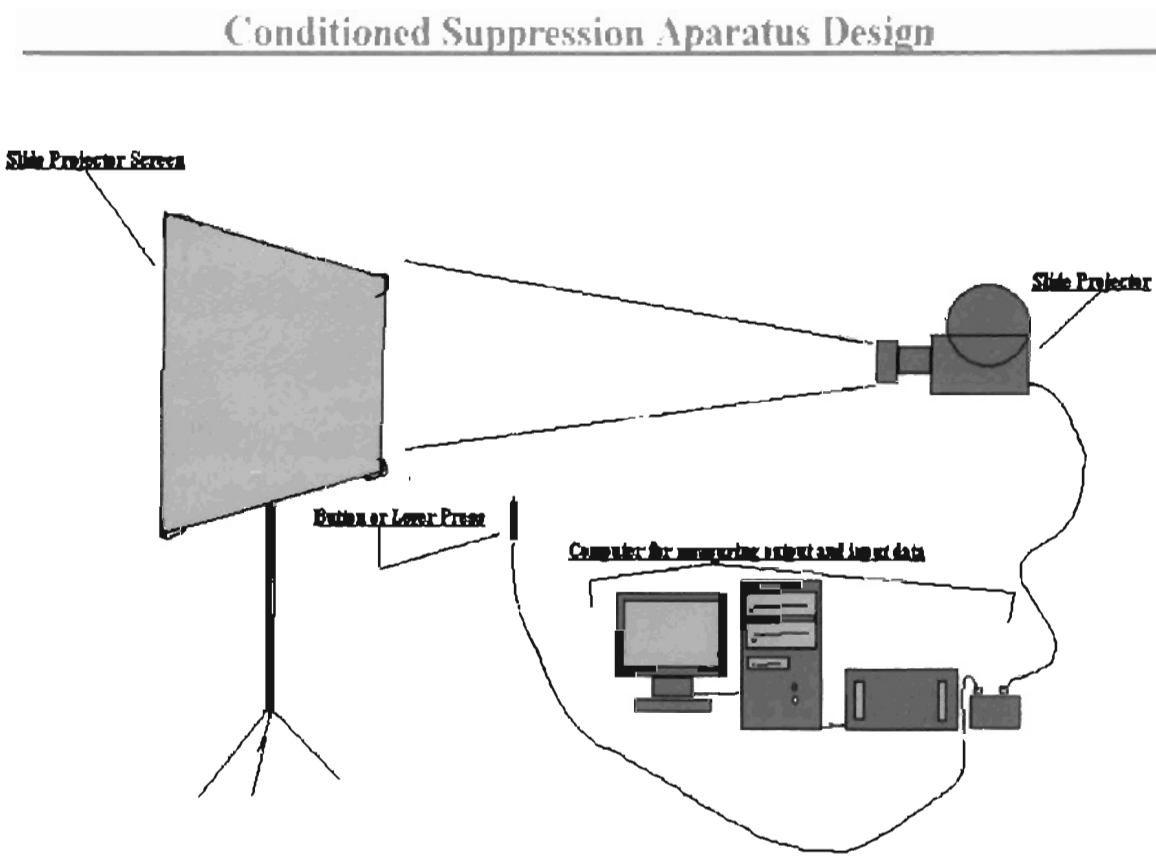

Figure 3. Apparatus Design used to Measure Interresponse Times

A baseline of responses was attained in accordance with an electronic metronome. This was the operant conditioning (learned task). The metronome was set for 60 beats per minute (bpm). The steady beat of the electronic metronome allowed the participant to respond at a steady rate. When the participant was comfortable that he/she could reproduce the metronome's beat by pressing a lever in time with the 60 beats per minute (one beat per second) the experiment began. The computer program advanced a series of 3 slide pictures (CS-), not associated with the simulated "criminal" act, Appendix D, experimental pictures E1, E2, and E3, and 3 slide pictures (CS+), associated with the simulated "criminal" act, Appendix D, control pictures C1, C2, and C3. Four other slide pictures were shown. These four slides were face images, two confederates, Appendix D, picture CF1, and CF2, that posed as contacts in the experiment and control scenario. The other two face images were found in the "DOOM Project" in the experimental scenario and in the library in the control scenario. The use of the face images allowed for a between group analysis. The pictures stayed on the screen for 5 seconds. While these pictures were being presented the participant was still conducting the lever press task.

Deception was analyzed by measuring time between responses and the number of responses between and during the presentation of the pictures. The computer software, described below, measured the response time in milliseconds between and during the pictures as well as the time between responses (IRT).

Hardware

The hardware used in this design was the PC MED, St. Albans, Vermont, SG-6080D Tabletop Interface Cabinet with one active test chamber; the ANL-926 Audio

Generator was disabled. Next was the PC MED Interface Module DIG-716 SmartCtrl, which interfaced the PC MED SG-6080D, the PC MED software, a KODAK AL-2 slide projector, (output 1) and a simple lever press (input 1). A Pentium III computer with 15-inch monitor was used to run the PC MED hardware and the Schedule Manager software.

Software

The software used in the design is the PC MED Associates, St. Albans, Vermont, Schedule Manager program. There are three areas of the Schedule Manager program. The first is the hardware set-up. The second is the configuration. The third is the procedure. The parameters for each area in this experiment are as follows:

Hardware: IRQ was set to "7". One chamber was used, communication card "780" with an output offset of "1" and an input offset of "0".

Configuration: Fixed time interval of "5" seconds. Reinforcement schedule

(Output 1) held for 500 milliseconds every "5" seconds with Soft CR enabled. Input set to "Count Only".

Procedure: Every "5" seconds output 1 is enabled for 500 milliseconds (advances the KODAK slide projector through a power relay connected to the remote of the projector). This procedure is repeated for the number of slides in the projector.

Data Storage

The PC Med Software automatically recorded the data into two files. The Soft CR data, which measured the time between responses, was automatically recorded in a file

named c:\smwin\!scrl.dat; all other data, number of responses per trial and stimuli presentation were automatically recorded in a file named c:\smwin\data1.dat. The raw data, IRT, was analyzed in SPSS statistical software package, 10.0 edition, SPSS Inc. Headquarters, Chicago, Illinois. A within subjects, within groups, and between groups analysis of the data was performed.

Data was generated in the form of milliseconds, time between responses, or interresponse times. Interresponse time scores were aligned with the specific picture (trial) they corresponded with. These scores were added together and divided by the number of responses for that trial. This gave a mean score for that specific trial in milliseconds. There were three experimental trials (CS+ pictures), three control trials (CS- pictures), and four face images. The four face images were seen by the experimental and control group; two confederates and two face images. A complete list and visual representation of the slides used in the experiment is shown in Appendix D. The mean millisecond scores were analyzed within subjects, within groups, and between groups.

The first step was to test for between group differences in mean millisecond scores. This was conducted by comparing group mean millisecond scores for experimental trials and control trials as well as the face trials. The face images were excluded from all other comparisons because face images were the same for both groups. A within subjects or within group analysis would not be applicable using the face image data. The expected results were that the experimental group would show more suppression to the face images that the control and since both groups were exposed to the same face images the results would be impressive if significant variations of IRT between groups could be shown. The next step was a within group analysis of mean differences.

This was conducted by comparing the mean scores of experimental trials with control trials within the specific group excluding the face images. The larger the millisecond score the more suppression observed. Finally a within subjects analysis was conducted using mean scores of individual experimental trials compared to individual control trials, excluding the face images. The larger the millisecond score the more suppression observed.

Participants

This section describes participant selection and demographics. All participants were verbally solicited from Oklahoma State University undergraduate psychology classes. Participants earned extra course credit for their participation. Most introductory and lower-level psychology and business courses at Oklahoma State University offer students a small amount of course credit (usually less that 5 % of their grade) for the participation in the research process. In psychology courses, students are required to earn two "unit" of research experience. The requirement may be fulfilled in one of three ways: 1) serving as human participants in one or two current research project(s), 2) attending two Undergraduate Research Colloquiums, or 3) researching and writing two 3-4 page papers on two designated research topics. Each hour of participation in a research project as a participant is generally regarded as satisfying one "unit" of the requirement, and students participating in this study will earn one hour (or "unit") of credit.

The participants were randomly assigned to either a control or an experimental group. All participants sign a consent form outlining the risks involved in the experiment, (Appendix A). The final sample consisted of 43 ($N = 43$) participants with a mean age of 21 ($M = 21.27$) who ranged from 19 to 34 years of age. Thirty-eight (88.4%) were of

white, non-Hispanic background. There were 16 males (37.2%) and 27 females (62.8%) who participated. Thirty-five (81.4%) of the participants reported to be right handed. Eleven (25%) reported to have had some involvement with law enforcement other than a parking ticket. The experimental group consisted of 21 participants (n = 21), 8 men and 13 women, with a mean age of 21 (M = 21.14) who ranged from 19 to 33 years of age. The control group consisted of 22 participants (n = 22), 8 men and 14 women, with a mean age of 21 (M = 21.40) who ranged from 19 to 34 years of age.

CHAPTER IV

RESULTS

To aid in graph interpretation, the stimuli used in this study will be briefly described. Experimental trials were pictures from the experimental scenario. Control trials were from the control (errand) scenario. Face images used in this study were two hardcopy pictures, one male and one female, and two confederates, which acted as contacts within the scenarios. An explanation of the stimuli is shown in table 1.

TABLE I

DESCRIPTION OF STIMULI USED

Experimental trials	E1	Picture of Southeast Basement Door of South Murray
	E2	Picture of Schematic Labeled "DOOM PROJECT"
	E3	Picture of Theta Pond Area (Park on Campus)
Control trials	C1	Picture of North Door of Edmon Low Library
	C2	Picture of Book Cover Titled "Regret"
	C3	Picture of Chio Clock Tower
Face images	FI1	Female image
	FI2	Male image
	CF1	Confederate 1
	CF2	Confederate 2

As seen in table 1, each trial is labeled. The contents of experimental trials are generated from data gathered from trials E1, E2, and E3, similarly, the data generated for control trials are from C1, C2, and C3.

Between Groups Analysis

A between groups analysis was conducted to determine significant differences in IRT across experimental and control trials. An independent samples t-test was used with 95% confidence interval of mean differences or .05 Alpha level. Both equal variances assumed and not assumed tests were conducted. As was expected there were significant differences between groups mean IRT scores.

Experimental group trial E1 to control group trial E1 trail showed significant difference, ($t = 2.44$, $p = .021$), $p < .05$. Figure 4 shows mean scores for trial E1 between groups. Experimental group has a mean of 102 ($M = 102$), and control group has a mean of 96 ($M = 96.5$), showing a difference of 5.5 milliseconds.

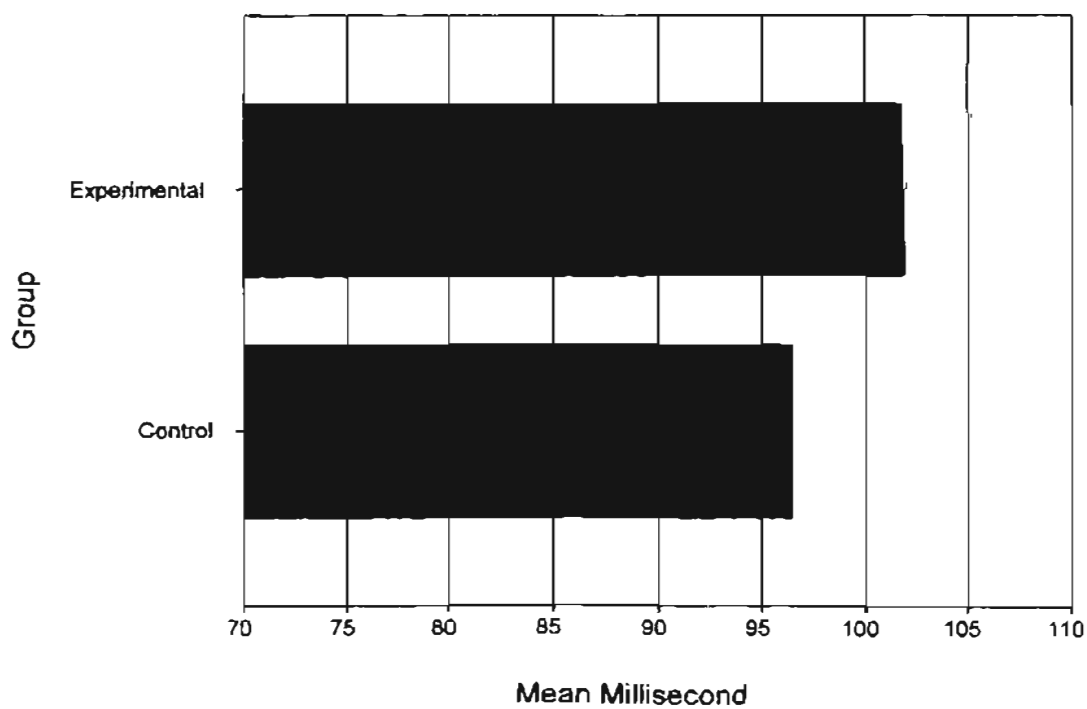

Figure 4. E1 Between Group Mean Millisecond Scores

Experimental group trial E2 to control group trial E2 showed significant difference, ($t = 2.26$, $p = .029$), $p < .05$. Figure 5 shows mean scores for trial E2 between groups. Experimental group has a mean of 101 ($M = 101$), and control group has a mean of 96 ($M = 96$), showing a difference of 5 milliseconds.

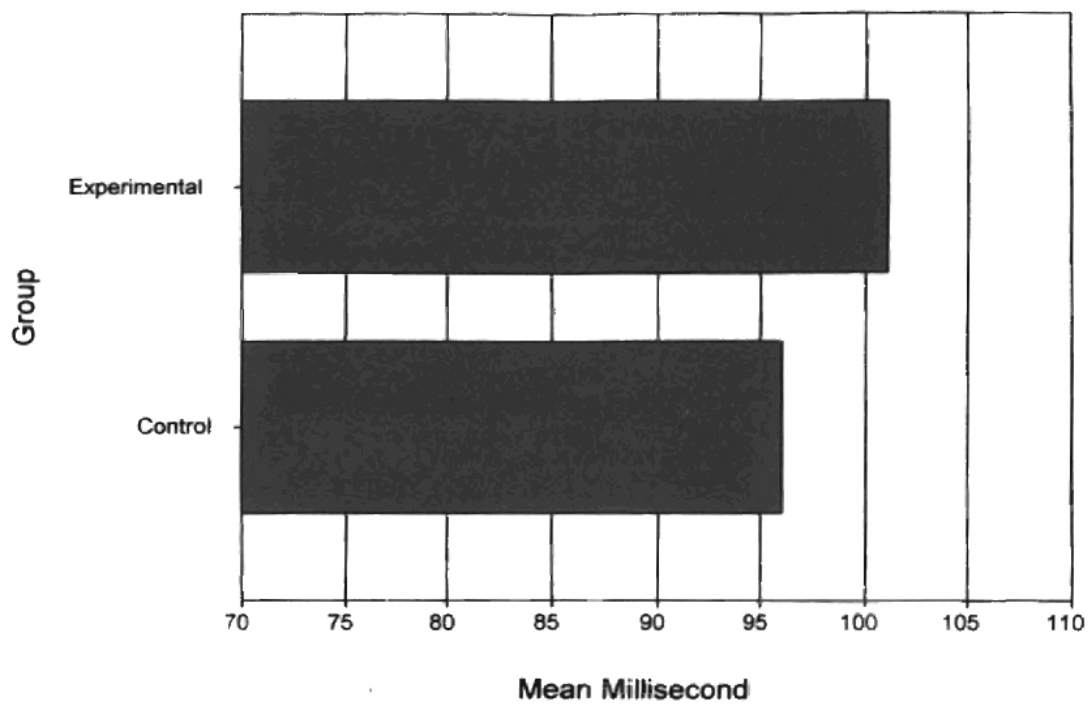

Figure 5. E2 Between Group Mean Millisecond Scores

Experimental group trial E3 to control group trial E3 showed significant difference, ($t = 2.72$, $p = .009$), $p < .05$. Figure 6 shows mean scores for trial E3 between groups. Experimental group has a mean of 102.5 ($M = 102.5$), and control group has a mean of 96 ($M = 95.5$), showing a difference of 7 milliseconds.

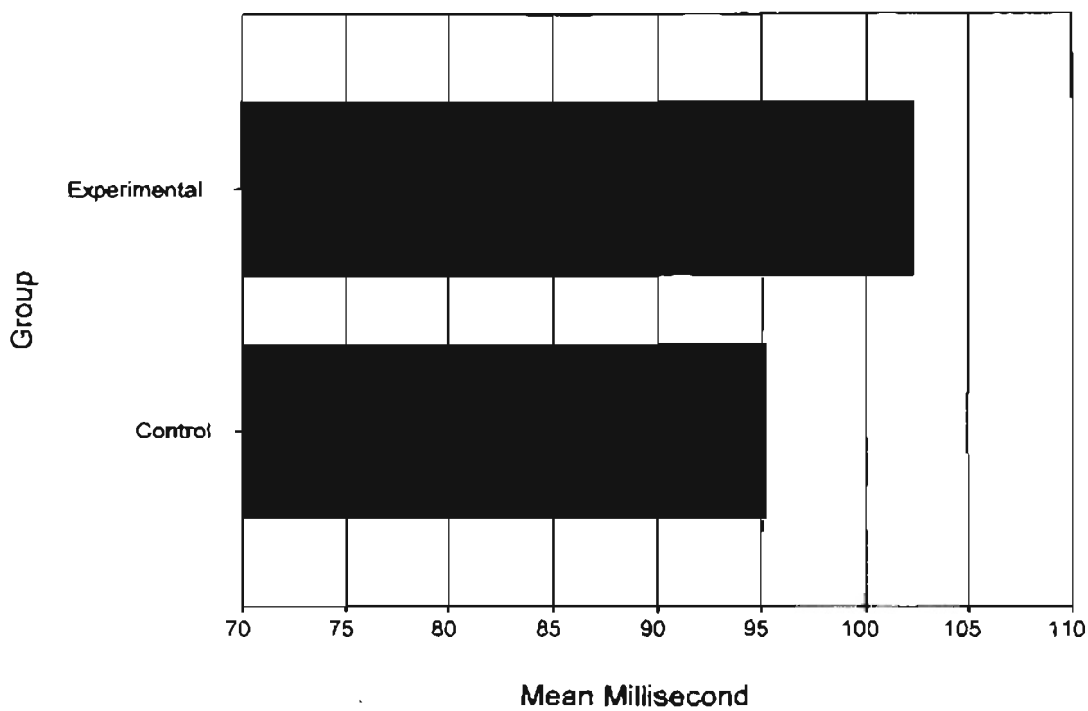

Figure 6. E3 Between Group Mean Millisecond Scores

As was expected control group trials showed no significant differences between groups. Experimental group trial C1 to control group trial C1 showed no significant difference, ($t = -.435$, $p = .663$), $p > .05$. Figure 7 shows mean scores for trial C1 between groups. Experimental group has a mean of 95.5 ($M = 95.5$), and control group has a mean of 96 ($M = 96.3$), showing a difference of .8 milliseconds.

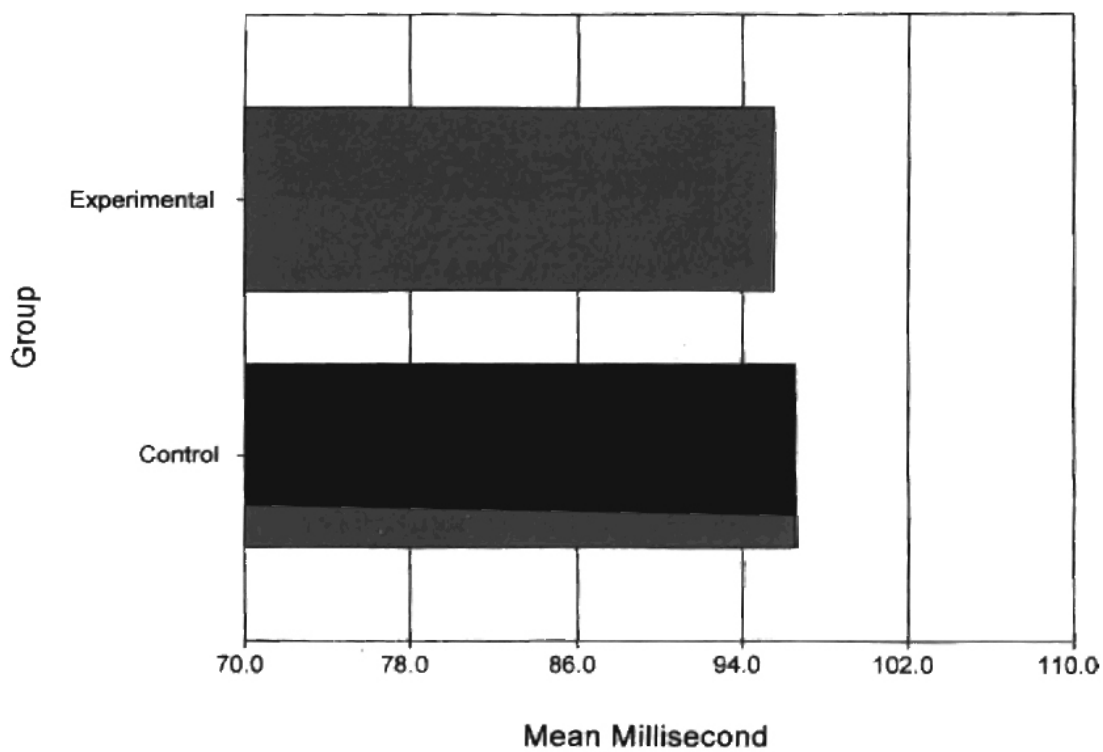

Figure 7. C1 Between Group Mean Millisecond Scores

Experimental group trial C2 to control group trial C2 showed no significant difference, ($t = -.685$, $p = .498$), $p > .05$. Figure 8 shows mean scores for trial C2 between groups. Experimental group has a mean of 94 ($M = 94$), and control group has a mean of 95 ($M = 95$), showing a difference of 1 millisecond.

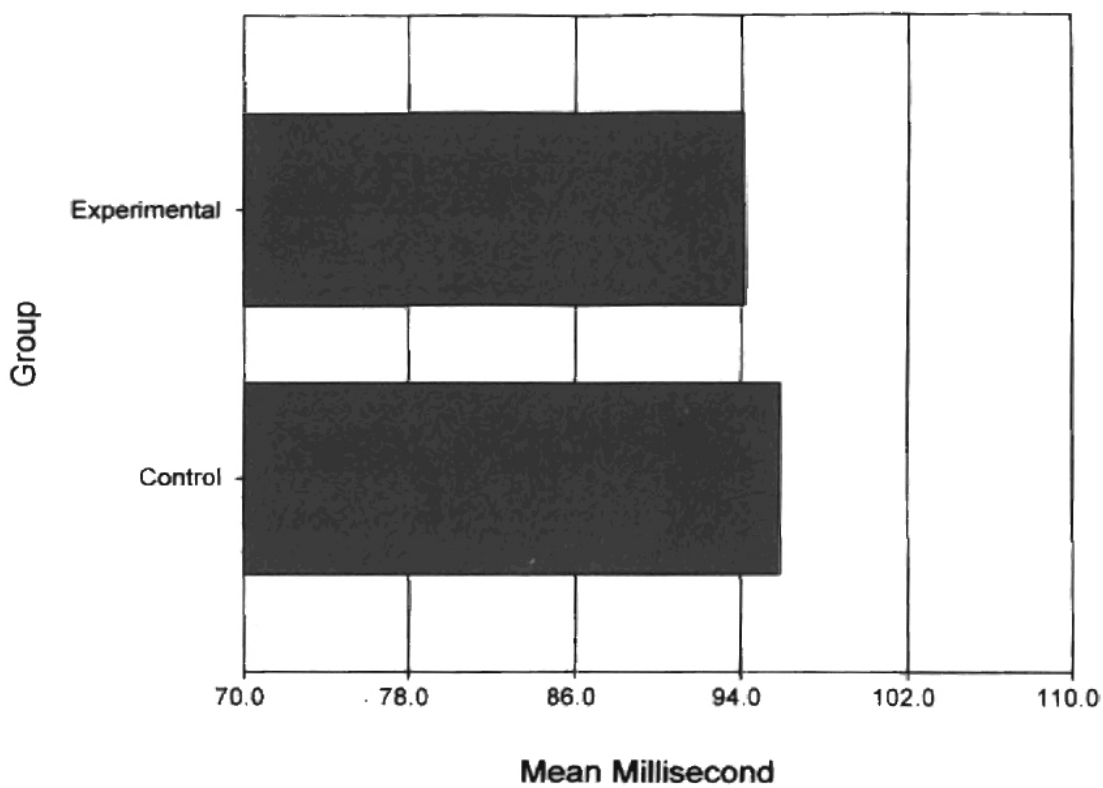

Figure 8. C2 Between Group Mean Millisecond Scores

Experimental group trial C3 to control group trial C3 showed no significant difference, ($t = -.626$, $p = .535$), $p > .05$. Figure 9 shows mean scores for trial C3 between groups. Experimental group has a mean of 93.5 ($M = 93.5$), and control group has a mean of 94.3 ($M = 94.3$), showing a difference of .8 milliseconds.

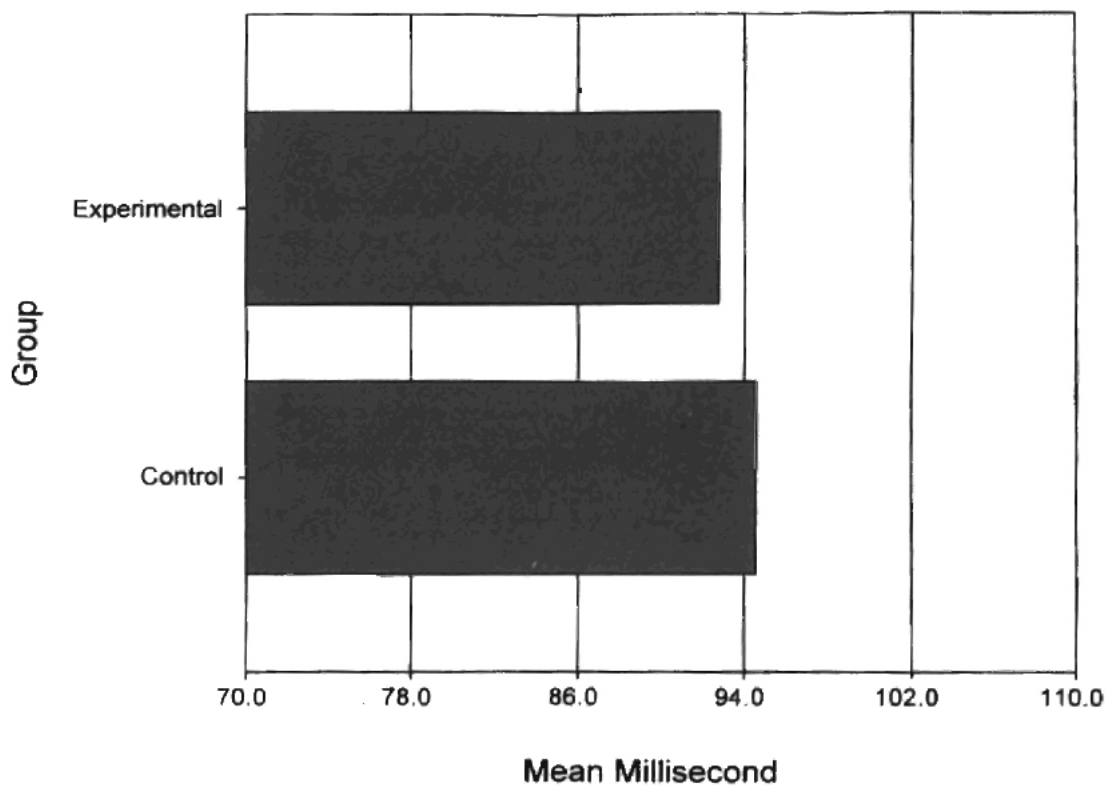

Figure 9. C3 Between Group Mean Millisecond Scores

Face image trials were analyzed between groups with significant results. Experimental group trial FI1 to control group trial FI1 showed significant difference, ($t = 2.28$, $p = .029$), $p < .05$. Figure 10 shows mean scores for trial FI1 between groups. Experimental group has a mean of 99.5 ($\underline{M} = 99.5$), and control group has a mean of 93 ($\underline{M} = 93$), showing a difference of 6.5 milliseconds.

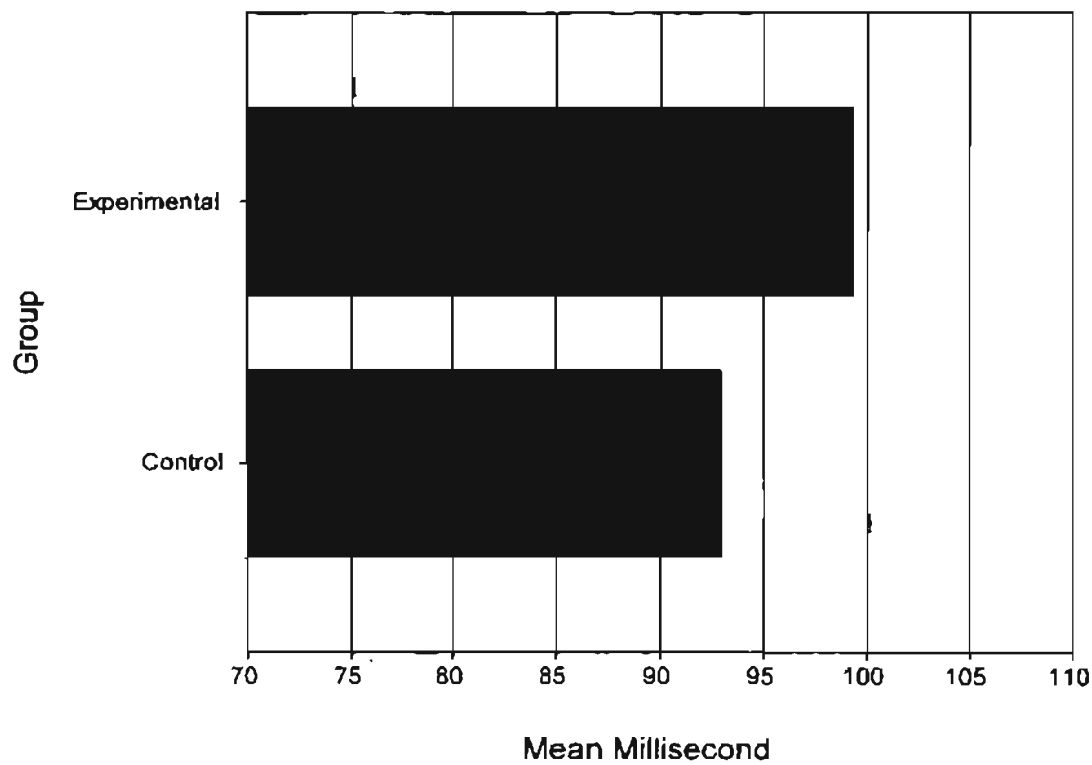

Figure 10. Face Image 1 (FI1) Between Group Mean Millisecond Scores from Interresponse Time Data

Experimental group trial FI2 to control group trial FI2 showed significant difference, ($t = 2.96$, $p = .005$), $p < .05$. Figure 11 shows mean scores for trial FI2 between groups. Experimental group has a mean of 99.8 ($\underline{M} = 99.8$), and control group has a mean of 93.7 ($\underline{M} = 93.7$), showing a difference of 6.1 milliseconds.

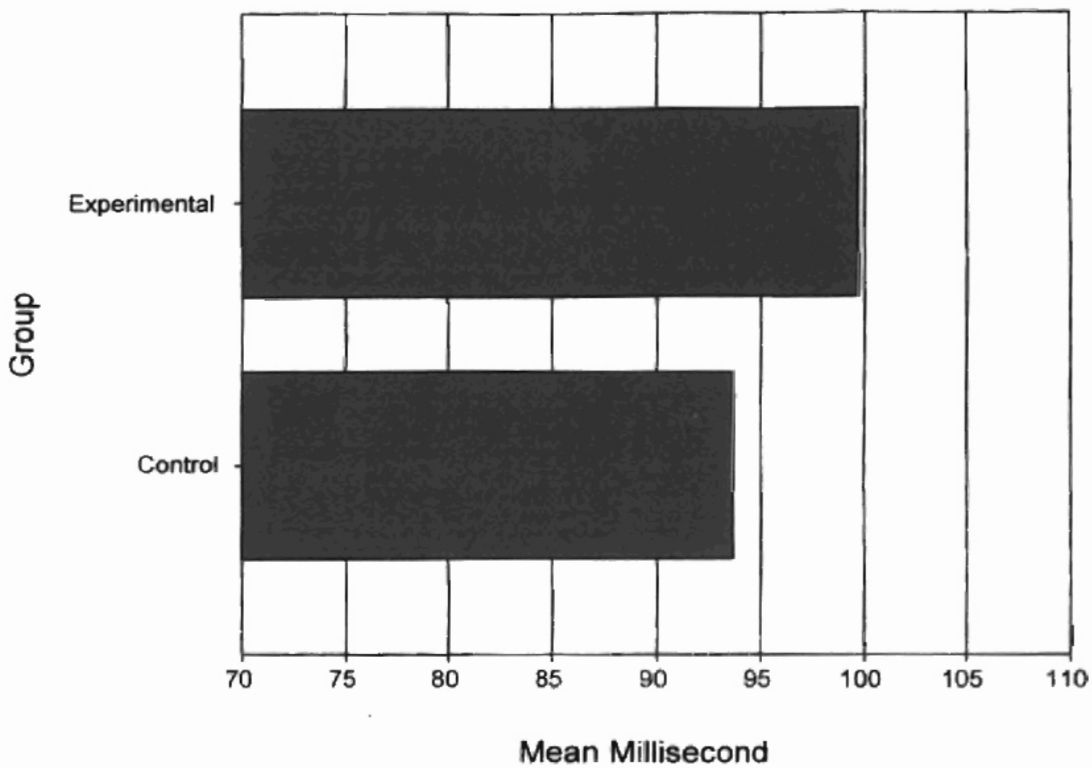

Figure 11. Face Image 2 (FI2) Between Group Mean Millisecond Scores from Interresponse Time Data

Experimental group trial CF1 to control group trial CF1 showed significant difference, ($t = 2.58$, $p = .014$), $p < .05$. Figure 12 shows mean scores for trial CF1 between groups. Experimental group has a mean of 99.7 ($\underline{M} = 99.7$), and control group has a mean of 95.5 ($\underline{M} = 94.3$), showing a difference of 4.2 milliseconds.

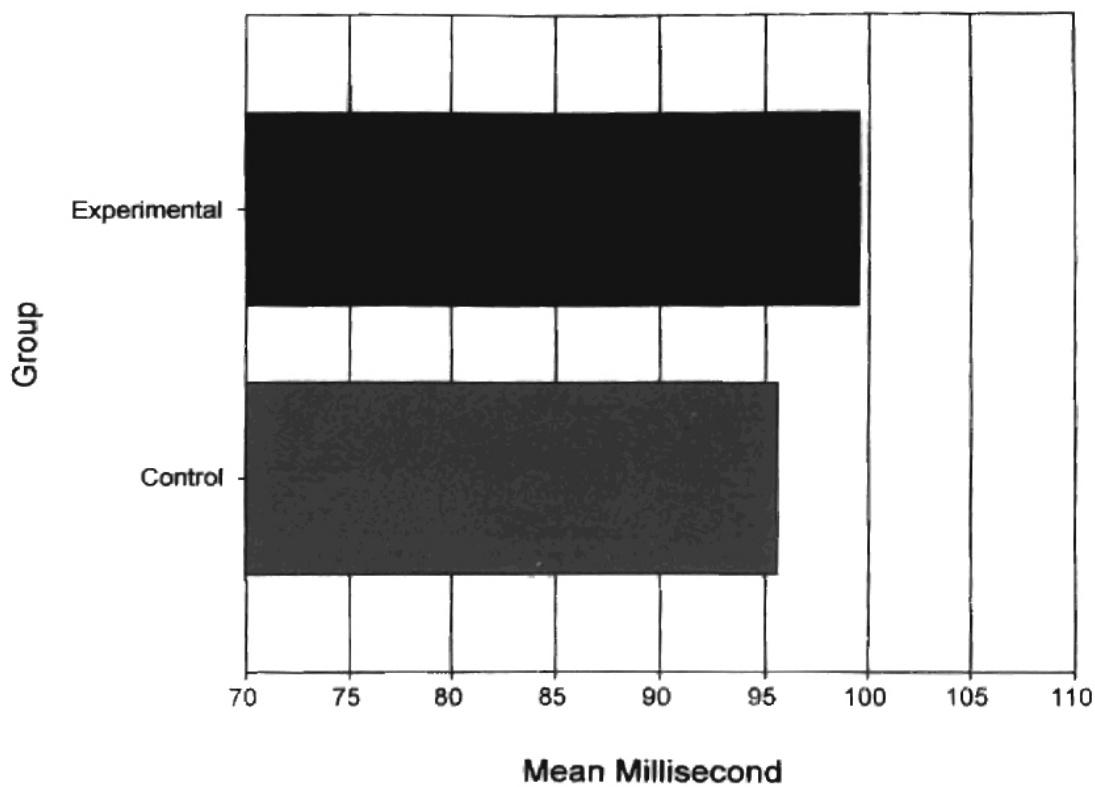

Figure 12. Confederate 1 (CF1) Between Group Mean Millisecond Scores from Interresponse Time Data

Experimental group trial CF2 to control group trial CF2 showed significant difference, ($t = 2.64$, $p = .012$), $p < .05$. Figure 13 shows mean scores for trial CF2 between groups. Experimental group has a mean of 100.5 ($\underline{M} = 100.5$), and control group has a mean of 94 ($\underline{M} = 94$), showing a difference of 6.5 milliseconds.

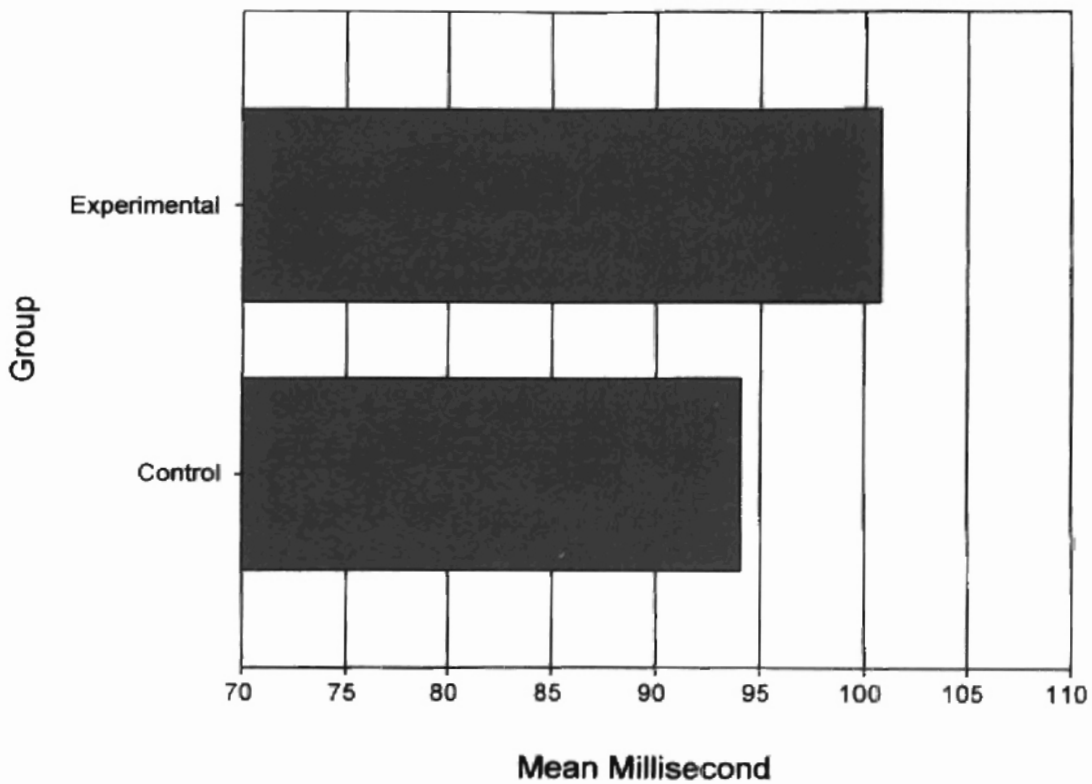

Figure 13. Confederate 2 (CF2) Between Group Mean Millisecond Scores from Interresponse Time Data

Within Groups Analysis

A within groups analysis was conducted to determine if there were significant differences between experimental and control trials within each group, experimental and control. An independent samples t-test was used with 95% confidence interval of mean differences or .05 Alpha level. Both equal variances assumed and not assumed tests were conducted. As was expected there were significant differences in within group mean IRT scores between experimental and control trials in the experimental group. Also, as was expected there were no significant difference in within group mean IRT scores between experimental and control trials in the control group.

Experimental Group

As was expected the between groups analysis showed suppression for each experimental trial compared to each control trial within the experimental group. A paired samples t-test was conducted to determine significance between trials.

Experimental trial E1 compared to control trial C1 showed a significance of .000, ($t = 8.55$, $p = .000$), $p < .05$. Experimental trial E1 compared to control trial C2 showed significance of .000, ($t = 5.28$, $p = .000$), $p < .05$. Experimental trial E1 compared to control trial C3 showed significance of .000, ($t = 5.45$, $p = .000$), $p < .05$. Experimental trial E2 compared to control trial C1 showed significance of .000, ($t = 7.04$, $p = .000$), $p < .05$. Experimental trial E2 compared to control trial C2 showed significance of .000, ($t = 5.48$, $p = .000$), $p < .05$. Experimental trial E2 compared to control trial C3 showed significance of .000, ($t = 5.05$, $p = .000$), $p < .05$.

Experimental trial E3 compared to control trial C1 showed significance of .000, ($t = 6.05$, $p = .000$), $p < .05$. Experimental trial E3 compared to control trial C2 showed significance of .000, ($t = 5.11$, $p = .000$), $p < .05$. Experimental trial E3 compared to control trial C3 showed significance of .000, ($t = 7.13$, $p = .000$), $p < .05$. Figure 14 shows the mean score for all trials in the experimental group. The means for each trial are as follows: E1, $M = 101.8$,E2, $M = 101.1$, E3 $M = 102.3$, C1, $M = 95.5$, C2, $M = 94$, C3, $M = 92.7$.

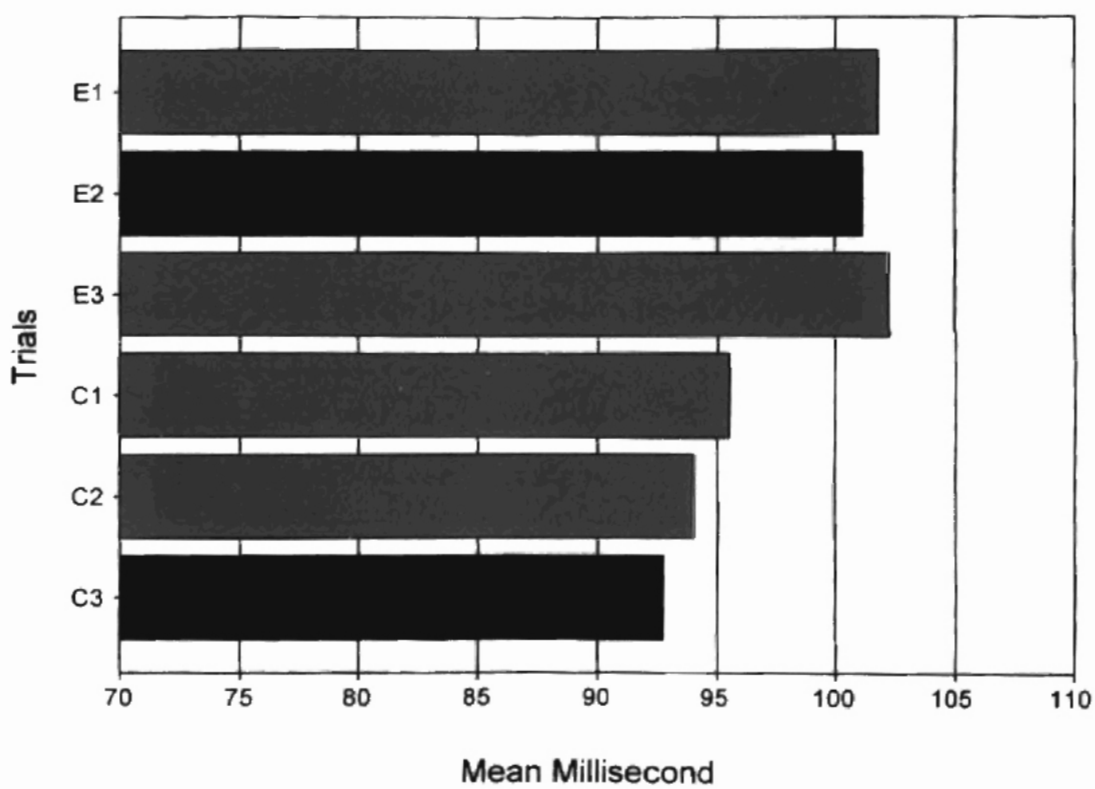

Figure 14. Mean Millisecond Scores from Experimental Group

Control Group

A within groups analysis of the control group was also conducted. A paired samples t-test was used to determine significance between trials. Each experimental trial was compared to each control trial. No significant variations were expected, however some comparisons showed significant differences. A discussion of these variations and their significance will be addressed in the discussion portion of this thesis.

Experimental trial E1 compared to control trial C1 showed no significant difference, ($t = -.244$, $p = .809$), $p > .05$. Experimental trial E1 compared to control trial C2 showed significance of .031, ($t = 2.31$, $p = .031$), $p < .05$. Experimental trial E1 compared to control trial C3 showed significance of .006, ($t = 3.05$, $p = .006$), $p < .05$. Experimental trial E2 compared to control trial C1 showed no significant difference, ($t = -1.72$, $p = .099$), $p > .05$. Experimental trial E2 compared to control trial C2 showed no significant difference, ($t = .845$, $p = .408$), $p > .05$. Experimental trial E1 compared to control trial C3 showed significance of .014, ($t = 2.67$, $p = .014$), $p < .05$. Experimental trial E3 compared to control trial C1 showed significance of .045, ($t = -2.13$, $p = .045$), $p < .05$. Experimental trial E3 compared to control trial C2 showed no significant difference, ($t = -1.14$, $p = .265$), $p > .05$. Experimental trial E3 compared to control trial C3 showed significance of .049, ($t = 2.09$, $p = .049$), $p < .05$.

Figure 15 shows the mean score for all trials in the control group The means for each trial are as follows: E1, $M = 96.4$,E2, $M = 96.2$, E3 $M = 95.3$, C1, $M = 96.5$, C2, $M = 95.8$, C3, $M = 94.5$.

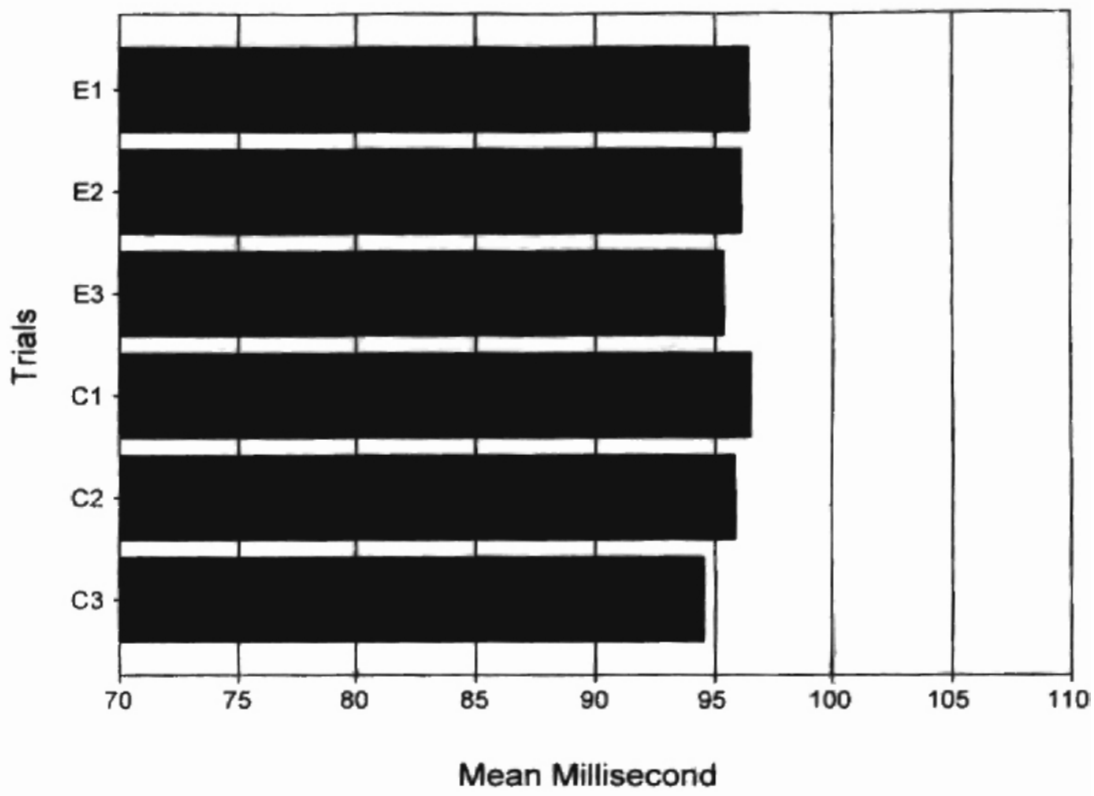

Figure 15. Mean Millisecond Scores from Control Group

Experimental Group Results by Participant

The following section shows within subject results for each experimental participant. As was expected there were significant within subject differences between experimental and control trials.

Experimental Participant 1

The results for participant one indicated more suppression occurred during the experimental trials, which was the expected result for all experimental participants.

Figure 16 shows Experimental (M = 102.9), which is the mean millisecond score for all the experimental trials and Control (M = 101.7), which is the mean millisecond score for all the control trials. A paired samples t-test was conducted between control and experimental trials with a significance of .007, ($t = 3.14$, $p = .007$), $p < .05$.

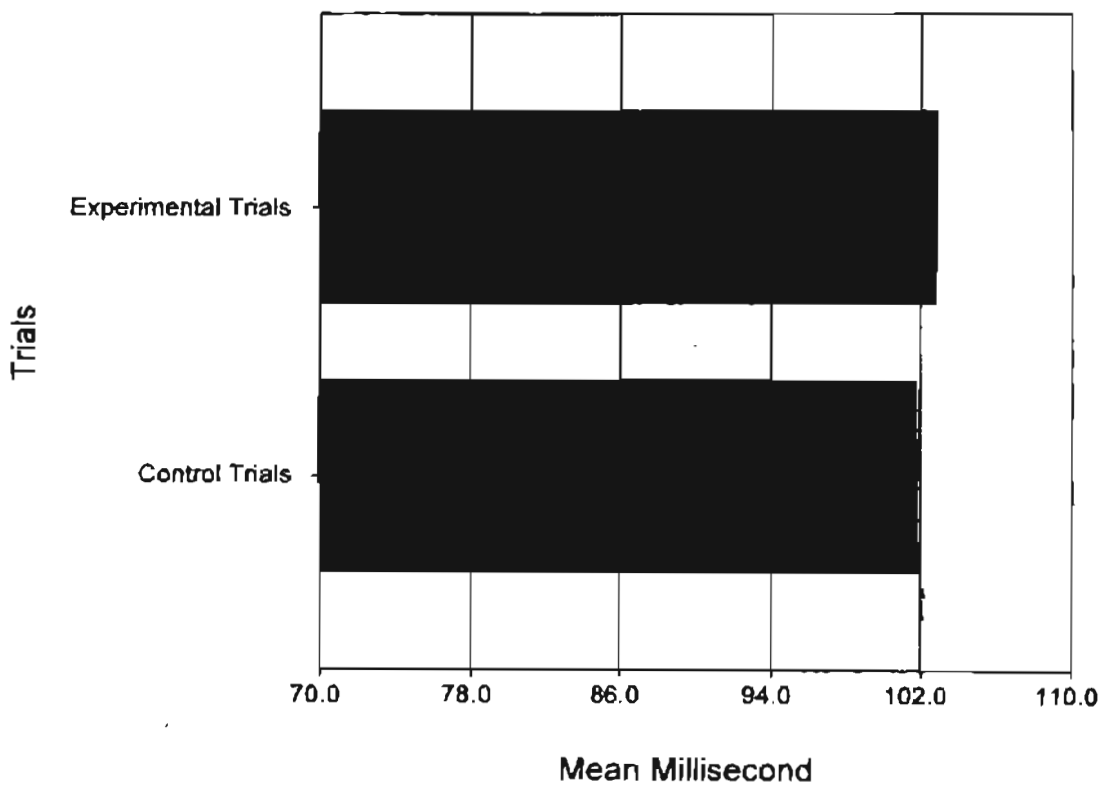

Figure 16. Mean Millisecond Scores Showing Main Effect of Stimulus for Experimental Participant 1

Experimental Participant 2

The results for participant two indicated more suppression occurred during the experimental trials, which was the expected result for all experimental participants. Figure 17 shows Experimental ($\underline{M}$ = 104.1), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 96.2), which is the mean millisecond score for all the control trials. A paired samples t-test was conducted between control and experimental trials with a significance of .000, ($t = 7.50$, $\underline{p} = .000$), $\underline{p} < .05$.

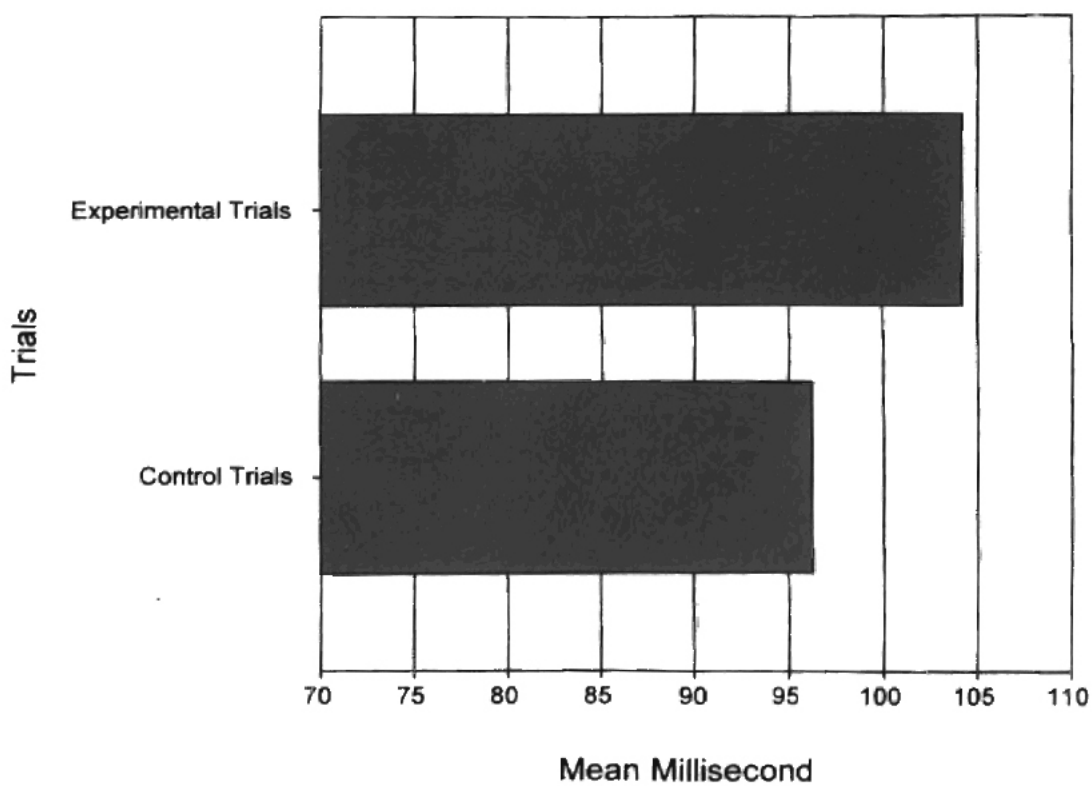

Figure 17. Mean Millisecond Scores Showing Main Effect of Stimulus for Experimental Participant 2

Experimental Participant 3

The results for participant three indicated more suppression occurred during the experimental trials, which was the expected result for all experimental participants. Figure 18 shows Experimental ($\underline{M}$ = 103.2), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 96.8), which is the mean millisecond score for all the control trials. A paired samples t-test was conducted between control and experimental trials with a significance of .000, ($t = 12.37$, $\underline{p} = .000$), $\underline{p} < .05$.

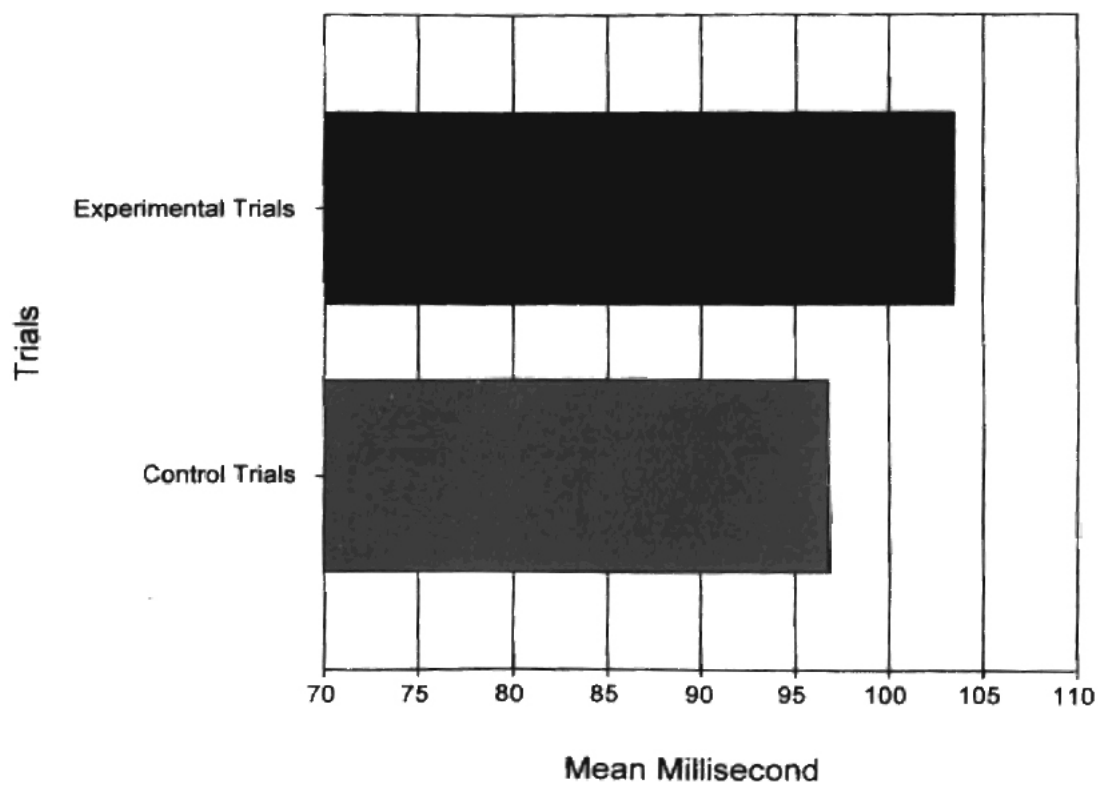

Figure 18. Mean Millisecond Scores Showing Main Effect of Stimulus for Experimental Participant 3

Experimental Participant 4

The results for participant four indicated more suppression occurred during the experimental trials, which was the expected result for all experimental participants. Figure 19 shows Experimental ($\underline{M}$ = 103.4), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 95.9), which is the mean millisecond score for all the control trials. A paired samples t-test was conducted between control and experimental trials with a significance of .000, ($t = 10.74$, $\underline{p} = .000$), $\underline{p} < .05$.

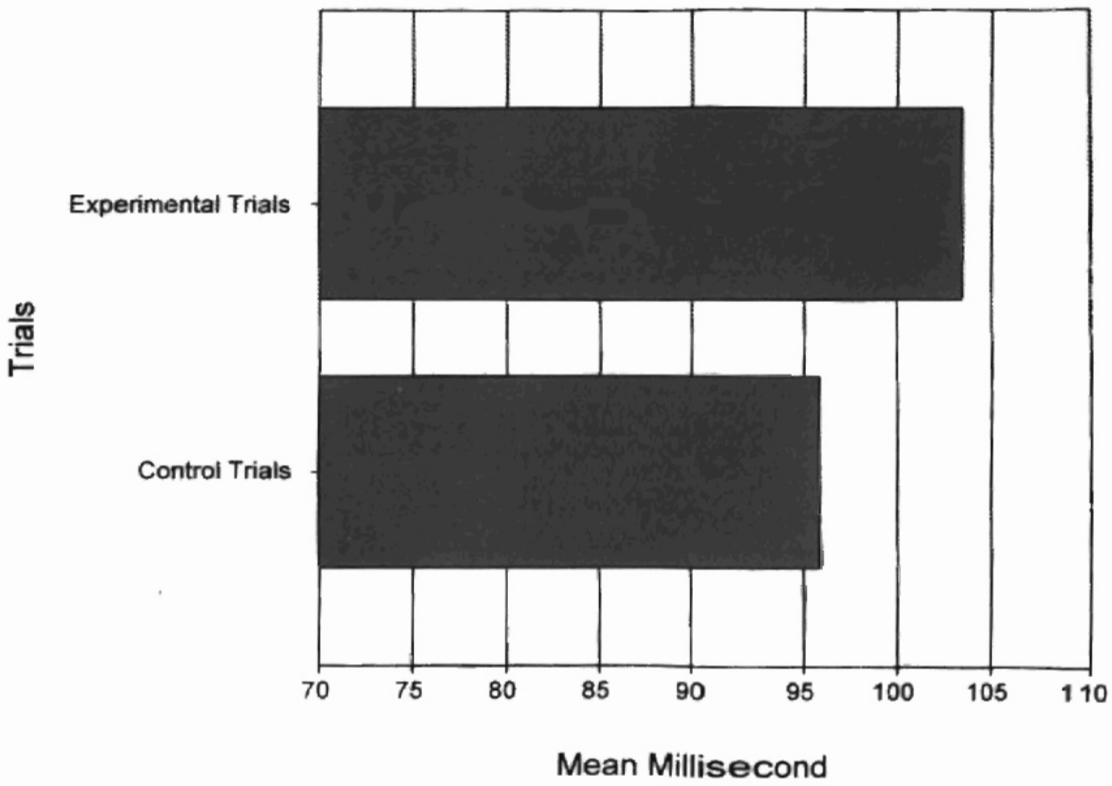

Figure 19. Mean Millisecond Scores Showing Main Effect of Stimulus for Experimental Participant 4

Experimental Participant 5

The results for participant five indicated more suppression occurred during the experimental trials, which was the expected result for all experimental participants. Figure 20 shows Experimental ($\underline{M}$ = 96.4), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 88.6), which is the mean millisecond score for all the control trials. A paired samples t-test was conducted between control and experimental trials with a significance of .000, ($t = 10.07$, $\underline{p} = .000$), $\underline{p} < .05$.

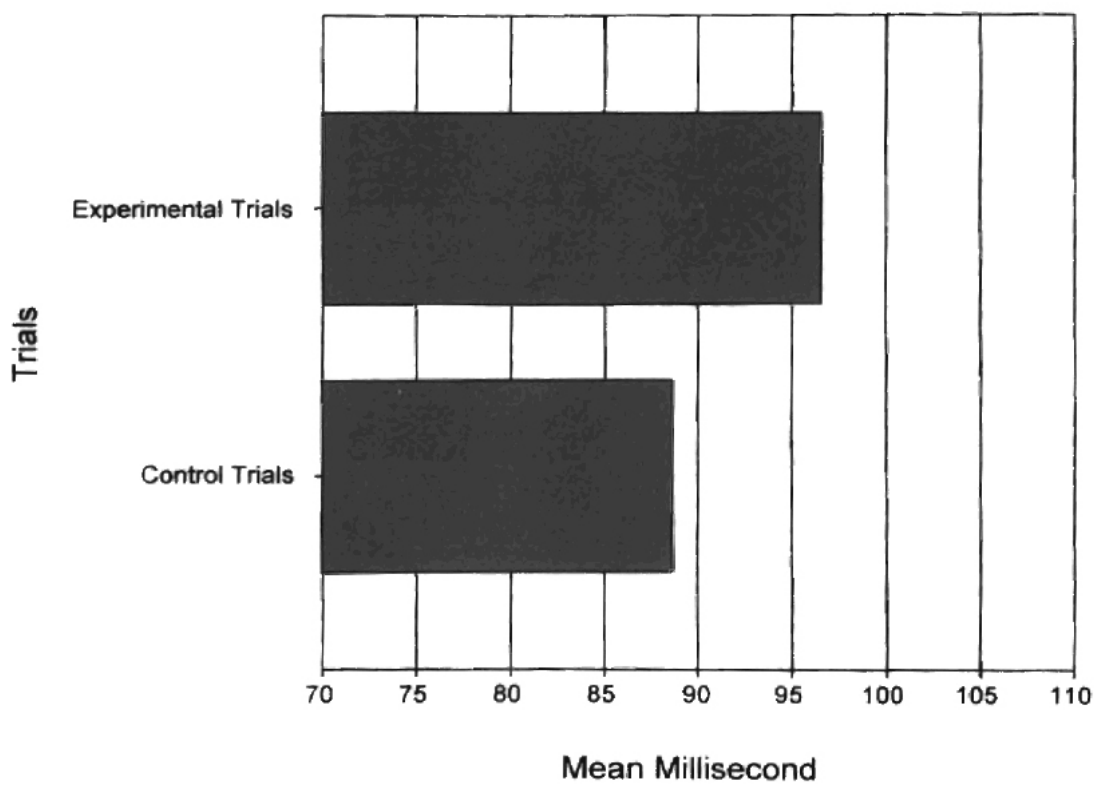

Figure 20. Mean Millisecond Scores Showing Main Effect of Stimulus for Experimental Participant 5

Experimental Participant 6

The results for participant six indicated more suppression occurred during the experimental trials, which was the expected result for all experimental participants. Figure 21 shows Experimental ($\underline{M}$ = 89), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 80.8), which is the mean millisecond score for all the control trials. A paired samples t-test was conducted between control and experimental trials with a significance of .000, ($t = 6.30$, $\underline{p} = .000$), $\underline{p} < .05$.

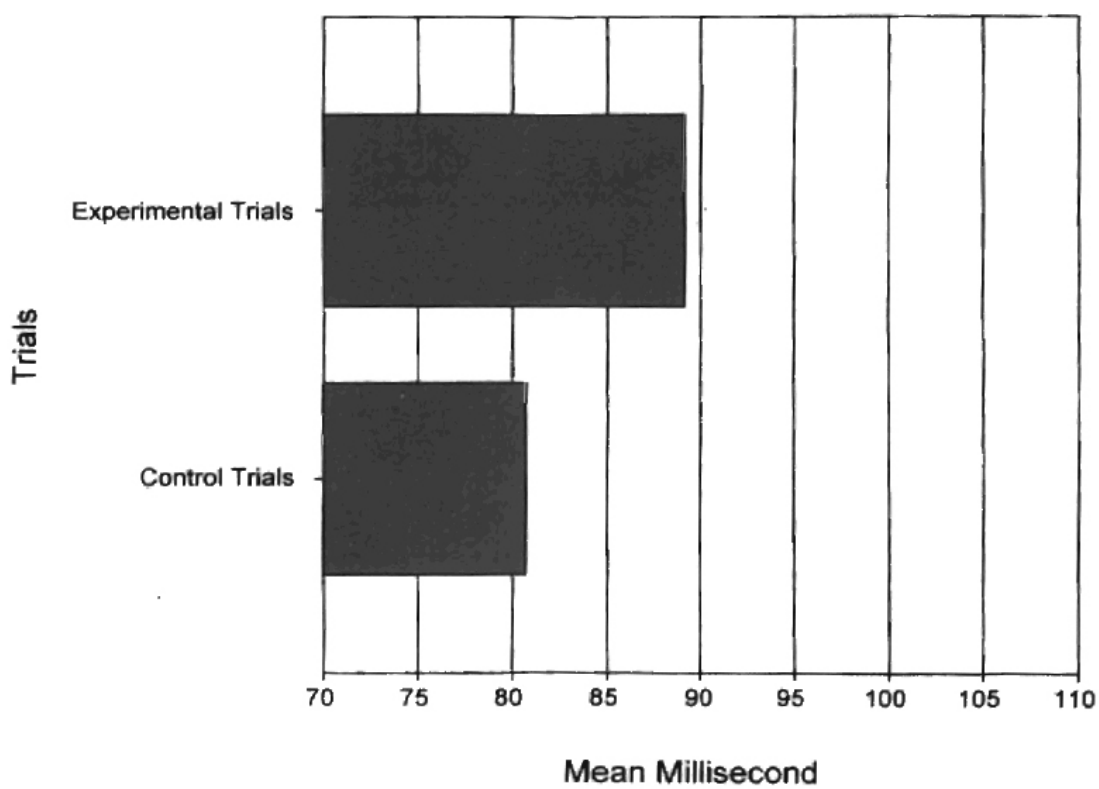

Figure 21. Mean Millisecond Scores Showing Main Effect of Stimulus for Experimental Participant 6

Experimental Participant 7

The results for participant seven indicated more suppression occurred during the experimental trials, which was the expected result for all experimental participants. Figure 22 shows Experimental ($\underline{M}$ = 106.8), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 96.9), which is the mean millisecond score for all the control trials. A paired samples t-test was conducted between control and experimental trials with a significance of .000, ($t = 5.70$, $\underline{p} = .000$), $\underline{p} < .05$.

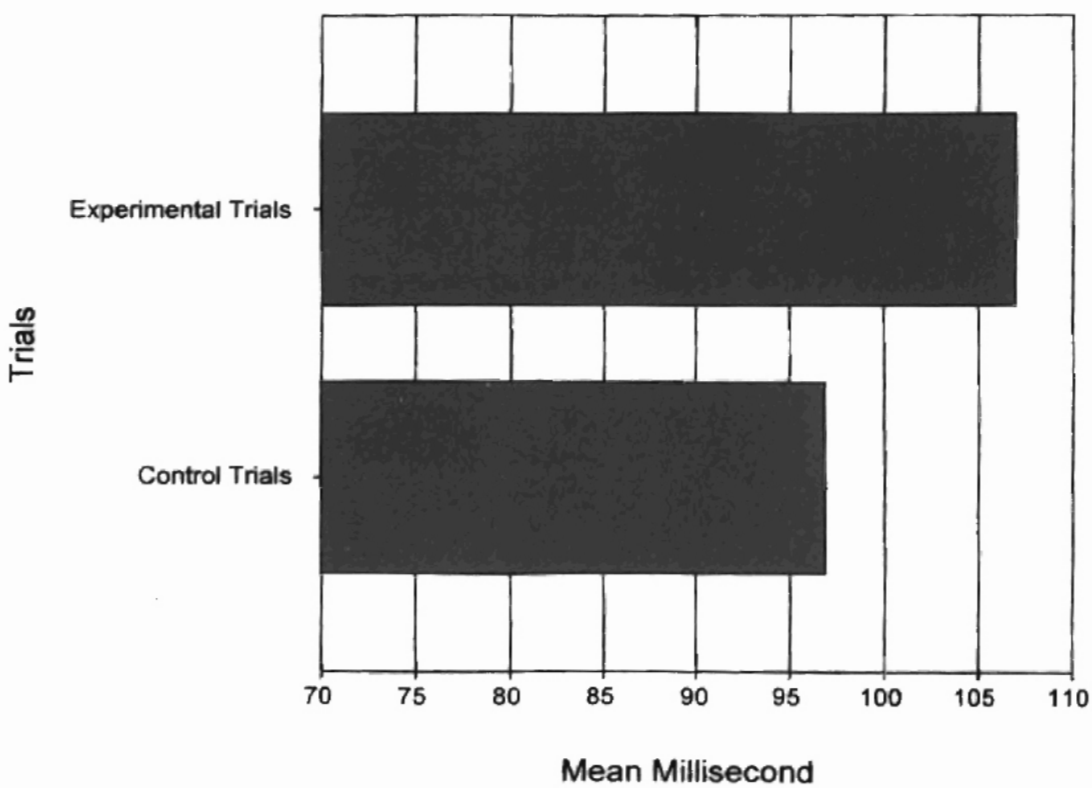

Figure 22. Mean Millisecond Scores Showing Main Effect of Stimulus for Experimental Participant 7

Experimental Participant 8

The results for participant eight indicated more suppression occurred during the experimental trials, which was the expected result for all experimental participants. Figure 23 shows Experimental ($\underline{M}$ = 102.4), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 95.4), which is the mean millisecond score for all the control trials. A paired samples t-test was conducted between control and experimental trials with a significance of .000, ($t = 8.28$, $\underline{p} = .000$), $\underline{p} < .05$.

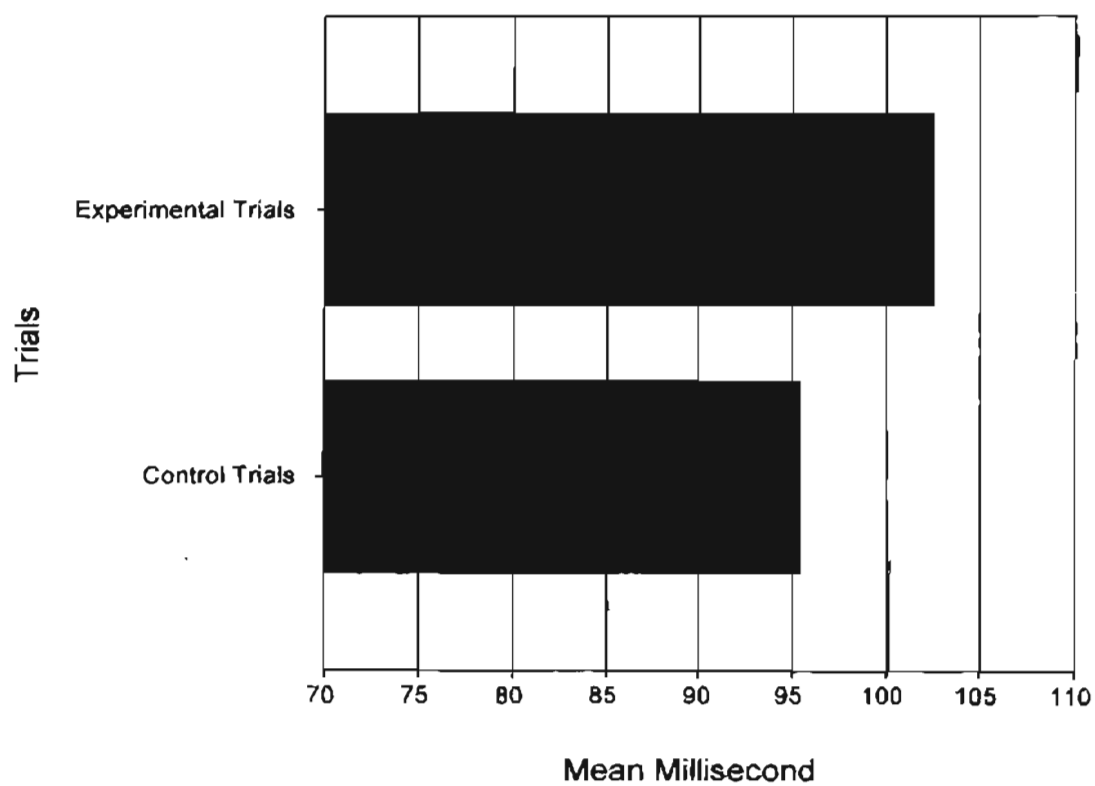

Figure 23. Mean Millisecond Scores Showing Main Effect of Stimulus for Experimental Participant 8

Experimental Participant 9

The results for participant nine indicated more suppression occurred during the experimental trials, which was the expected result for all experimental participants. Figure 24 shows Experimental ($\underline{M}$ = 101.5), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 94.7), which is the mean millisecond score for all the control trials. A paired samples t-test was conducted between control and experimental trials with a significance of .001, ($t = 4.39$, $\underline{p} = .001$), $\underline{p} < .05$.

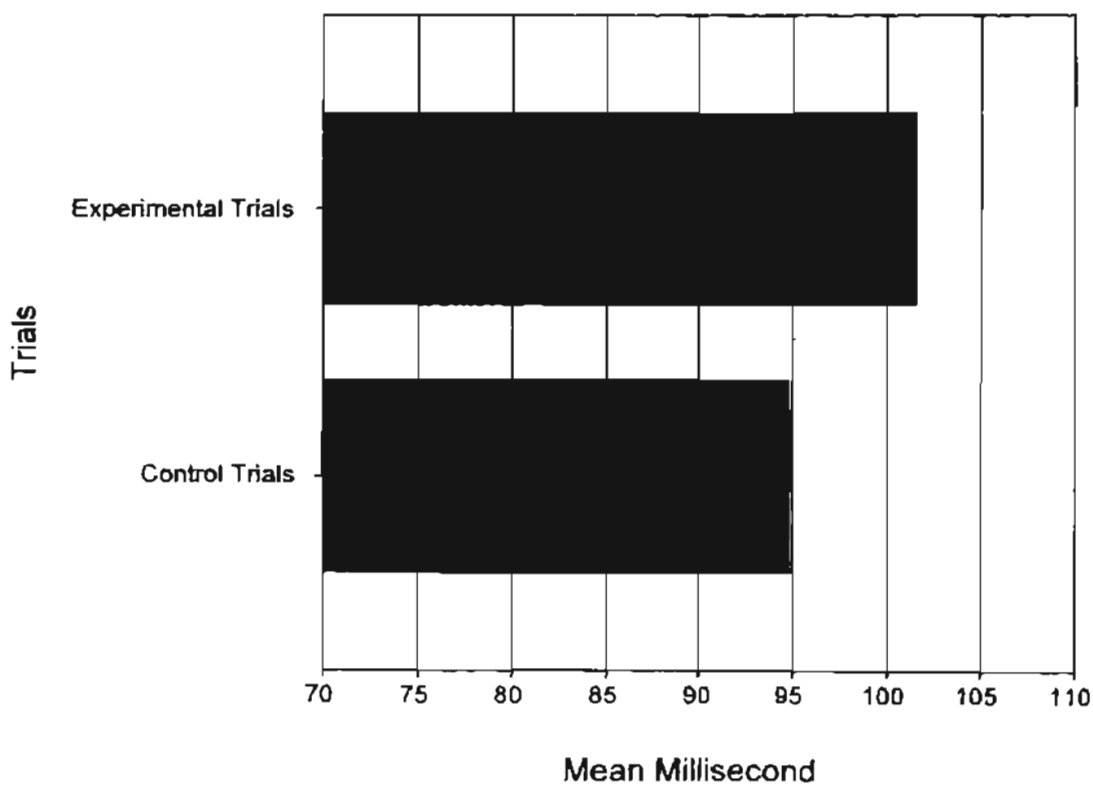

Figure 24. Mean Millisecond Scores Showing Main Effect of Stimulus for Experimental Participant 9

Experimental Participant 10

The results for participant ten indicated more suppression occurred during the experimental trials, which was the expected result for all experimental participants. Figure 25 shows Experimental ($\underline{M}$ = 109.8), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 100.2), which is the mean millisecond score for all the control trials. A paired samples t-test was conducted between control and experimental trials with a significance of .000, ($t = 8.62$, $\underline{p} = .000$), $\underline{p} < .05$.

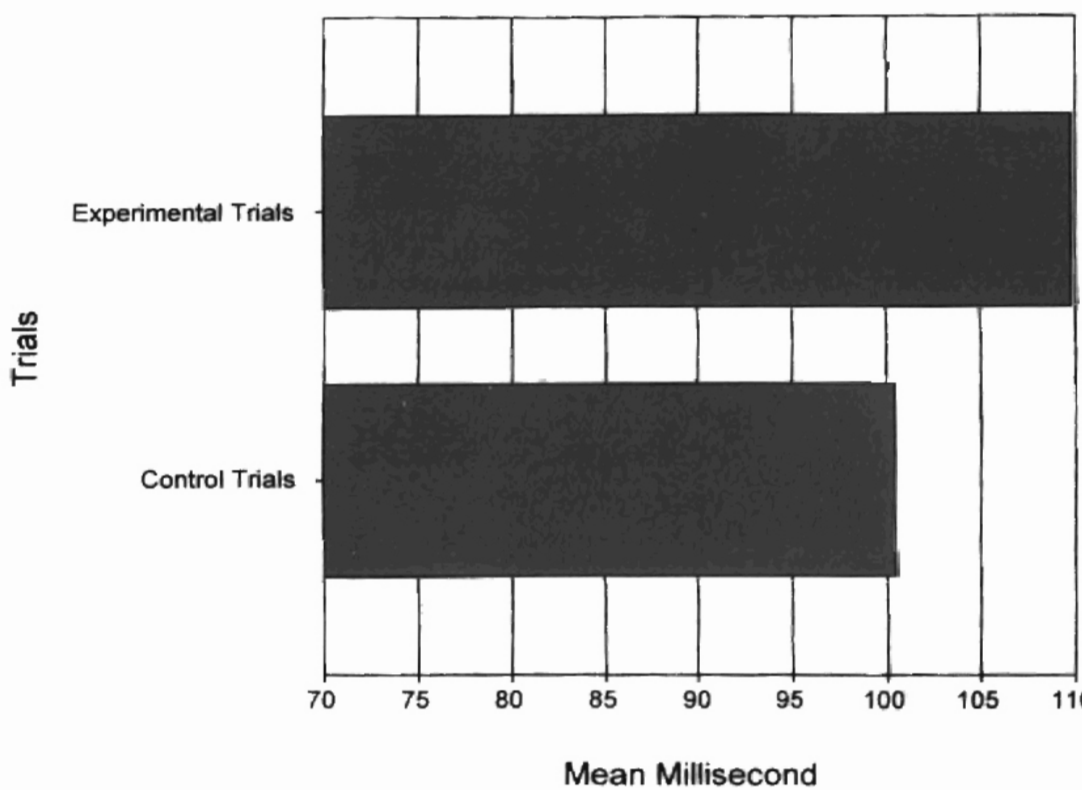

Figure 25. Mean Millisecond Scores Showing Main Effect of Stimulus for Experimental Participant 10

Experimental Participant 11

The results for participant eleven indicated more suppression occurred during the experimental trials, which was the expected result for all experimental participants. Figure 26 shows Experimental ($\underline{M}$ = 92.1), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 86.8), which is the mean millisecond score for all the control trials. A paired samples t-test was conducted between control and experimental trials with a significance of .003, ($t = 3.54$, $\underline{p} = .003$), $\underline{p} < .05$.

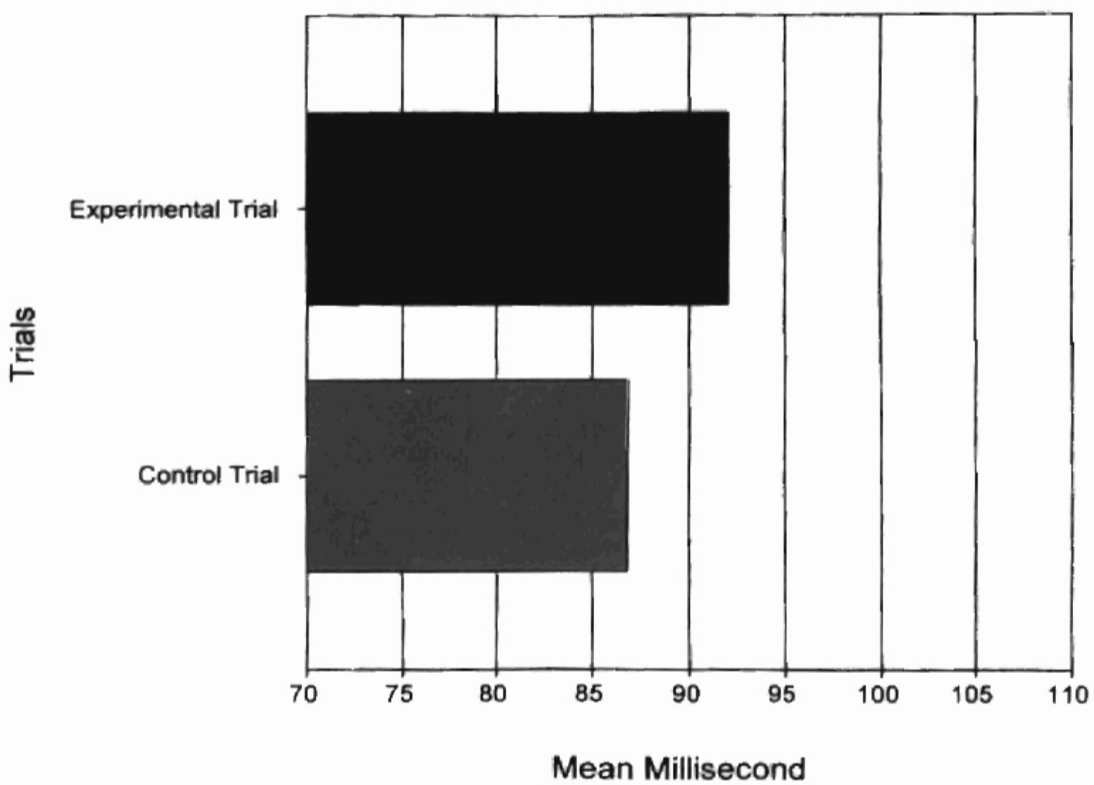

Figure 26. Mean Millisecond Scores Showing Main Effect of Stimulus for Experimental Participant 11

Experimental Participant 12

The results for participant twelve indicated more suppression occurred during the experimental trials, which was the expected result for all experimental participants. Figure 27 shows Experimental ($\underline{M}$ = 102.2), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 92.8), which is the mean millisecond score for all the control trials. A paired samples t-test was conducted between control and experimental trials with a significance of .000, ($t = 11.48$, $\underline{p} = .000$), $\underline{p} < .05$.

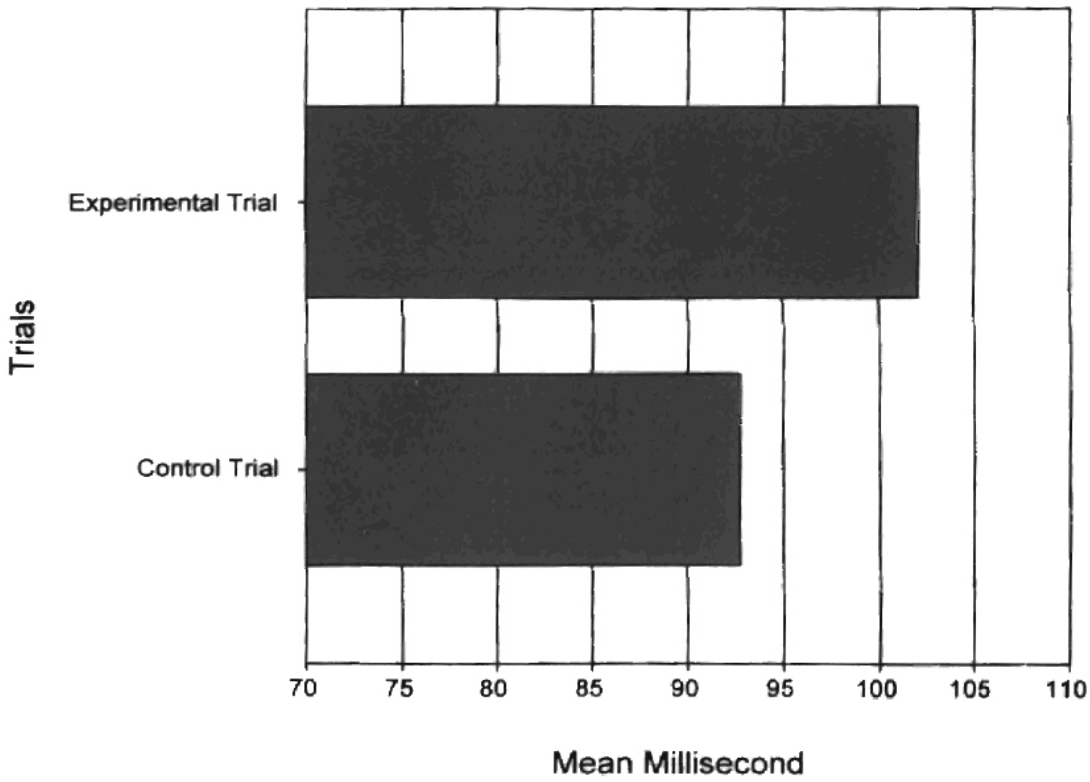

Figure 27. Mean Millisecond Scores Showing Main Effect of Stimulus for Experimental Participant 12

Experimental Participant 13

The results for participant thirteen indicated more suppression occurred during the experimental trials, which was the expected result for all experimental participants. Figure 28 shows Experimental ($\underline{M}$ = 104.7), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 99.7), which is the mean millisecond score for all the control trials. A paired samples t-test was conducted between control and experimental trials with a significance of .000, ($t = 7.16$, $\underline{p} = .000$), $\underline{p} < .05$.

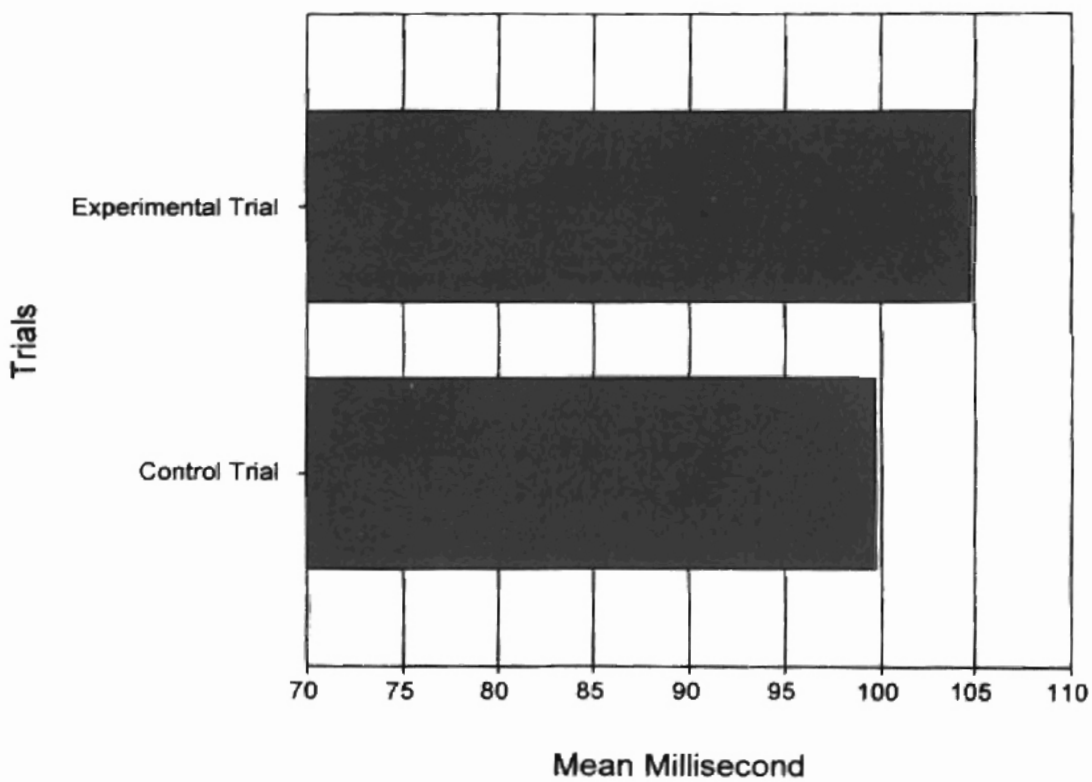

Figure 28. Mean Millisecond Scores Showing Main Effect of Stimulus for Experimental Participant 13

Experimental Participant 14

The results for participant fourteen indicated more suppression occurred during the experimental trials, which was the expected result for all experimental participants. Figure 29 shows Experimental ($\underline{M}$ = 106.7), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 99.8), which is the mean millisecond score for all the control trials. A paired samples t-test was conducted between control and experimental trials with a significance of .000, ($t = 10.91$, $\underline{p} = .000$), $\underline{p} < .05$.

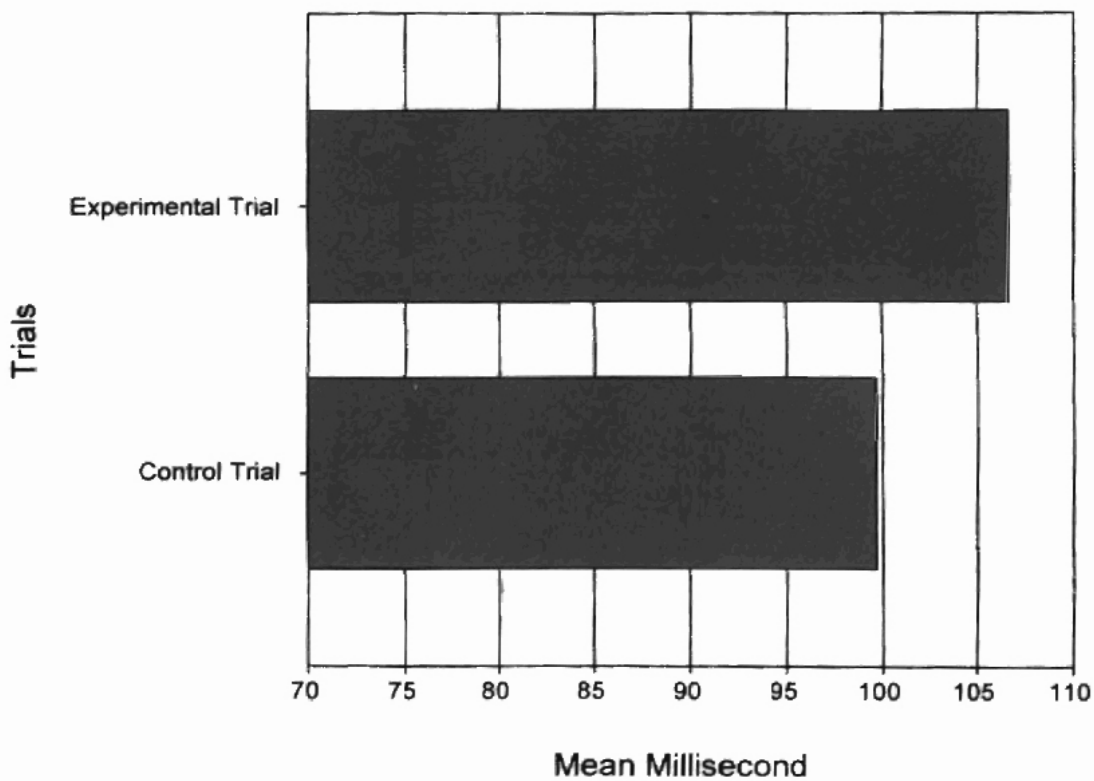

Figure 29. Mean Millisecond Scores Showing Main Effect of Stimulus for Experimental Participant 14

Experimental Participant 15

The results for participant fifteen indicated more suppression occurred during the experimental trials, which was the expected result for all experimental participants. Figure 30 shows Experimental ($\underline{M}$ = 105.2), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 98.1), which is the mean millisecond score for all the control trials. A paired samples t-test was conducted between control and experimental trials with a significance of .000, ($t = 16.46$, $\underline{p} = .000$), $\underline{p} < .05$.

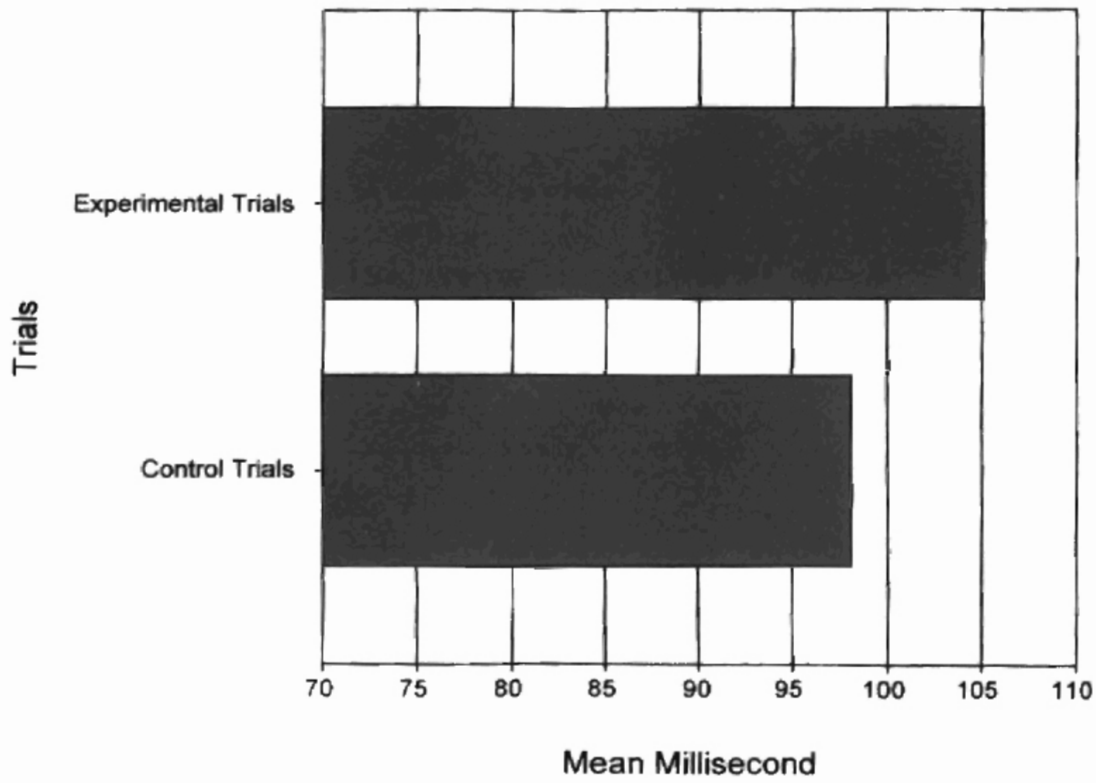

Figure 30. Mean Millisecond Scores Showing Main Effect of Stimulus for Experimental Participant 15

Experimental Participant 16

The results for participant sixteen indicated more suppression occurred during the experimental trials, which was the expected result for all experimental participants. Figure 31 shows Experimental ($\underline{M}$ = 98.2), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 91.2), which is the mean millisecond score for all the control trials. A paired samples t-test was conducted between control and experimental trials with a significance of .000, ($t = 7.65$, $\underline{p} = .000$), $\underline{p} < .05$.

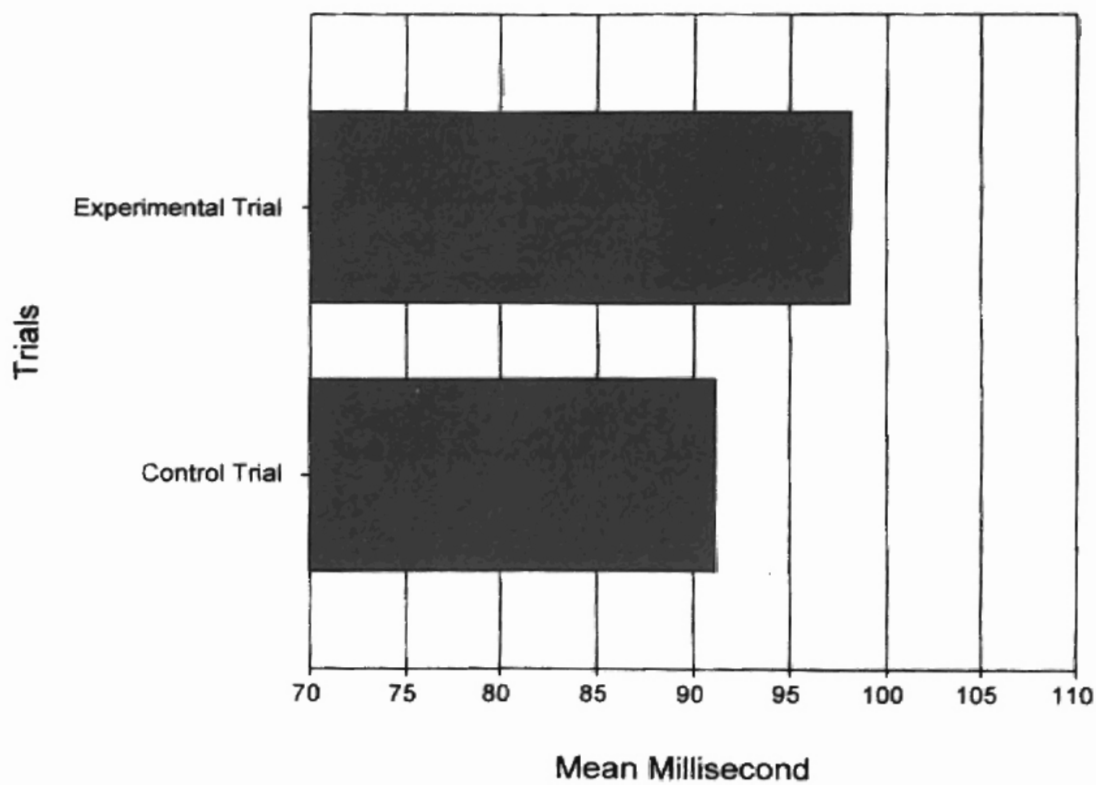

Figure 31. Mean Millisecond Scores Showing Main Effect of Stimulus for Experimental Participant 16

Experimental Participant 17

The results for participant seventeen indicated more suppression occurred during the experimental trials, which was the expected result for all experimental participants. Figure 32 shows Experimental ($\underline{M}$ = 108), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 101.3), which is the mean millisecond score for all the control trials. A paired samples t-test was conducted between control and experimental trials with a significance of .000, ($t = 7.03$, $\underline{p} = .000$), $\underline{p} < .05$.

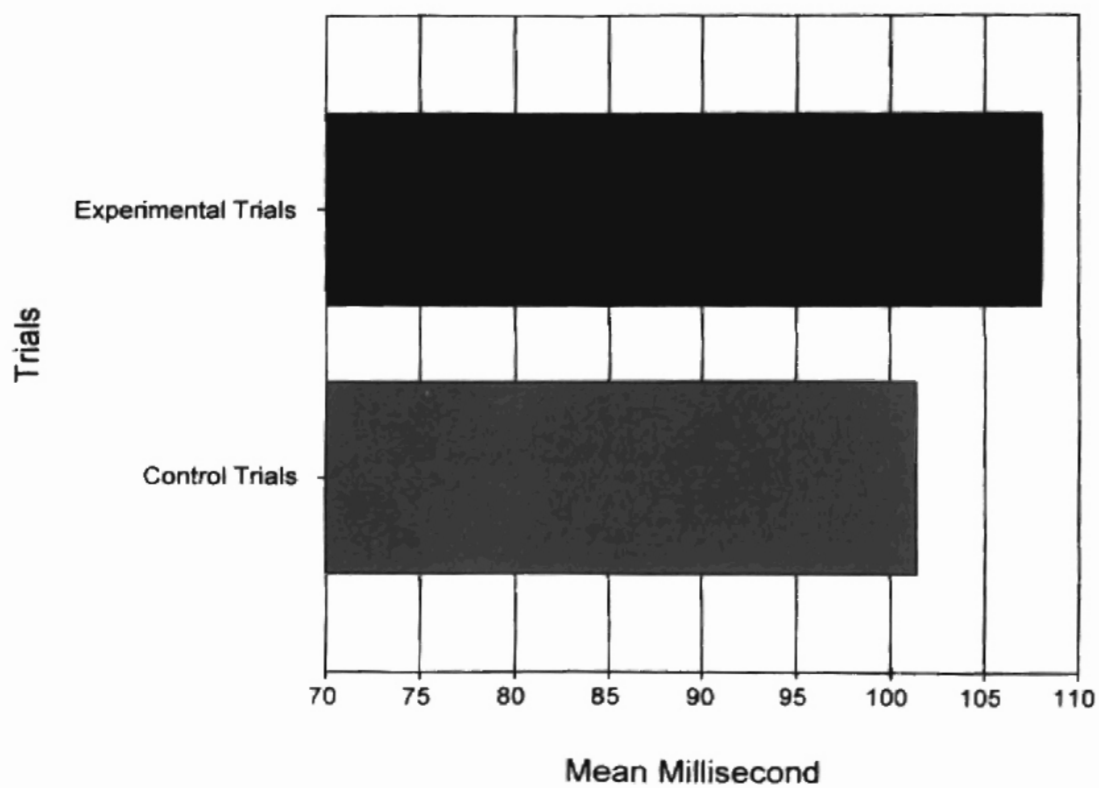

Figure 32. Mean Millisecond Scores Showing Main Effect of Stimulus for Experimental Participant 17

Experimental Participant 18

The results for participant eighteen indicated more suppression occurred during the experimental trials, which was the expected result for all experimental participants. Figure 33 shows Experimental ($\underline{M}$ = 106.5), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 101.9), which is the mean millisecond score for all the control trials. A paired samples t-test was conducted between control and experimental trials with a significance of .001, ($t = 3.97$, $\underline{p} = .001$), $\underline{p} < .05$.

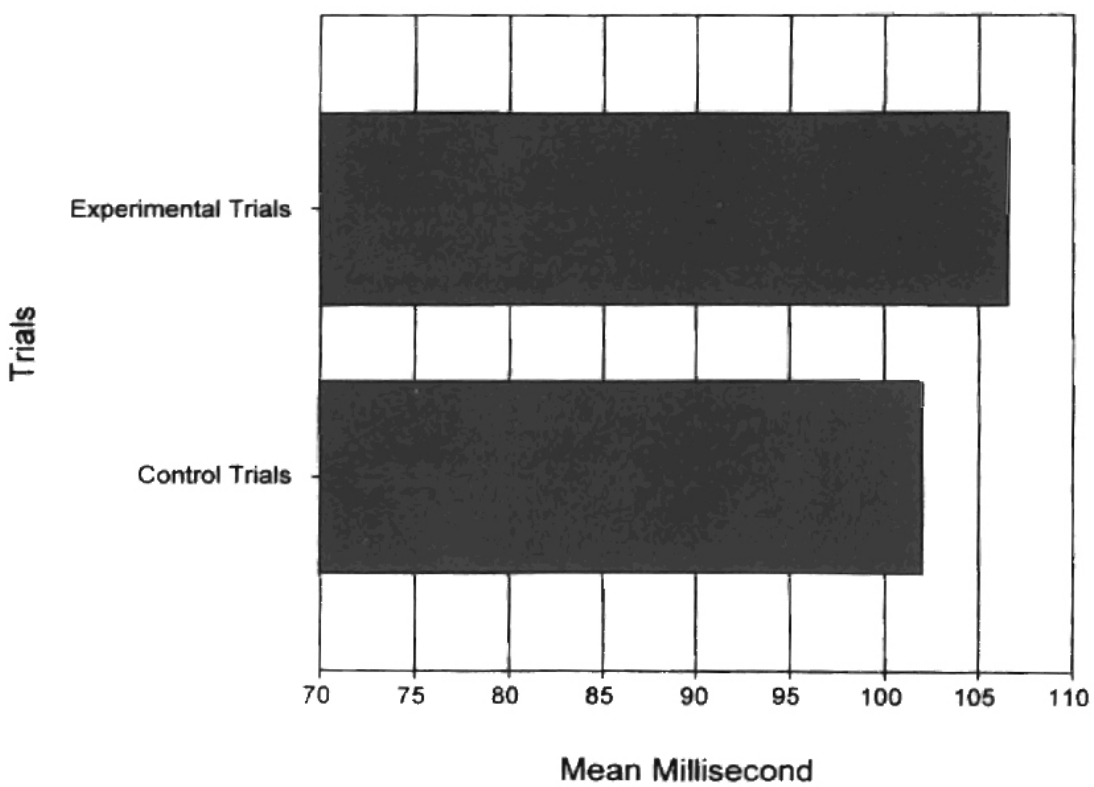

Figure 33. Mean Millisecond Scores Showing Main Effect of Stimulus for Experimental Participant 18

Experimental Participant 19

The results for participant nineteen indicated more suppression occurred during the experimental trials, which was the expected result for all experimental participants. Figure 34 shows Experimental ($\underline{M}$ = 97.5), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 73), which is the mean millisecond score for all the control trials. A paired samples t-test was conducted between control and experimental trials with a significance of .000, ($t = 5.82$, $\underline{p} = .000$), $\underline{p} < .05$.

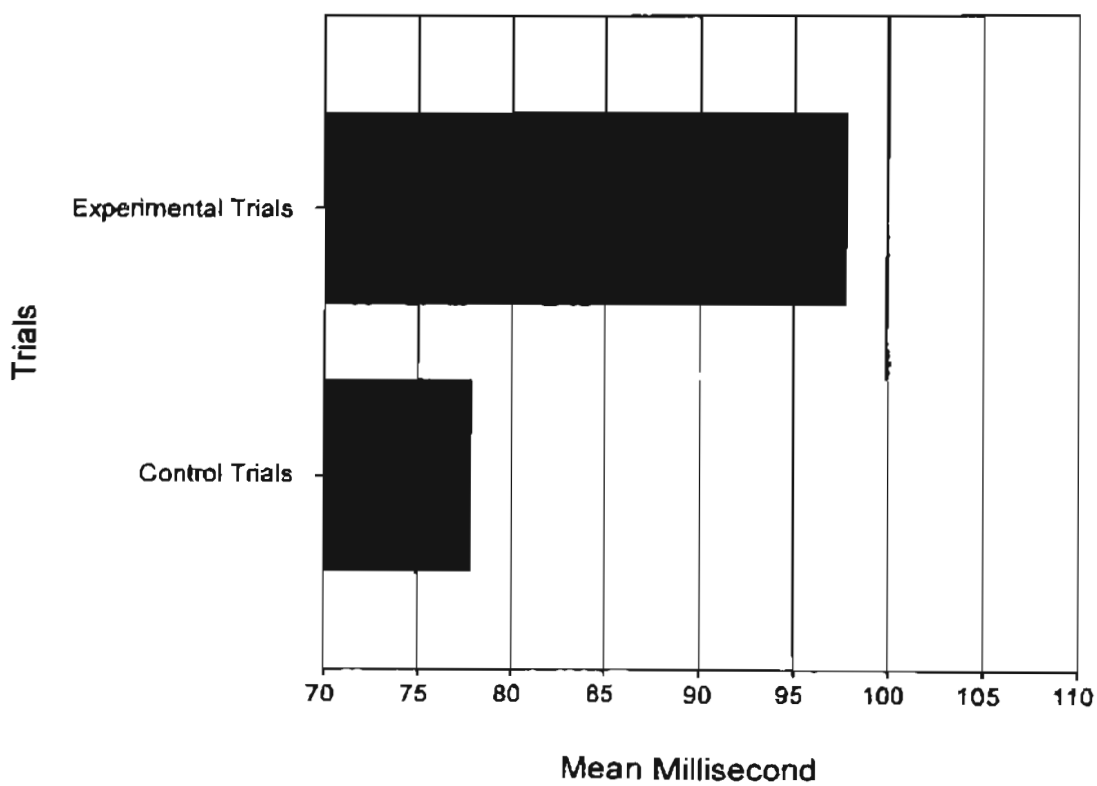

Figure 34. Mean Millisecond Scores Showing Main Effect of Stimulus for Experimental Participant 19

Experimental Participant 20

The results for participant twenty indicated more suppression occurred during the experimental trials, which was the expected result for all experimental participants. Figure 35 shows Experimental ($\underline{M}$ = 102.8), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 98.6), which is the mean millisecond score for all the control trials. A paired samples t-test was conducted between control and experimental trials with a significance of .000, ($t = 8.09$, $\underline{p} = .000$), $\underline{p} < .05$.

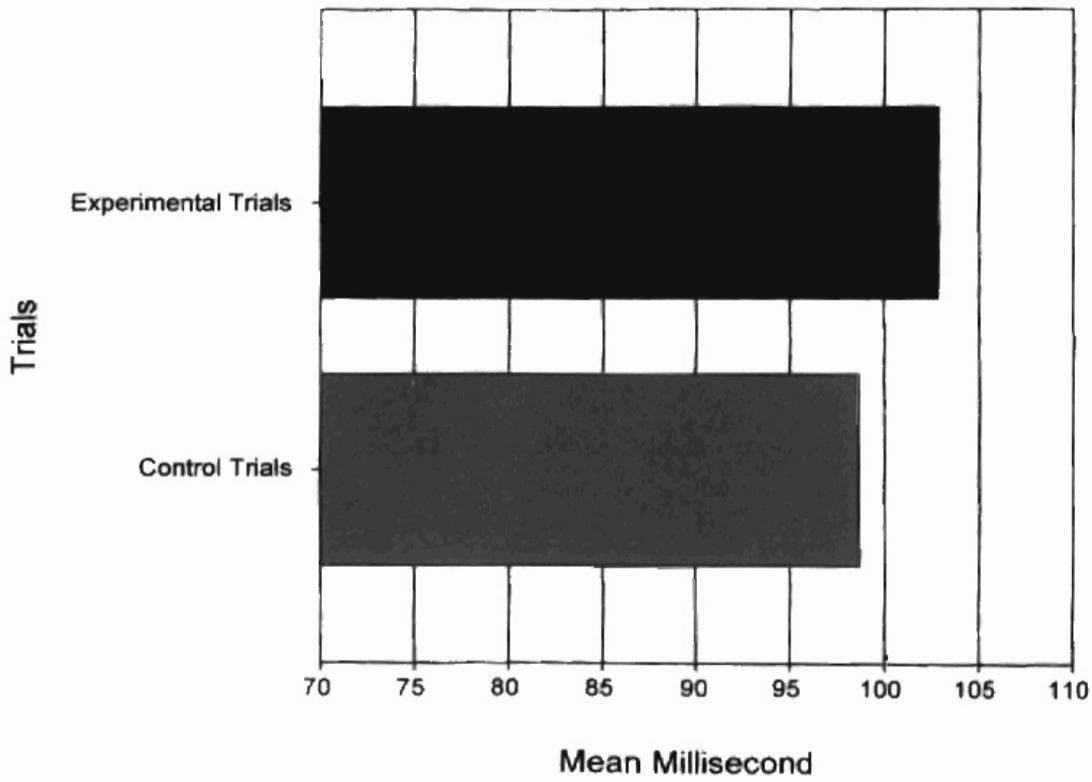

Figure 35. Mean Millisecond Scores Showing Main Effect of Stimulus for Experimental Participant 20

Experimental Participant 21

The results for participant twenty-one indicated more suppression occurred during the experimental trials, which was the expected result for all experimental participants. Figure 36 shows Experimental ($\underline{M}$ = 97.8), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 91.1), which is the mean millisecond score for all the control trials. A paired samples t-test was conducted between control and experimental trials with a significance of .000, ($t = 6.54$, $p = .000$), $p < .05$.

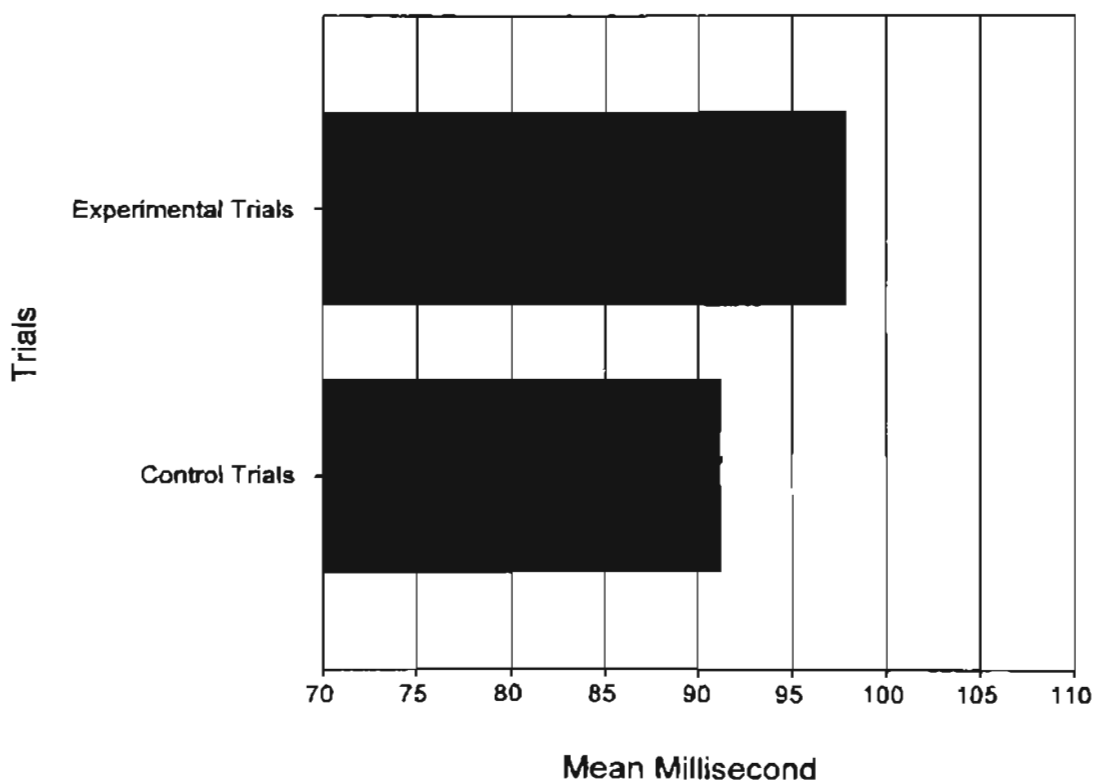

Figure 36. Mean Millisecond Scores Showing Main Effect of Stimulus for Experimental Participant 21

Control Group Results by Participant

The following section shows within subject results for each control participant. Twenty of the 22 participants showed no significance between experimental and control trials as was expected, however, control participants 15 and 16 showed significant difference between experimental and control trials. These differences will be discussed in the discussion portion of this thesis.

Control Participant 1

The results for control participant one indicated no significant difference in mean scores for experimental trials compared to control trials, which was the expected result for all control participants. Figure 37 shows Experimental (M = 105.35), which is the mean millisecond score for all the experimental trials and Control (M = 105.2), which is the mean millisecond score for all the control trials. A paired sample t-test was conducted with a significance of .755, (t = .318, p = .755), $p > .05$.

Control Participant 2

The results for control participant two indicated no significant difference in mean scores for experimental trials compared to control trials, which was the expected result for all control participants. Figure 38 shows Experimental (M = 103.4), which is the mean millisecond score for all the experimental trials and Control (M = 103.1), which is the mean millisecond score for all the control trials. A paired sample t-test was conducted with a significance of .553, (t = .605, p = .553), $p > .05$.

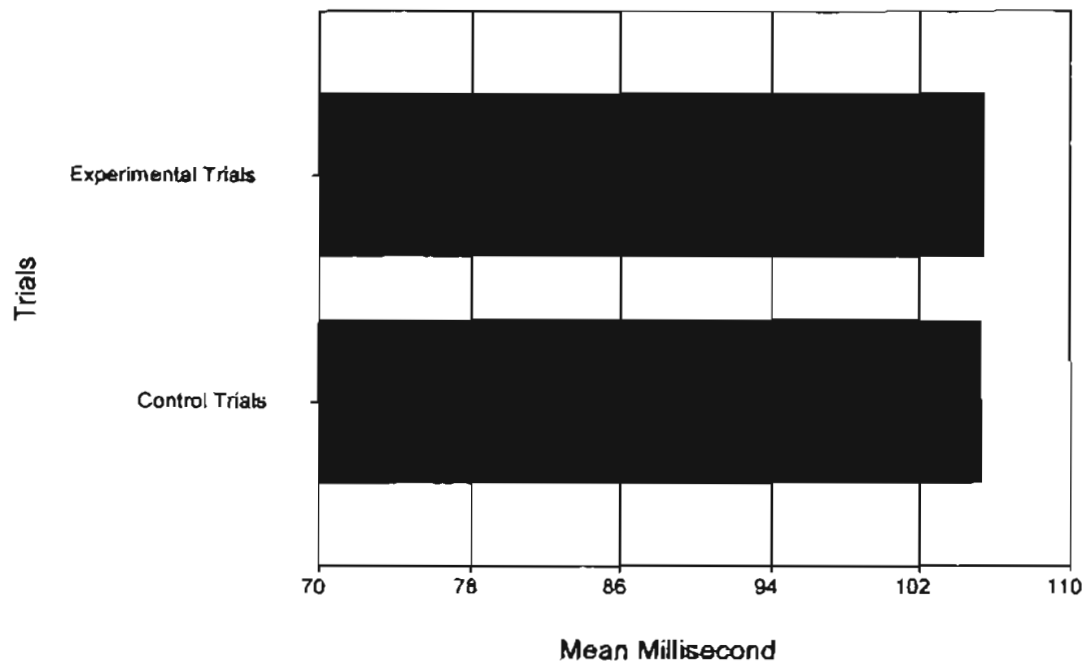

Figure 37. Control Participant 1 Mean Millisecond Scores

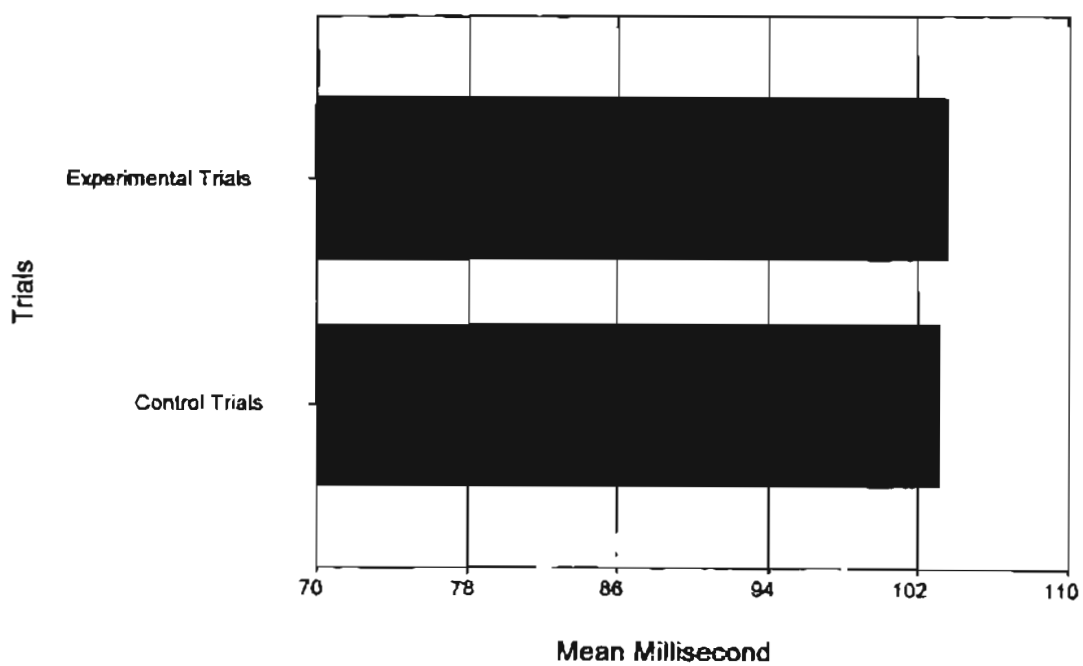

Figure 38. Control Participant 2 Mean Millisecond Scores

Control Participant 3

The results for control participant three indicated no significant difference in mean scores for experimental trials compared to control trials, which was the expected result for all control participants. Figure 39 shows Experimental ($\underline{M}$ = 104.41), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 103.95), which is the mean millisecond score for all the control trials. A paired sample t-test was conducted with a significance of .315, ($t = 1.03$, $\underline{p} = .315$), $\underline{p} > .05$.

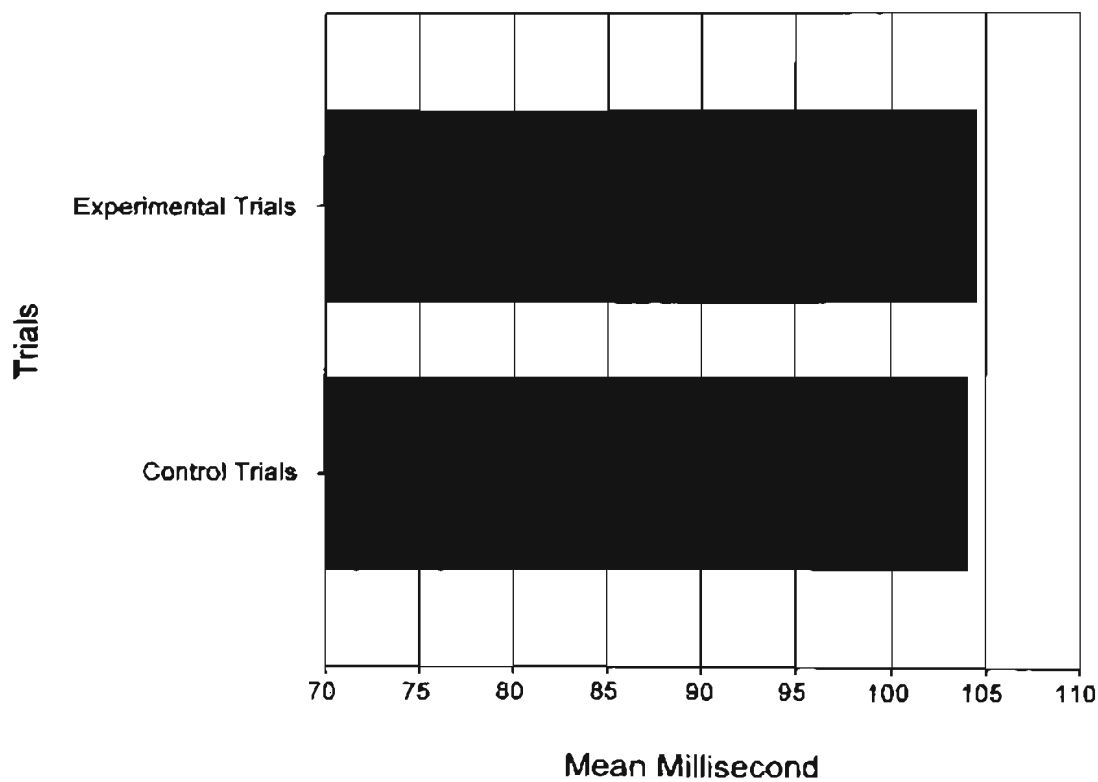

Figure 39. Control Participant 3 Mean Millisecond Scores

Control Participant 4

The results for control participant four indicated no significant difference in mean scores for experimental trials compared to control trials, which was the expected result for all control participants. Figure 40 shows Experimental ($\underline{M}$ = 91.54), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 92.53), which is the mean millisecond score for all the control trials. A paired sample t-test was conducted with a significance of .213, ($t = -1.29$, $p = .213$), $p > .05$.

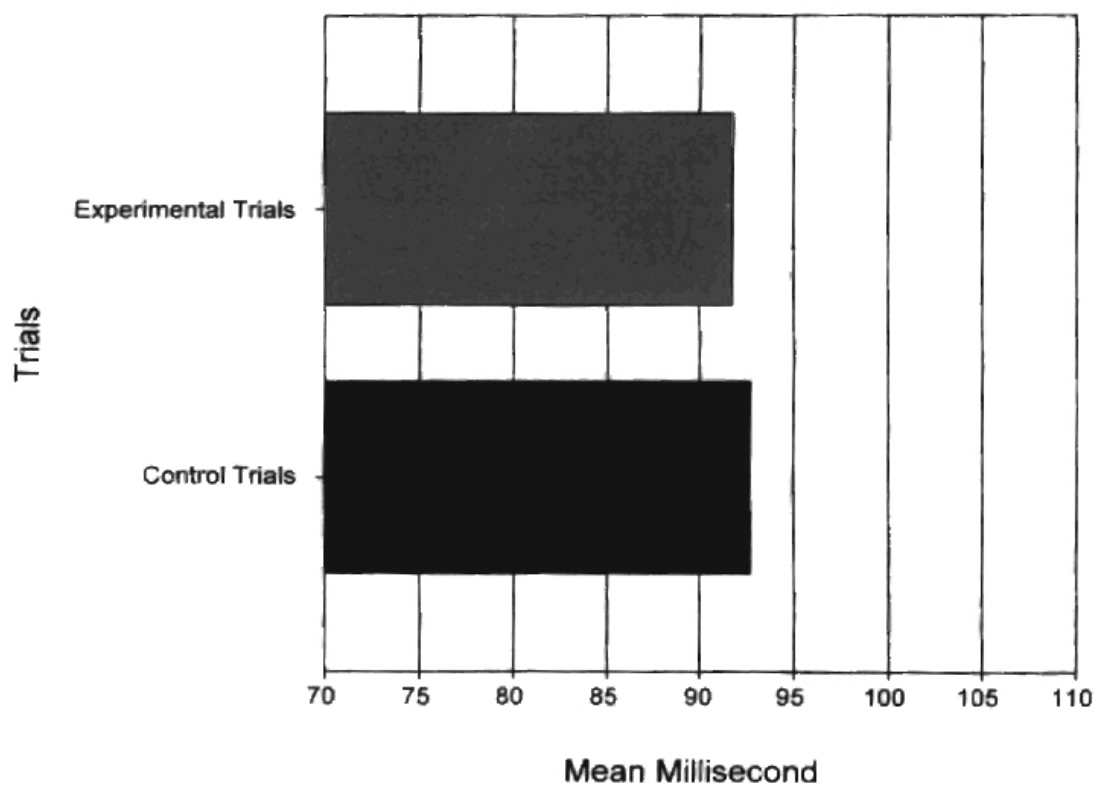

Figure 40. Control Participant 4 Mean Millisecond Scores

Control Participant 5

The results for control participant five indicated no significant difference in mean scores for experimental trials compared to control trials, which was the expected result for all control participants. Figure 41 shows Experimental ($\underline{M}$ = 98.51), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 98.05), which is the mean millisecond score for all the control trials. A paired sample t-test was conducted with a significance of .291, ($t = 1.08$, $\underline{p} = .291$), $\underline{p} > .05$.

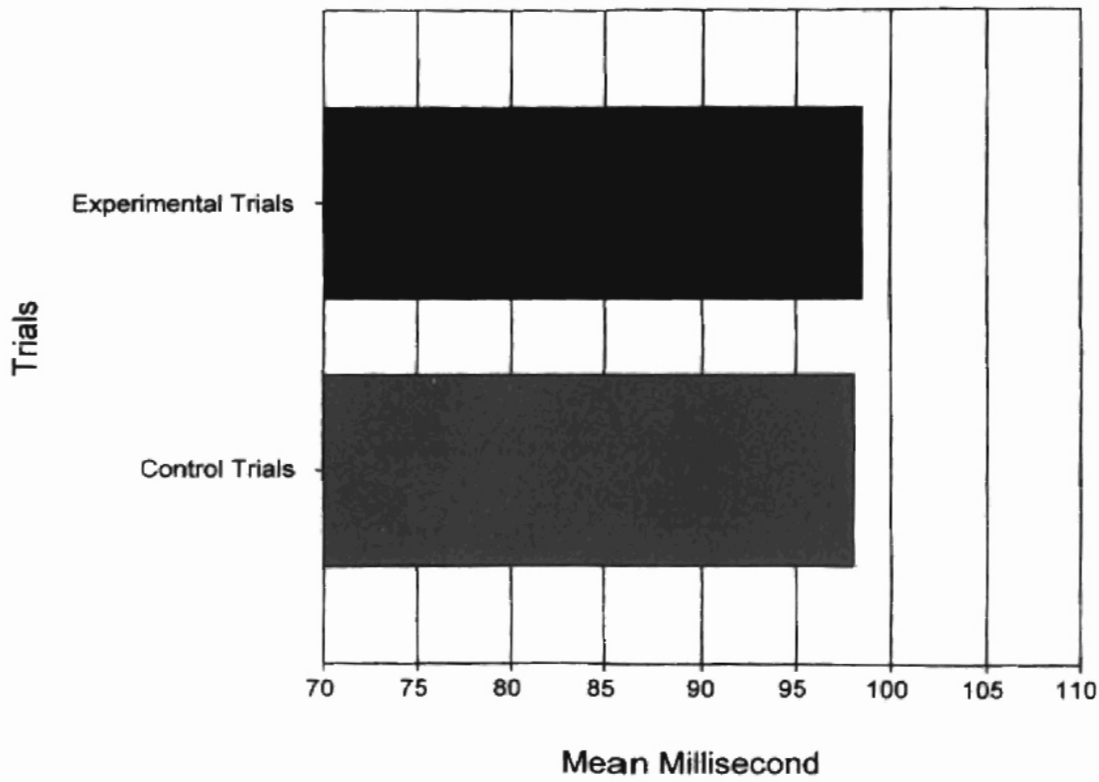

Figure 41. Control Participant 5 Mean Millisecond Scores

Control Participant 6

The results for control participant six indicated no significant difference in mean scores for experimental trials compared to control trials, which was the expected result for all control participants. Figure 42 shows Experimental ($\underline{M}$ = 99.02), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 98.91), which is the mean millisecond score for all the control trials. A paired sample t-test was conducted with a significance of .852, (t = .190, $\underline{p}$ = .852), $\underline{p} > .05$.

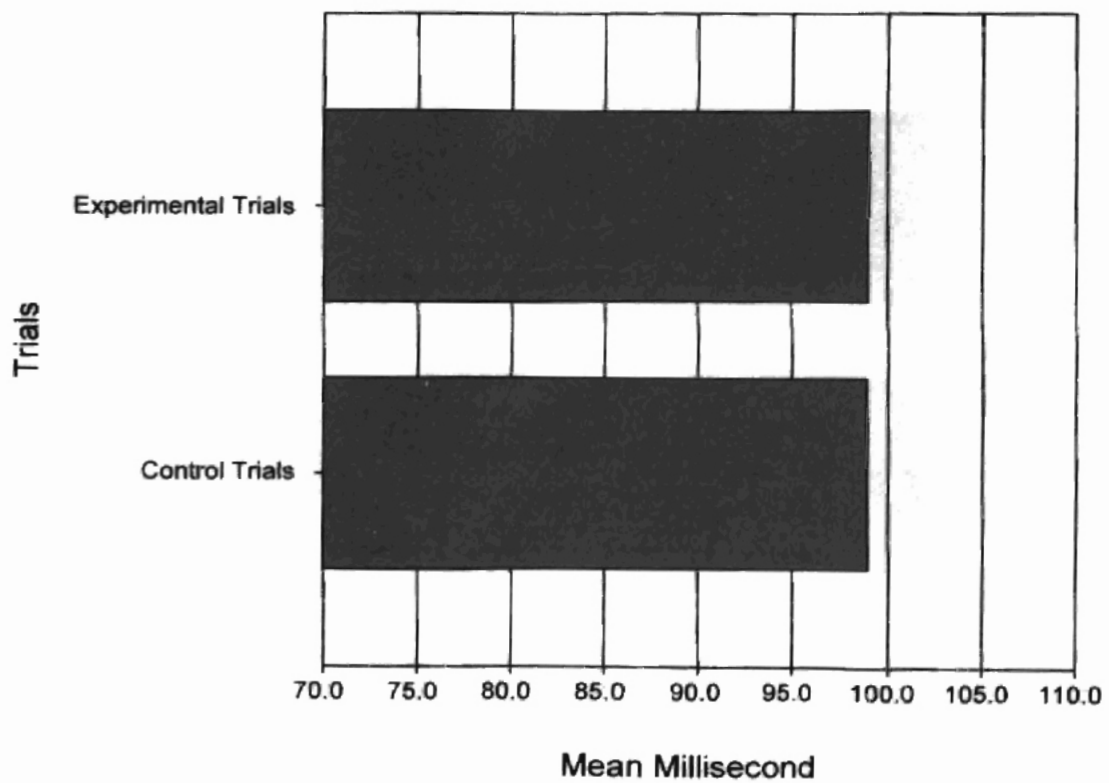

Figure 42. Control Participant 6 Mean Millisecond Scores

Control Participant 7

The results for control participant seven indicated no significant difference in mean scores for experimental trials compared to control trials, which was the expected result for all control participants. Figure 43 shows Experimental ($\underline{M}$ = 101.91), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 101.83), which is the mean millisecond score for all the control trials. A paired sample t-test was conducted with a significance of .756, (t = .316, $\underline{p}$ = .756), $\underline{p} > .05$.

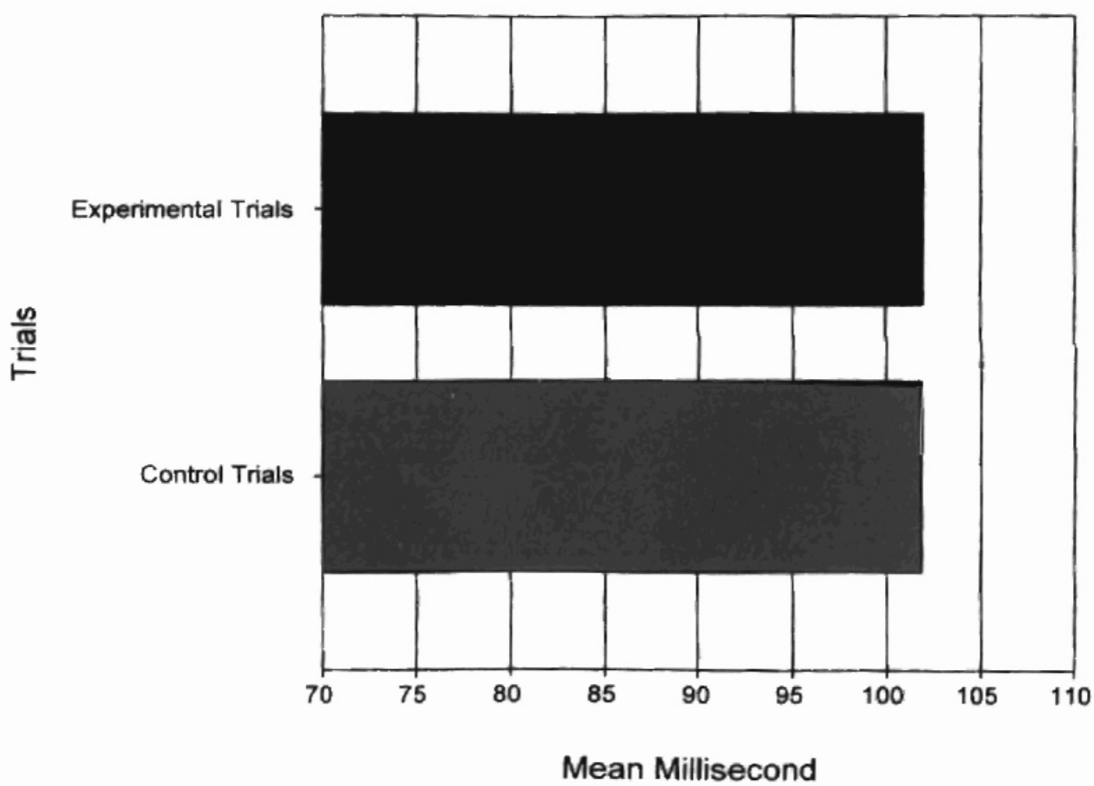

Figure 43. Control Participant 7 Mean Millisecond Scores

Control Participant 8

The results for control participant eight indicated no significant difference in mean scores for experimental trials compared to control trials, which was the expected result for all control participants. Figure 44 shows Experimental ($\underline{M}$ = 94.05), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 94.1), which is the mean millisecond score for all the control trials. A paired sample t-test was conducted with a significance of .920, ($t = -.102$, $\underline{p} = .920$), $\underline{p} > .05$.

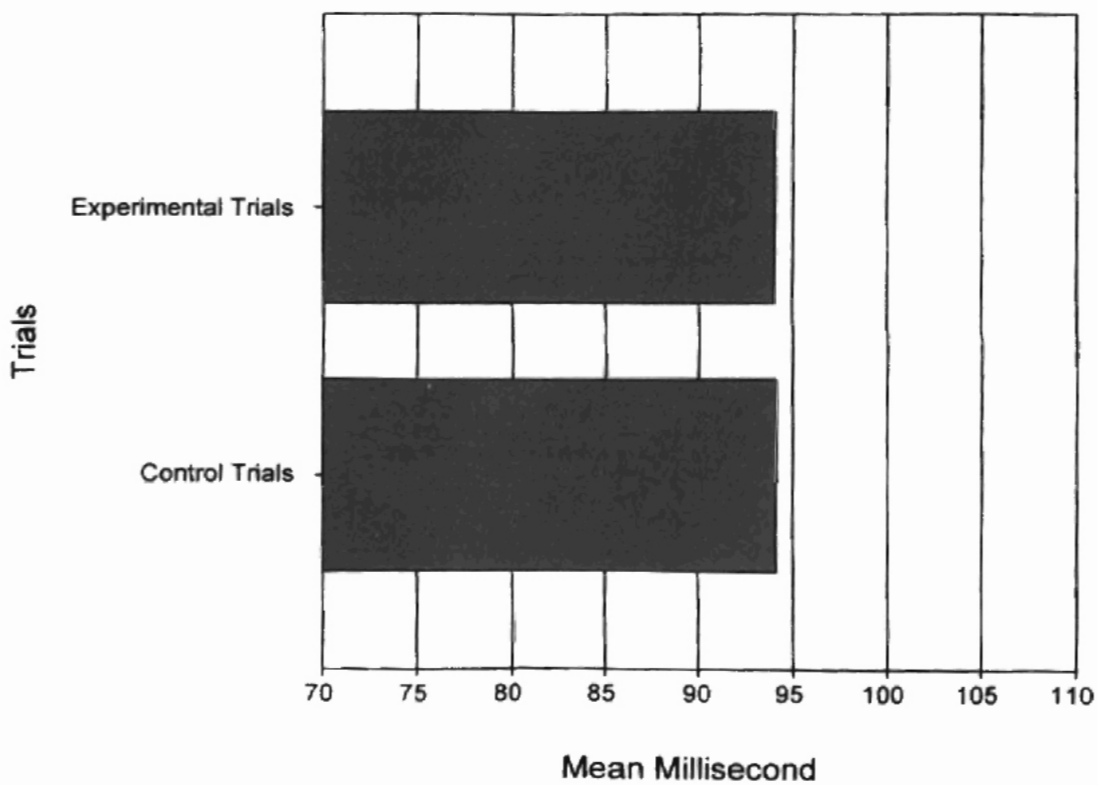

Figure 44. Control Participant 8 Mean Millisecond Scores

Control Participant 9

The results for control participant nine indicated no significant difference in mean scores for experimental trials compared to control trials, which was the expected result for all control participants. Figure 45 shows Experimental ($\underline{M}$ = 100.93), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 100.6), which is the mean millisecond score for all the control trials. A paired sample t-test was conducted with a significance of .175, (t = 1.42, $\underline{p}$ = .175), $\underline{p}$ > .05.

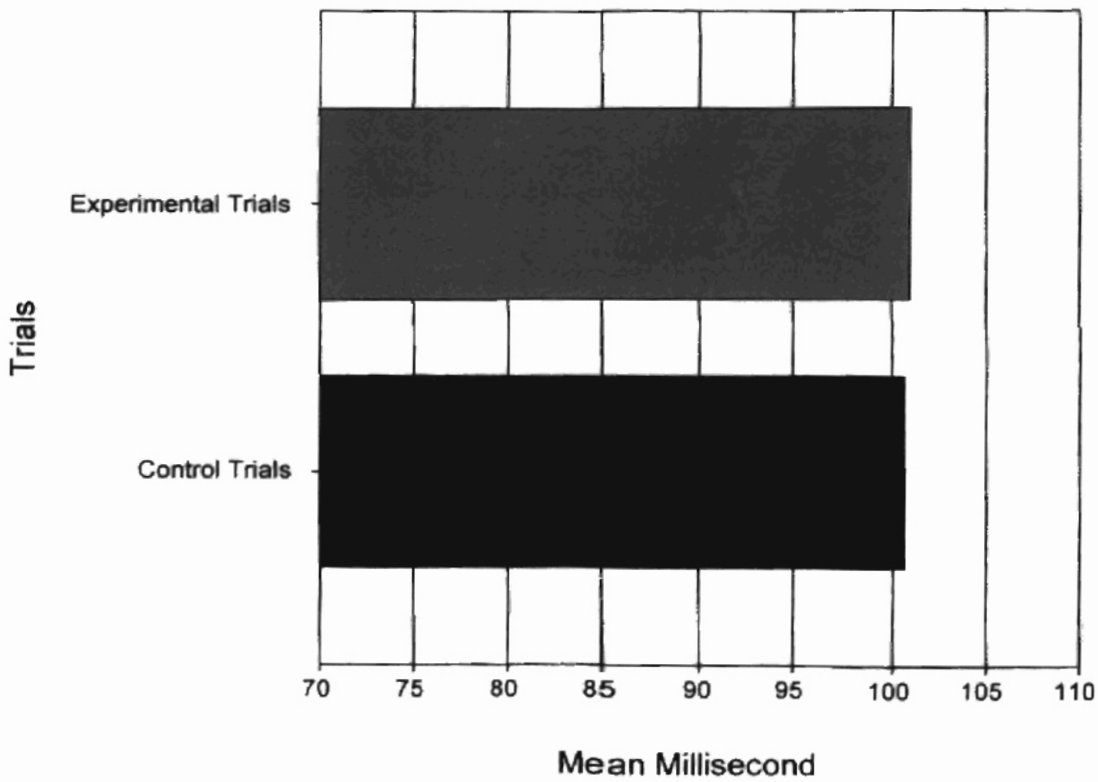

Figure 45. Control Participant 9 Mean Millisecond Scores

Control Participant 10

The results for control participant ten indicated no significant difference in mean scores for experimental trials compared to control trials, which was the expected result for all control participants. Figure 46 shows Experimental ($\underline{M}$ = 93.45), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ =94), which is the mean millisecond score for all the control trials. A paired sample t-test was conducted with a significance of .371, ($t = -.924$, $\underline{p} = .371$), $\underline{p} > .05$.

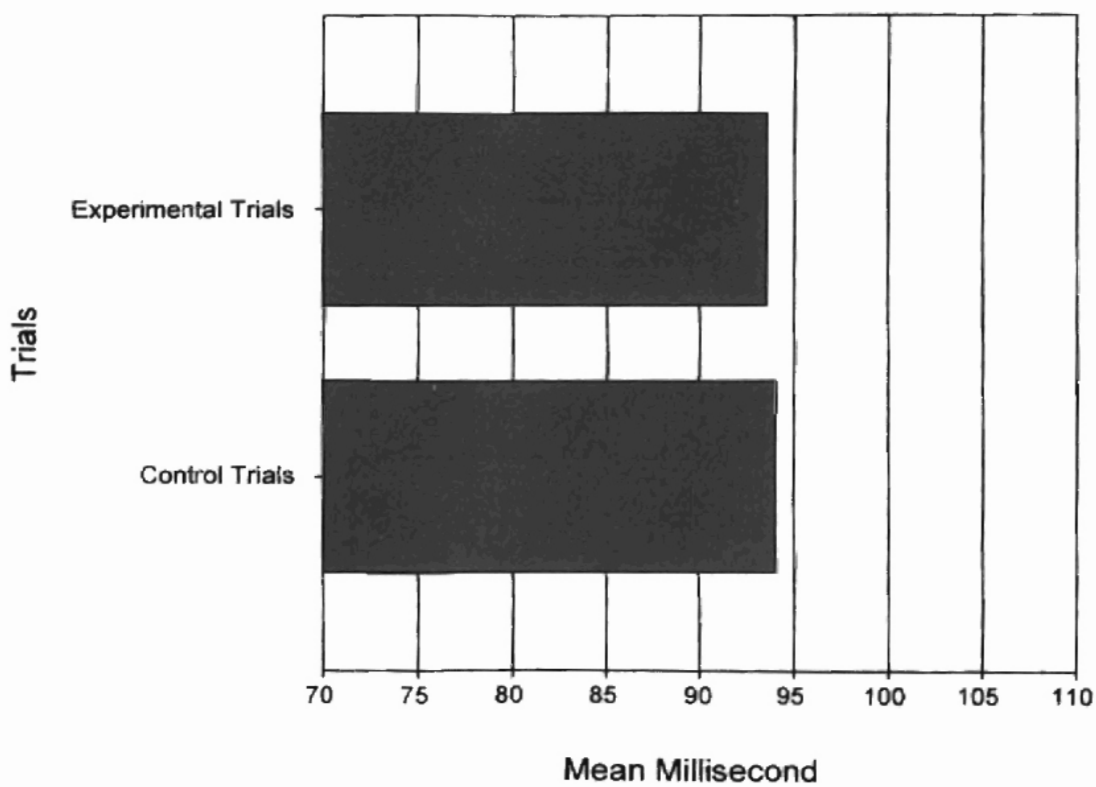

Figure 46. Control Participant 10 Mean Millisecond Scores

Control Participant 11

The results for control participant eleven indicated no significant difference in mean scores for experimental trials compared to control trials, which was the expected result for all control participants. Figure 47 shows Experimental ($\underline{M}$ = 100.9), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 100.41), which is the mean millisecond score for all the control trials. A paired sample t-test was conducted with a significance of .135, ($t = 1.58$, $\underline{p} = .135$), $\underline{p} > .05$.

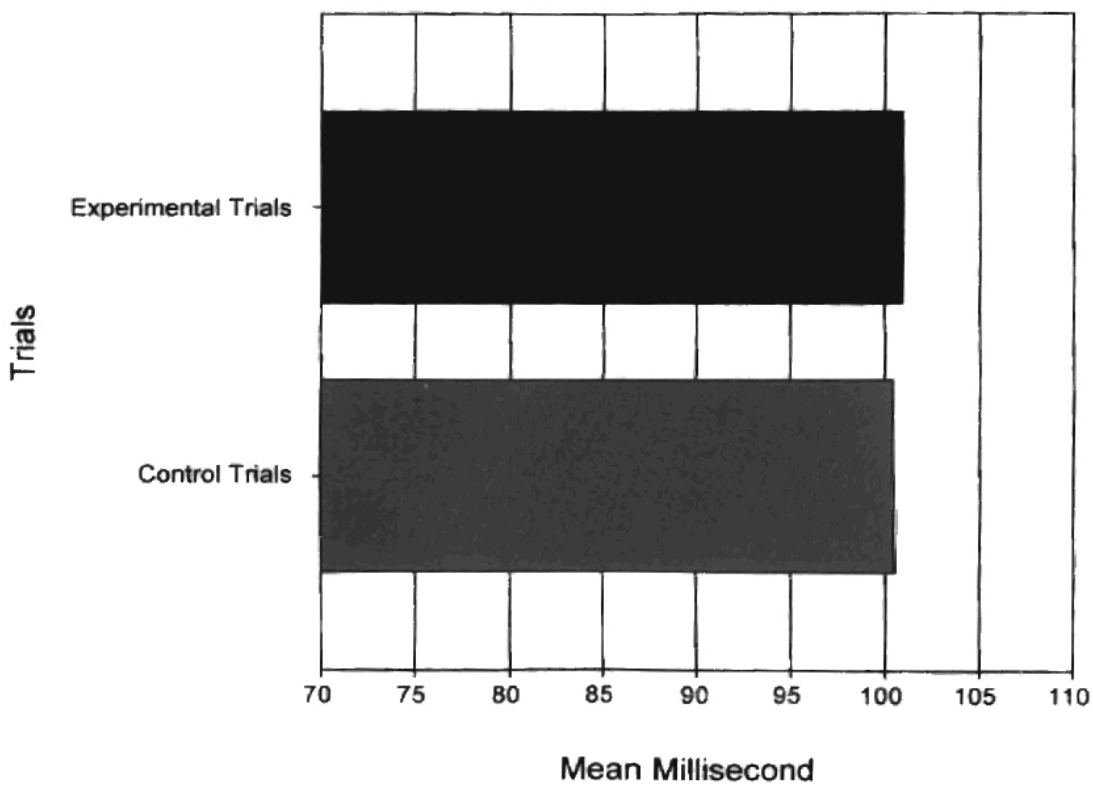

Figure 47. Control Participant 11 Mean Millisecond Scores

Control Participant 12

The results for control participant twelve indicated no significant difference in mean scores for experimental trials compared to control trials, which was the expected result for all control participants. Figure 48 shows Experimental ($\underline{M}$ = 97.83), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 97.81), which is the mean millisecond score for all the control trials. A paired sample t-test was conducted with a significance of .940, (t = .076, $\underline{p}$ = .940), $\underline{p} > .05$.

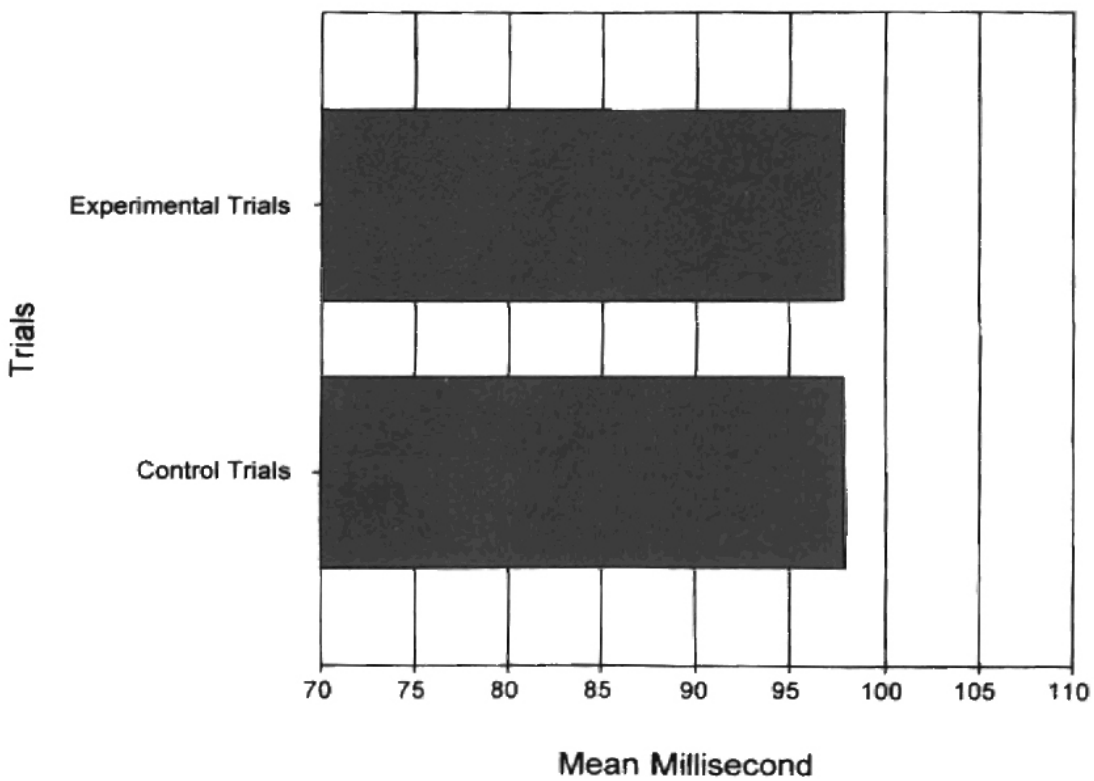

Figure 48. Control Participant 12 Mean Millisecond Scores

Control Participant 13

The results for control participant thirteen indicated no significant difference in mean scores for experimental trials compared to control trials, which was the expected result for all control participants. Figure 49 shows Experimental ($\underline{M}$ = 100.2), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 99.5), which is the mean millisecond score for all the control trials. A paired sample t-test was conducted with a significance of .235, ($t = 1.24$, $\underline{p} = .235$), $\underline{p} > .05$.

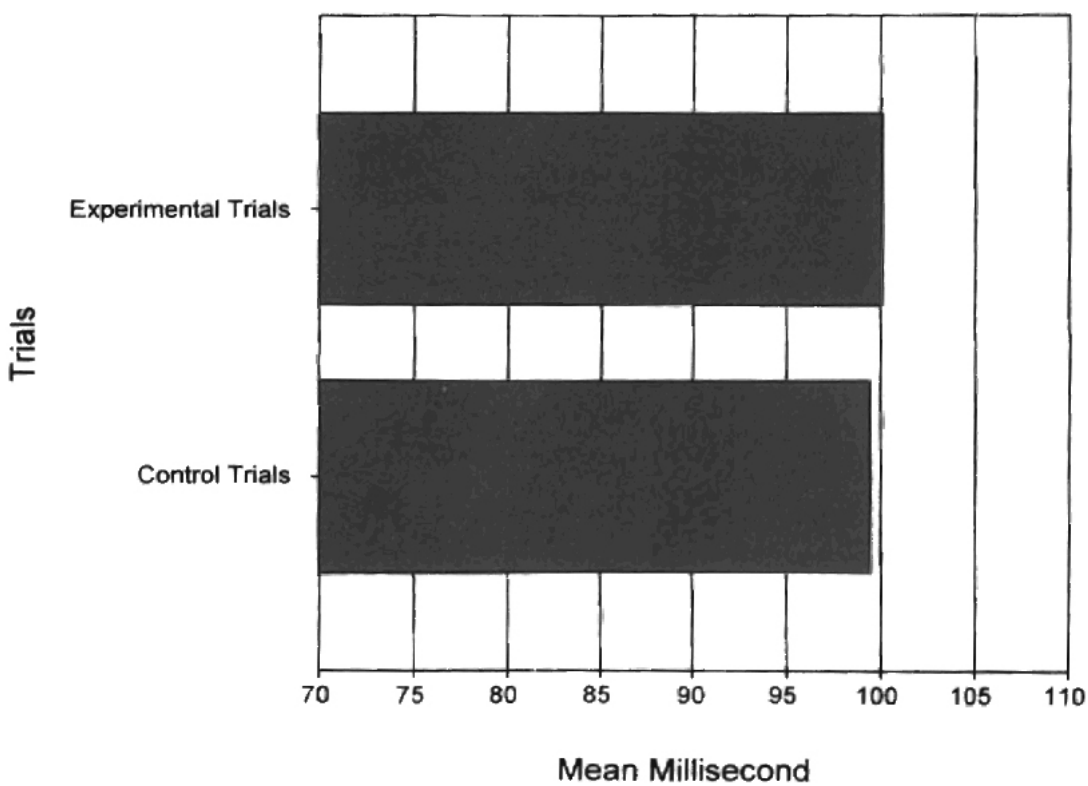

Figure 49. Control Participant 13 Mean Millisecond Scores

Control Participant 14

The results for control participant fourteen indicated no significant difference in mean scores for experimental trials compared to control trials, which was the expected result for all control participants. Figure 50 shows Experimental ($\underline{M}$ = 97.18), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 97.22), which is the mean millisecond score for all the control trials. A paired sample t-test was conducted with a significance of .894, ($t = -.136$, $\underline{p} = .894$), $\underline{p} > .05$.

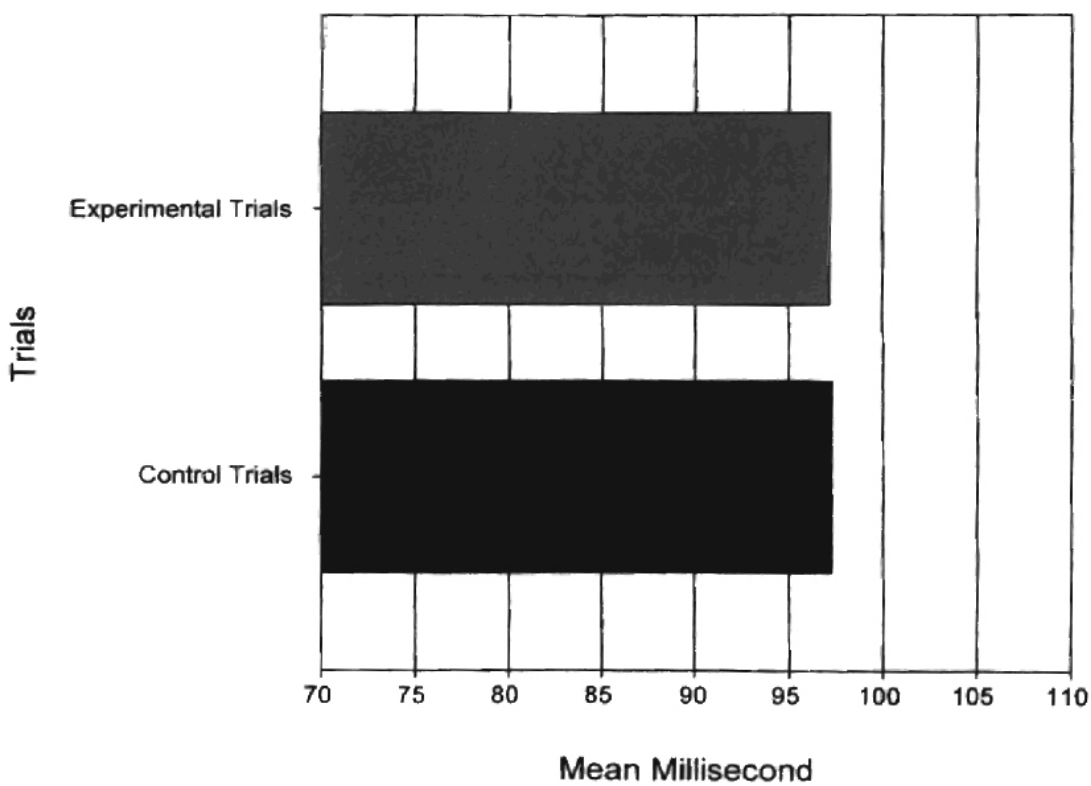

Figure 50. Control Participant 14 Mean Millisecond Scores

Control Participant 15

The results for control participant fifteen indicated significant difference in mean scores for experimental trials compared to control trials, which was not the expected result. Figure 51 shows Experimental ($\underline{M}$ = 94.8), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 97.3), which is the mean millisecond score for all the control trials. There was a 2.5 millisecond difference. A paired sample t-test was conducted with a significance of .000, ($t = -5.70$, $\underline{p} = .000$), $\underline{p} < .05$. There were no abnormal anomalies in this participant's data. Demographic data suggested no abnormal anomalies. Further discussion on participant data will be located in the discussion portion of this thesis.

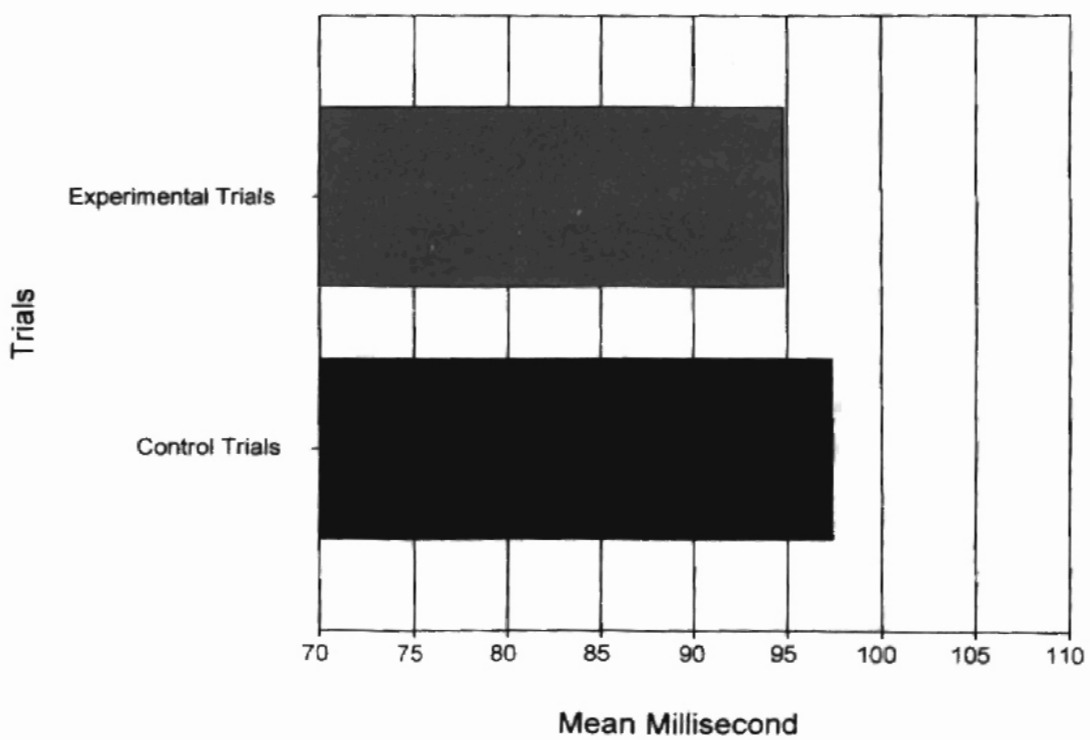

Figure 51. Control Participant 15 Mean Millisecond Scores

Control Participant 16

The results for control participant sixteen indicated significant difference in mean scores for experimental trials compared to control trials, which was not the expected result. Figure 52 shows Experimental ($\underline{M}$ = 94.2), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 92.5), which is the mean millisecond score for all the control trials. There was a 2-millisecond difference. A paired sample t-test was conducted with a significance of .029, ($t = 2.40$, $\underline{p} = .029$), $\underline{p} < .05$. There were no abnormal anomalies in this participant's data. Demographic data suggested no abnormal anomalies. Further discussion on participant data will be located in the discussion portion of this thesis.

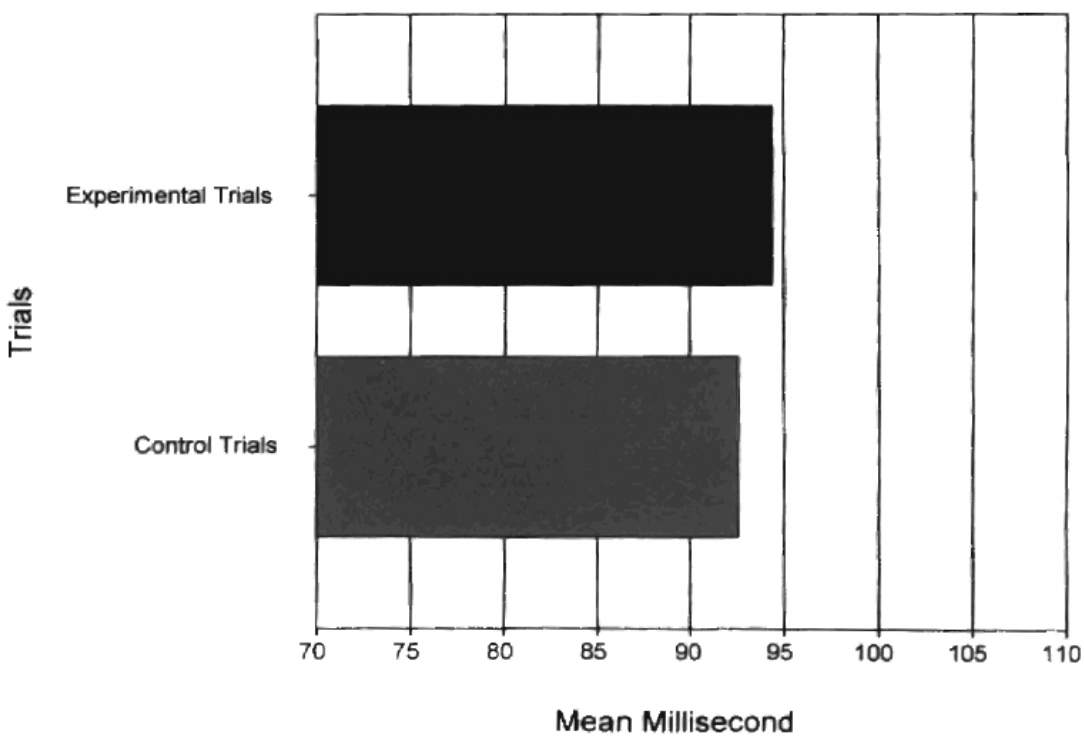

Figure 52. Control Participant 16 Mean Millisecond Scores

Control Participant 17

The results for control participant seventeen indicated no significant difference in mean scores for experimental trials compared to control trials, which was the expected result for all control participants. Figure 53 shows Experimental ($\underline{M}$ = 100.5), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ =100.8), which is the mean millisecond score for all the control trials. A paired sample t-test was conducted with a significance of .309, (t = -1.05, $\underline{p}$ = .309), $\underline{p}$ > .05.

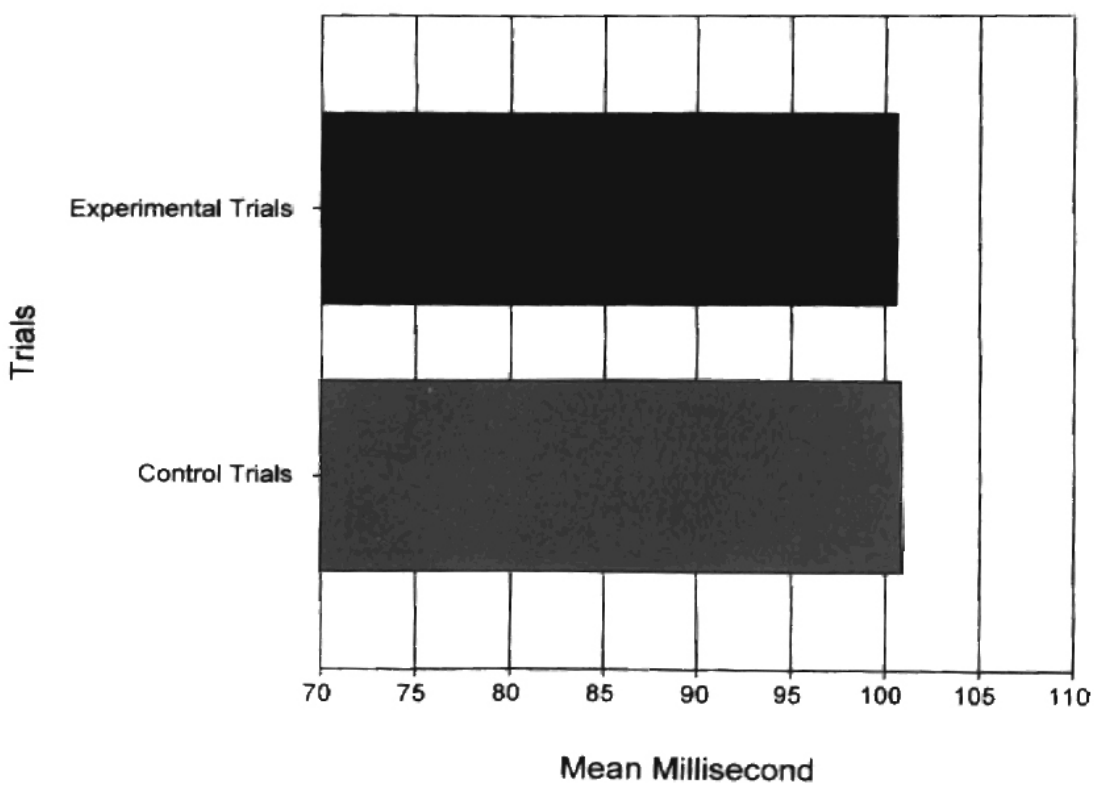

Figure 53. Control Participant 17 Mean Millisecond Scores

Control Participant 18

The results for control participant eighteen indicated no significant difference in mean scores for experimental trials compared to control trials, which was the expected result for all control participants. Figure 54 shows Experimental ($\underline{M}$ = 94.01), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 94.14), which is the mean millisecond score for all the control trials. A paired sample t-test was conducted with a significance of .509, ($t = -.677$, $\underline{p} = .509$), $\underline{p} > .05$.

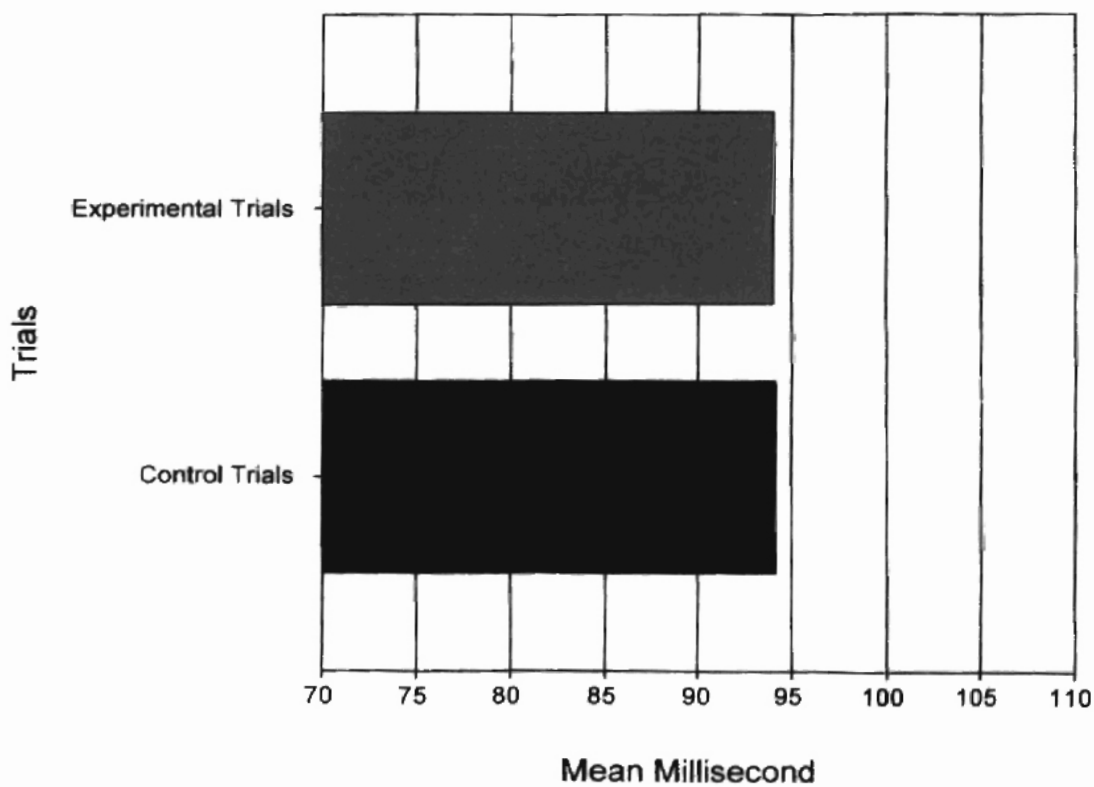

Figure 54. Control Participant 18 Mean Millisecond Scores

Control Participant 19

The results for control participant nineteen indicated no significant difference in mean scores for experimental trials compared to control trials, which was the expected result for all control participants. Figure 55 shows Experimental ($\underline{M}$ = 75.23), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 74.8), which is the mean millisecond score for all the control trials. A paired sample t-test was conducted with a significance of .240, ($t = 1.22$, $\underline{p} = .240$), $\underline{p} > .05$.

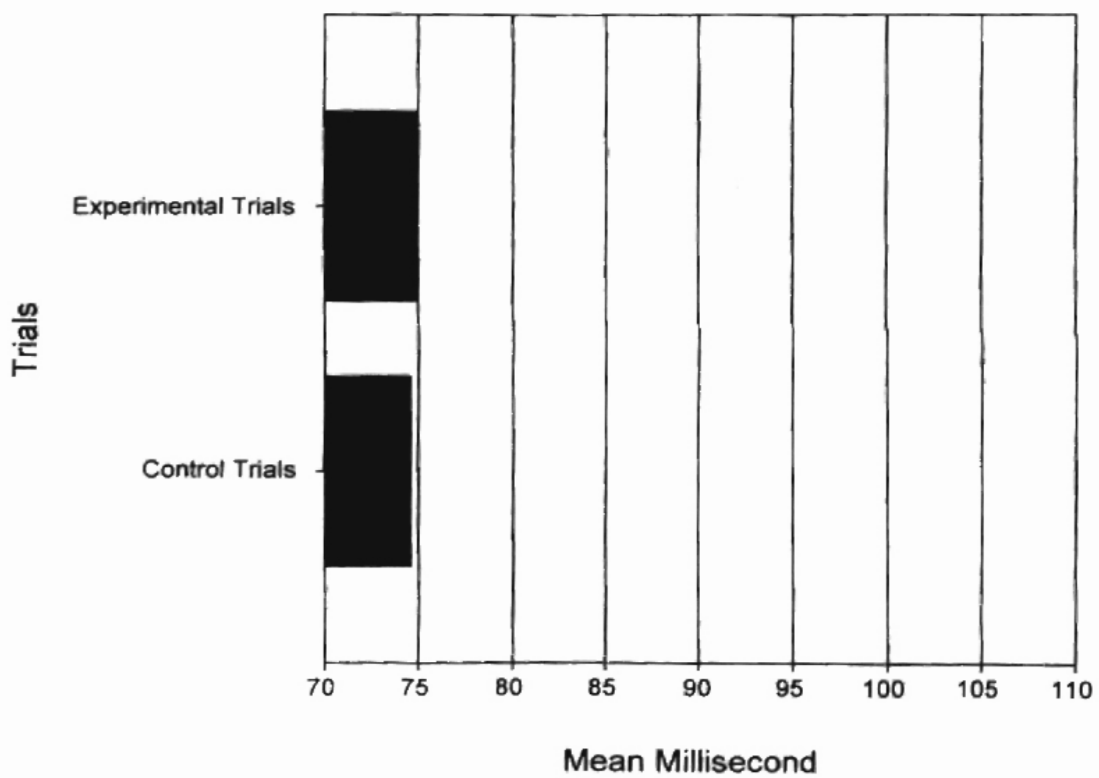

Figure 55. Control Participant 19 Mean Millisecond Scores

Control Participant 20

The results for control participant twenty indicated no significant difference in mean scores for experimental trials compared to control trials, which was the expected result for all control participants. Figure 56 shows Experimental ($\underline{M}$ = 94.6), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 94.54), which is the mean millisecond score for all the control trials. A paired sample t-test was conducted with a significance of .810, ($t = .245$, $\underline{p} = .810$), $\underline{p} > .05$.

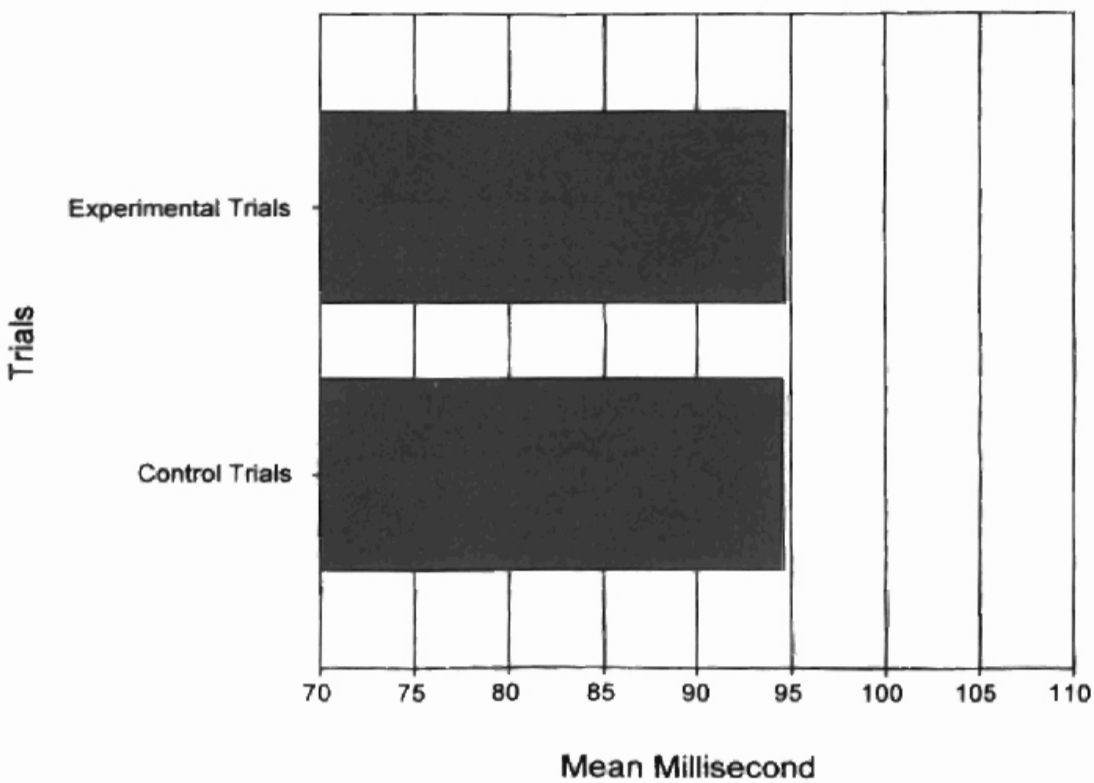

Figure 56. Control Participant 20 Mean Millisecond Scores

Control Participant 21

The results for control participant twenty-one indicated no significant difference in mean scores for experimental trials compared to control trials, which was the expected result for all control participants. Figure 57 shows Experimental ($\underline{M}$ = 97.8), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 97.46), which is the mean millisecond score for all the control trials. A paired sample t-test was conducted with a significance of .492, ($t = .705$, $\underline{p} = .492$), $\underline{p} > .05$.

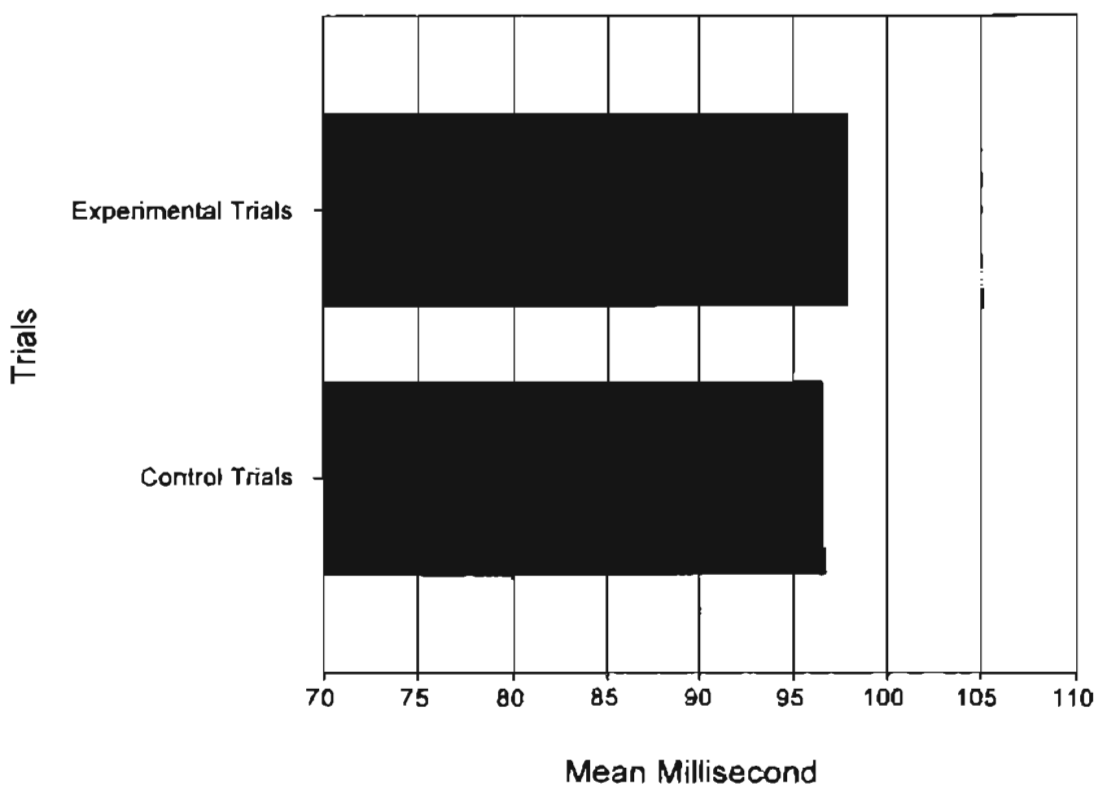

Figure 57. Control Participant 21 Mean Millisecond Scores

Control Participant 22

The results for control participant twenty-two indicated no significant difference in mean scores for experimental trials compared to control trials, which was the expected result for all control participants. Figure 58 shows Experimental ($\underline{M}$ = 80.3), which is the mean millisecond score for all the experimental trials and Control ($\underline{M}$ = 80.22), which is the mean millisecond score for all the control trials. A paired sample t-test was conducted with a significance of .891, (t = .139, p = .891), $p > .05$.

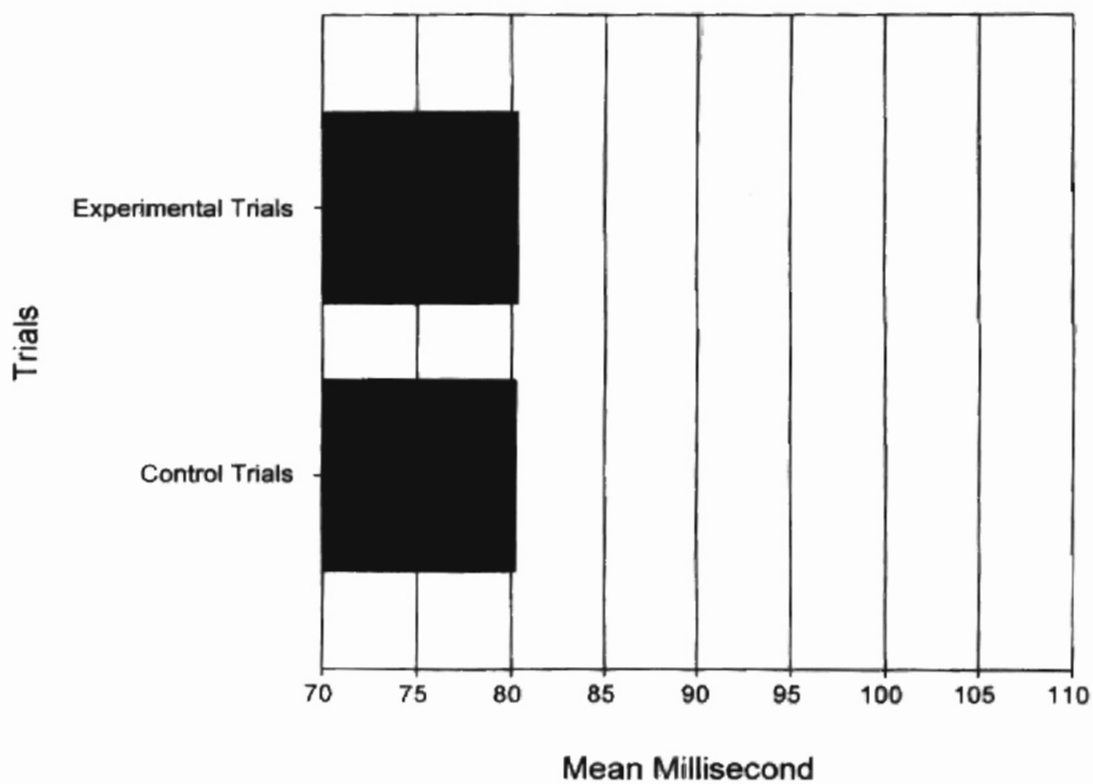

Figure 58. Control Participant 22 Mean Millisecond Scores

CHAPTER V

DISCUSSION

Summary

Results of this study revealed that conditioned suppression can be established in humans as was suggested by Arcediano, Ortega, and Matute (1996), and that participants that engage in active deception would show marked suppression (Lawson, 2000; Spence, Farrow, Herford, Wilkinson, Zheng, & Woodfuff, 2001). As suggested by the findings of Estes & Skinner, 1941; Lyon & Millar, 1969; Rescorla 1969; Arcediano, Ortega, and Matute 1996. IRT was expected to increase when experimental participants were presented with stimuli from the simulated "criminal" act (CS+) (Estes & Skinner, 1941; Rosenfeld, Nasman, Whalen, Cantwell, & Mazzeri, 1987; Zhou, Yang, Liao, & Zou, 2000/2001), and that there would be no significant change in IRT in control participants across stimuli.

The results also showed that deception can be measured with reliability using the conditioned suppression technique outlined in this study. Deceptive and non-deceptive participants demonstrated expected results in that deceptive participants suppressed responses, longer IRT, when shown pictures associated with their deceptive act (CS+) compared to CS- trials. Non-deceptive participants showed no significant IRT differences between pictures associated with their errand task (CS-) and associated with the criminal scenario (CS+). There were however, two participants in the control group that showed

suppression, they will be discussed in the next section, nevertheless the overall design of the study produced significant results.

Experimental Group Findings

The experimental group produced significant results. As hypothesized, experimental participants learned task was disrupted in the form of suppression, longer Interresponse times (IRT), when presented with conditioned stimuli (CS+) connected to the simulated "criminal" act. All 21 participants in this group showed significant suppression to CS+ pictures when compared to CS- pictures. Between and within groups analyses showed significant differences. Face images, when compared between groups, also showed significant differences.

Control Group Findings

Control group findings were significant. Out of the 22 participants in the control group, 20 showed no significant differences in IRT between trials. The between groups analysis showed no significant differences in IRT across trials, which was congruent with the expected results. However, within control group analysis showed significance between several trials. The largest IRT difference was 2.5 milliseconds. Also, two control group participants showed significant difference, control participants 15 and 16. These IRT differences could be the cause of the within control group variations in IRT.

Individual mean scores for trials indicate that control participant 15 suppressed on trials E1, E2 and trials C1, C2, as shown in figure 59. A paired sample t-test was conducted with a significance of .000, ($t = -5.70$, $p = .000$), $p < .05$. Control participant 16 suppressed on trials E1, E2 and trial C1, as shown in figure 60. A paired sample t-test

was conducted with a significance of .029, ($t = 2.40$, $p = .029$), $p < .05$. As a result, total mean scores reflected a main effect of stimuli.

Demographic data and trainer reports of possible equipment malfunction or any other participant problems did not exist, the suppression indicated by these two participants is unknown. It is speculated that the stimuli involved in the test had strong significance to these participants. It could also be that the participants attempted to understand the measure and subsequently confound its ability to accurately measure suppression. It is important to point out that the only variations in the expected results of this study were control participants 15 and 16, and that their data was not significant enough to distort the between or within group analyses. It should also be mentioned that all of the experimental participants showed significance.

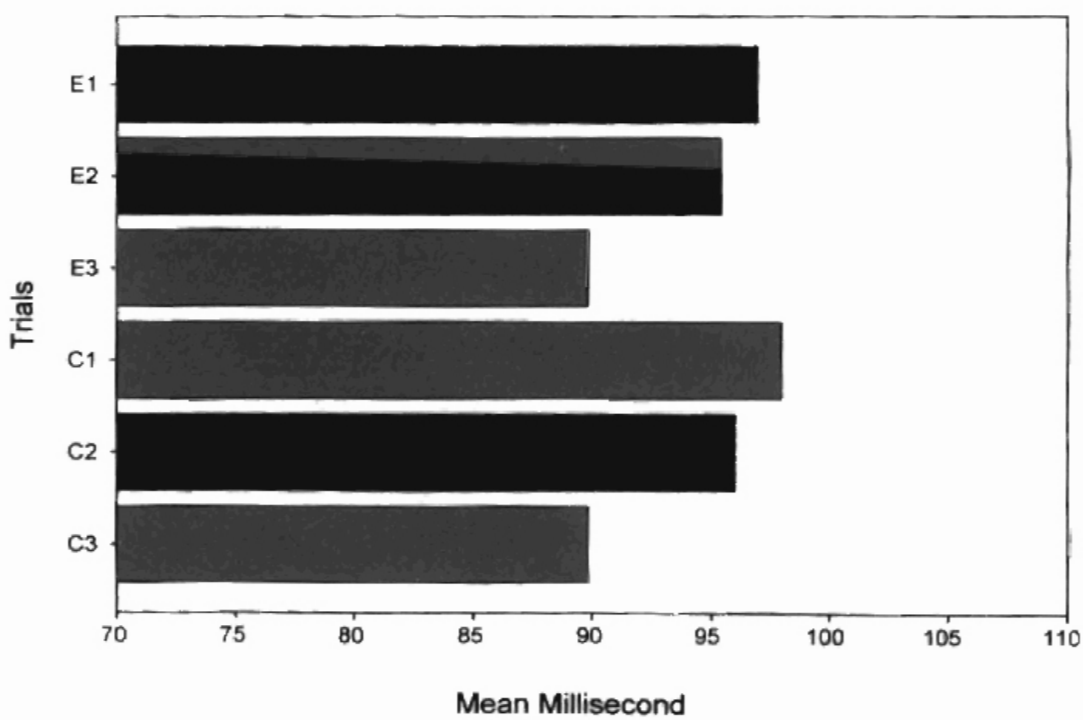

Figure 59. Mean Interrespones Time scores for Control Participant 15

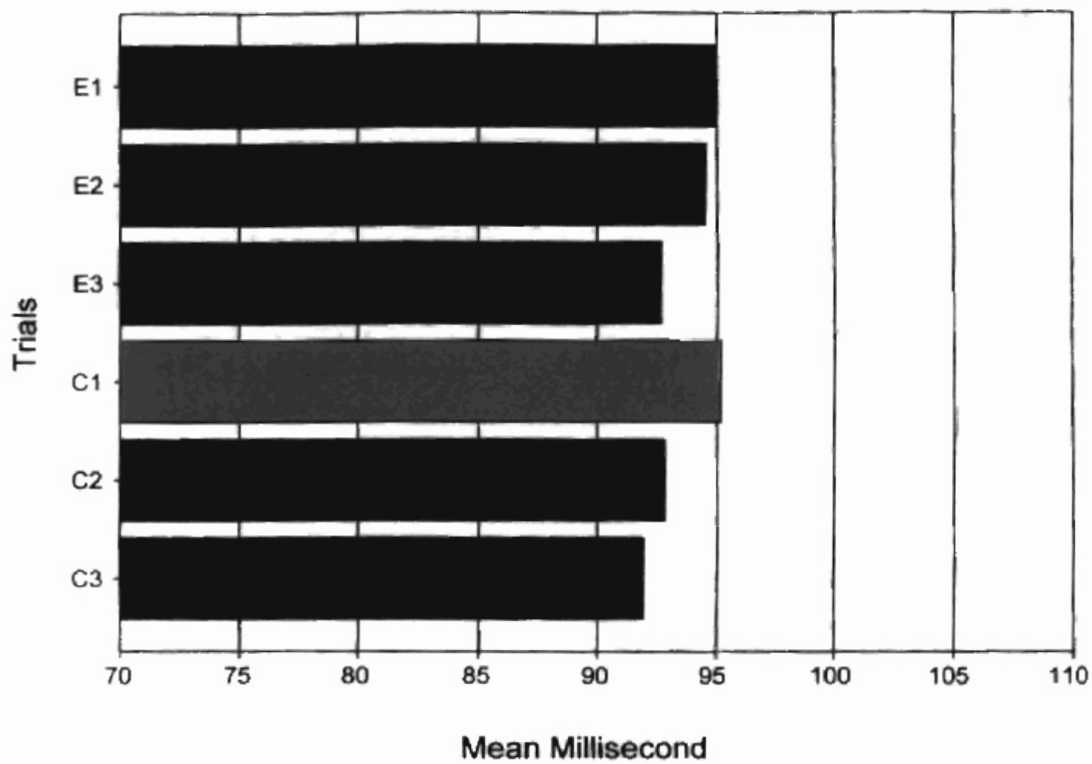

Figure 60. Mean Interrespones Time scores for Control Participant 16

Applications of the Findings

Criminal Investigation

In criminal investigations the conditioned suppression technique outlined in this study has the potential to aid instruments already used in law enforcement for deception detection, such as the polygraph. As shown in this study the technique can be used to detect deception. As will be discussed later the technique can also show social relationships. Since the design is not language biased, meaning it is not based on

assumptions of words or verbal communication, it has the potential to be used cross-culturally, which can be useful in international security issues.

Terrorist Network Mapping

Law enforcement authorities have the difficult task of apprehending and extracting information from criminals. Criminals, especially those affiliated with crime syndicates, are difficult to identify as well as disinclined to provide information about themselves and their illegal activities (Kelley, 1982). Terrorist organizations/cells operate in similar ways, operating in secrecy with criminal behavior. The design of an experimental model to recreate a "criminal" act is of key concern so as to test the reliability of the measure being used.

As was stated before, the criminal model used in this study is based off the Key-Pin terrorist cell system. This model was chosen for its sound design in avoiding authorities and inspiring secrecy among its members. In this system a cell member has little to no knowledge about other members. One individual, who usually does not have direct knowledge of the information being delivered, handles communication between members. Members usually have few faces to remember and detailed data exists only at the highest echelons or with the specific member carrying out the task. If one member is caught there is little information that can be extracted.

The key pin system is a standard pyramid model. At the top of the pyramid sits the leader of the organization. Flowing from beneath the leader are two members. These two members are the only two that have direct contact with the leader. These two members do not know each other, however, they pass down information to two other members. Each member that gets the information has the ability to pass it down to two

more (Hoffman, 1998). This system is ideal for keeping information confidential since no member knows more than three other members, and only knows one of those members to be above them, see figure 61.

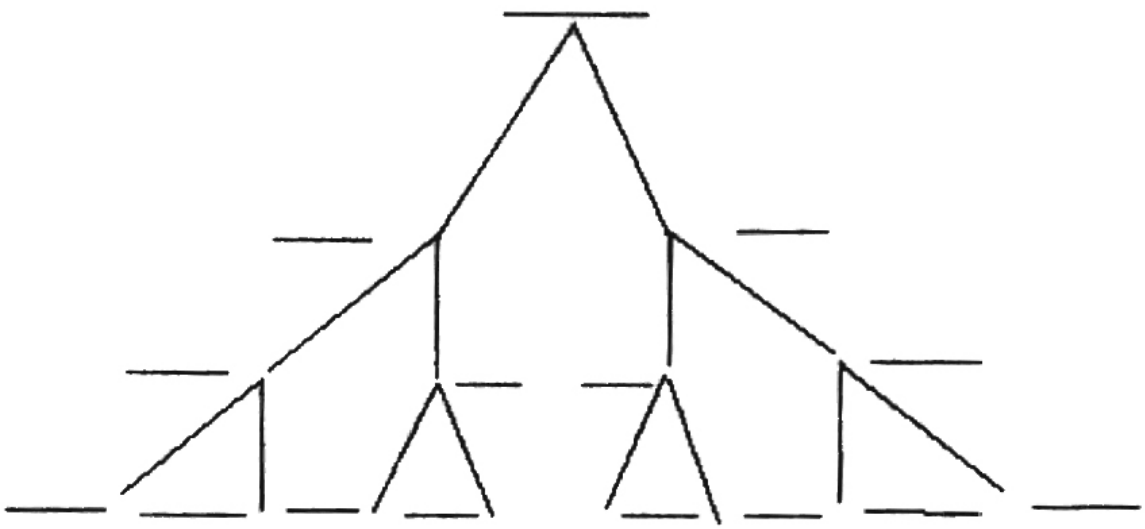

Figure 61. Key Pin Terrorist Cell Model; based on information by Kelley (1982) and Hoffman (1998), terrorist network research.

To uncover this system one must find a cell member and extract information that would reveal another in the pyramid, thus giving the ability to unravel the system name by name until one reaches the top. In Algiers the French were forced to utilize harsh tactics to uncover this system, which was being implemented to rebel against the French occupation of Algiers. They were successful. However, these methods used to uncover the system were not ethical. Practices of torture are not international accepted or ethical. Now, using the conditioned suppression design outlined in this study, more humane

techniques of information gathering, such as those employed in interrogations, can be completed with a high degree of accuracy.

Another terrorist network structure is that of the Al-Qaida. Al-Qaida is a network of many organizations in diverse countries. Their organizational structure is unlike Key Pin terrorist models, which usually use a pyramid structure. This structure, as seen in figure 63, is more modular. The leadership is at the center of the structure, however if the leadership fails, any "planning module" can take its place. The "planning module" seeks out targets and confirms (gets permission) to attack the target from the leadership. "Execution modules" get their orders from the "planning module", but can also pick out targets and forward them to the "planning module". The "recover module" exists to aid in the "R&R" of cell members that are either wounded or exhausted.

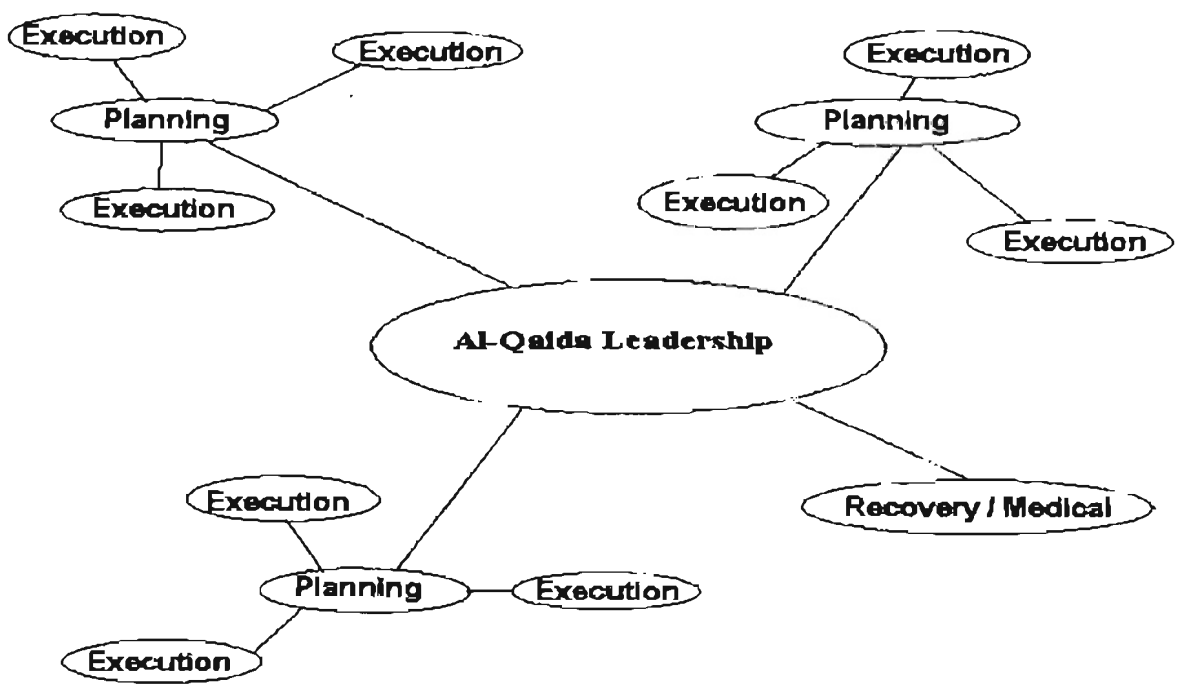

Figure 62. Al-Queda Structure; designed based on information from Hoffman (1998) and

Krebs (2002) studies on terrorist network structures.

Filling in the blanks on a model, such as figures 61 and 62, can be achieved using the conditioned suppression design outlined in this study. Common problems of terrorist network mapping are incompleteness of the information, unclear boundaries of who to include or exclude, and the dynamic nature of the relationships, which are ever changing (Sparrow, 1991). Relationships between cell members may be very weak. However, based on past and current research in deception that measures internal aspects of the human body and human brain function (Bashore & Rapp, 1993; Lawson and Pratarelli, 2000; Farwell & Donchin, 1991; Zhou, Yang, Liao, & Zou, 2000/2001), and on the level of involvement and emotion (McCarthy & Stewart, 1998; Nabi, 1999), relationships can be uncovered.

Terrorist network mapping can seem like a never-ending endeavor. Seldom do cell members know one-another or contact between members is rare; mapping the relationships can prove lengthy. After the events of September 11th 2001 Ossama bin Laden stated that "Those who were trained to fly didn't know the others. One group of people did not know the other group" (U.S. Department of Defense, 2001). Krebs (2002) looked at the difficulty in mapping terror networks. He used social network theories to begin his analysis of relationships between potential cell members. His data creates a web of relationships as seen in figure 63, using information accessible to the general public.

The deception detection test used in this study can be used in conjunction with the model used by Krebs (2000) to build an information base of relationships and bring into light a larger picture of interaction. For example, an investigator has a list of potential suspects. Pictures of the suspects are collected (CS+) and other pictures with no relation

to the case are also collected (CS-). Pictures are presented to the suspect. Longer IRT to pictures indicate that the suspect has had prior contact, at a level to create a strong US to CS pairing. Thus, the investigator has strengthened assumptions concerning possible relationships.

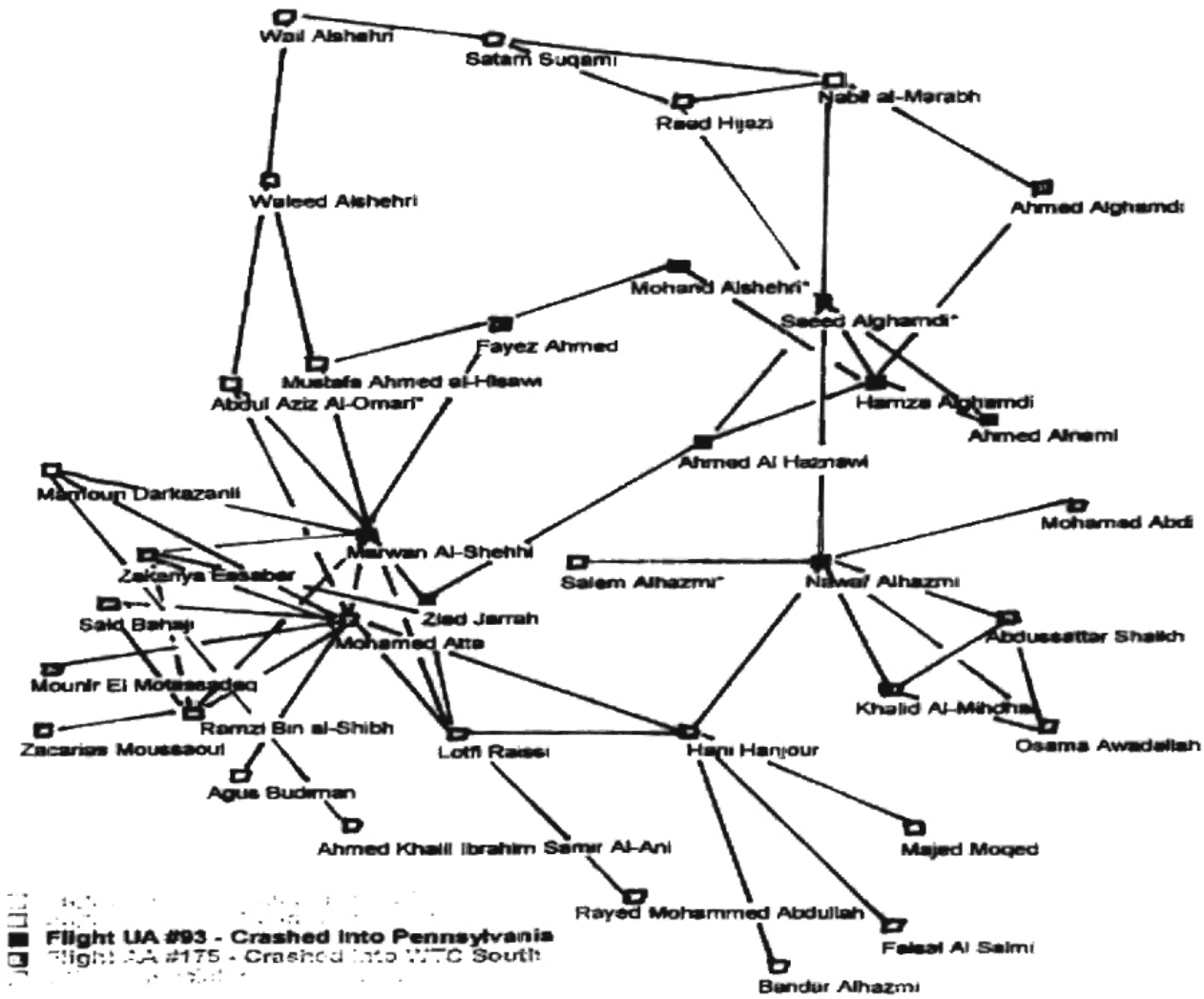

Figure 63. Terrorist Network by Relationship Strength; Krebs, V. E. (2002). Mapping networks of terrorist cells. Connections, 24 (3), 43-52

The deception test design outlined in this study can uncover relationships as well as potential targets, thus building an information base that can be utilized by agencies involved in investigating and combating crime cartels and terrorism. Terror and Cartel organizational structures are hierarchical and are based on social relationships. Using the deception test outlined in this study an investigator can interrogate in a way that does not inflict harm on the subject while at the same time extracting valuable information concerning the criminals associations and conditioned events.

Limitations and Direction of Future Studies

It is important to address the limitations with using quantitative studies. Low participant turnout and the unavailability of certain groups reduce statistical power and jeopardize statistical assumptions. In this particular study there was a follow-up portion. The follow-up was the deception test. Maintaining a schedule of participants proved to be difficult when dealing with the follow-up portion of the study. Future studies using the technique outlined in this study could propose a reward system of incitement for the follow-up portion, such as a small trinket.

The apparatus design could also be modified. Since significance was demonstrated using this conditioned suppression method, converting the apparatus to a digital based program would increase the practical use of the design. Digital imaging presented on a computer monitor, rather than slides presented from a slide projector, would allow a researcher to scan pictures rather than produce slides from camera film. Also, using a more sophisticated lever press could improve accuracy in response time.

When using millisecond scores in research the more sensitive the measure the better. Using a small portable computer, such as a laptop, could make this design applicable to external uses, outside the laboratory.

The deception test outlined in this study used inexperienced participants, possible future studies are as follows:

1) Gender; male versus female participants.

2) Age; young versus old participants.

3) Experience; Police Officers versus the average citizen (inexperienced).

4) Cross-cultural aspects; testing perceptions of deception across cultures.

5) Change scenarios to incorporate stronger stimuli, increasing US - CS pairing.

6) Field test; incorporate the test within a portable design.

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APPENDIXES

APPENDIX A

PARTICIPANT CONSENT PACKAGE

A. AUTHORIZATION

I,_____(participant), hereby authorizes, **John J. Gallagher IV** (researcher) and **Robbyn Barnes** (trainer) to perform the following treatment or procedure.

B. DESCRIPTION

I understand that the research study is entitled Conditioned Suppression as an Indicator of Deception: A Tool for Interrogation and is being conducted through the School of International Studies under the direction of Charles Abramson, Ph.D., Department of Psychology, at Oklahoma State University. I understand that the purpose of this research is to test a method of deception detection using a conditioned suppression technique.

I understand that I may be asked to take part in a simulated "criminal" act. I understand that the "criminal" act is taking pictures of mock documents in a classroom. I understand that I will be asked to come in for a follow-up phase the next day in which I will participate in a deception test.

I understand that there are no foreseeable risks or foreseeable discomfort to participants in this study beyond that which is experienced in daily life. I understand that participants in this study are not expected to benefit in any way. However, society may benefit one day, if the results lead to better techniques in detecting deception, in criminal interrogations.

I understand that any questions or concerns regarding this study can be directed to:

1. John Gallagher, gallajj@okstate.edu, MS student, School of International Studies.
2. Charles Abramson, Ph.D., Psychology Department, 401 N. Murray, Oklahoma State University, Stillwater, OK 74078. Phone: 405-744-7492, charles@okstate.edu.

I understand that any questions regarding my rights as a research participant can be directed to Sharon Bacher, IRB Executive Secretary, Oklahoma State University, 415 Whitehurst, Stillwater, OK 74078. Phone: (405)744-5700.

C. VOLUNTARY PARTICIPATION

I understand that participation is voluntary and that I will not be penalized if I choose not to participate. I am also aware that I am free to withdraw my consent and end my participation in this project at any time without penalty.

D. CONSENT

I have read and fully understand the consent form. I sign it freely and voluntary.
Please provide email address so a debriefing document can be sent at the end of the semester.

Date:_____Time:_____(a.m./p.m.)

Signed:_____E-mail: _____

I certify that I have personally explained all elements of this form to the participant before requesting the participant to sign it.

Signed_____

IF YOU AGREE TO PARTICIPATE, PLEASE COMPLETE THE FOLLOWING INFORMATION AND SIGN IN THE SPACE PROVIDED BELOW.

Subject code: _____

1. Which hand do you use to write with? Left Right

2. Your date of birth (month / year) ____/____/____

3. Your gender (please circle one) Male Female

4. Your race (indicate with a check)
___ African American
___ Native American
___ Indian
___ Arab
___ Hispanic
___ Latino
___ Pacific Islander
___ White (non-Hispanic)
___ Other (specify:_____)

5. Your religion (indicate with a check)
___ Protestant
___ Catholic
___ Orthodox
___ Islam
___ Judaism
___ Hinduism
___ Buddhism
___ Other (specify: _____)

6. Any history of neurological disorders or head trauma? Yes No

7. Do you have any prior history of reading disabilities? Yes No

8. Do you have normal or corrected to normal vision? Yes No

9. Have you had any prior involvement with law enforcement? Yes No

10. Your Education (check highest one)

___1st year undergraduate
___2nd year undergraduate
___3rd year undergraduate
___4-year College (BA, etc.)
___Post-Graduate Degree

BECK INVENTORY

CHOOSE ONE STATEMENT UNDER EACH LETTER THAT BEST DESCRIBES YOU FOR THE LAST SEVEN DAYS. Circle the number to the left of the statement you have chosen.

A.	0	I do not feel sad.
	1	I feel sad.
	2	I am sad all the time and I can't snap out of it.
	3	I am so sad or unhappy that I can't stand it.
B.	0	I am not particularly discouraged about the future.
	1	I feel discouraged about the future.
	2	I feel I have nothing to look forward to.
	3	I feel that the future is hopeless and that things cannot improve.
C.	0	I do not feel like a failure.
	1	I feel I have failed more than the average person.
	2	As I look back on my life, all I can see is a lot of failures.
	3	I feel I am a complete failure as a person.
D.	0	I get as much satisfaction out of things as I used to.
	1	I don't enjoy things the way I used to.
	2	I don't get real satisfaction out of anything anymore.
	3	I am dissatisfied or bored with everything.
E.	0	I don't feel particularly guilty.
	1	I feel guilty a good part of the time.
	2	I feel quite guilty most of the time.
	3	I feel guilty all of the time.
F.	0	I don't feel I am being punished
	1	I feel I may be punished.
	2	I expect to be punished.
	3	I feel I am being punished.
G.	0	I don't feel disappointed in myself.
	1	I am disappointed in myself.
	2	I am disgusted with myself.
	3	I hate myself.
H.	0	I don't feel I am any worse than anybody else.
	1	I am critical of myself for my weaknesses or mistakes.
	2	I blame myself all the time for my faults.
	3	I blame myself for everything bad that happens.
I.	0	I don't have any thoughts of killing myself.
	1	I have thoughts of killing myself, but I would not carry them out.
	2	I would like to kill myself.
	3	I would kill myself if I had the chance.
J.	0	I don't cry anymore than usual.
	1	I cry more now than I used to.
	2	I cry all the time now.
	3	I used to be able to cry, but now I can't cry even though I want to.

K.	0	I am no more irritated now than I ever am.
	1	I get annoyed or irritated more easily than I used to.
	2	I feel irritated all the time now.
	3	I don't get irritated at all by the things that used to irritate me.
L.	0	I have not lost interest in other people.
	1	I am less interested in other people than I used to be.
	2	I have lost most of my interest in other people.
	3	I have lost all of my interest in other people.
M.	0	I make decisions about as well as I ever could.
	1	I put off making decisions more than I used to.
	2	I have greater difficulty in making decisions than before.
	3	I can't make decisions at all anymore.
N.	0	I don't feel I look any worse than I used to.
	1	I am worried that I am looking old or unattractive.
	2	I feel that there are permanent changes in my appearance that make me look unattractive.
	3	I believe that I look ugly.
O.	0	I can work about as well as before.
	1	It takes an extra effort to get started at doing something.
	2	I have to push myself very hard to do anything.
	3	I can't do any work at all.
P.	0	I can sleep as well as usual.
	1	I don't sleep as well as I used to.
	2	I wake up 1-2 hours earlier than usual and find it hard to get back to sleep.
	3	I wake up several hours earlier than I used to and cannot get back to sleep.
Q.	0	I don't get more tired than usual.
	1	I get tired more easily than I used to.
	2	I get tired from doing almost anything.
	3	I am too tired to do anything.
R.	0	My appetite is no worse than usual.
	1	My appetite is not as good as it used to be.
	2	My appetite is much worse now.
	3	I have no appetite at all anymore.
S.	0	I haven't lost much weight, if any, lately.
	1	I have lost more than 5 pounds.
	2	I have lost more than 10 pounds.
	3	I have lost more than 15 pounds.

I am purposely trying to lose weight by eating less. Yes _____ No _____

T.	0	I am no more worried about my health than usual.
	1	I am worried about physical problems such as aches and pains; or upset stomach.
	2	I am very worried about physical problems and it's hard to think of much else.
	3	I am so worried about my physical problems, that I cannot think about anything else.
U.	0	I have not noticed any recent change in my interest in sex.
	1	I am less interested in sex than I used to be.
	2	I am much less interested in sex now.
	3	I have lost interest in sex completely.

APPENDIX B

EXPERIMENTAL GROUP SCRIPT

Leave North Murray through the north exit of the basement and walk east (go right) to the sidewalk along Monroe Street. Turn right again (south) and walk on the sidewalk adjacent to Monroe Street until you reach the stop lights at University Avenue. Turn right again (west) and walk to the emergency phone, turn right and go down the steps to the south entrance of North Murray.

Use the red key to unlock the door to the building and enter. Walk down the stairs and take the first hallway to your left. Examine the office numbers on the left side doors along the hallway as you walk. You will come to an office number 007. When you reach office number 007, stop, look to see if anyone is watching you, and unlock the office door using the same red key. Turn on the lights to the room and enter the office slowly, checking to see if anyone is inside the office. Close the door behind you.

Once inside the room, locate the file cabinet and use the green key to unlock the file cabinet. Open the bottom drawer of the file cabinet and look for a file with the heading: "doom project". **DO NOT UNDER ANY CIRCUMSTANCES OPEN THE TOP DRAWER OF THE FILE CABINET!** Take this file out of the file cabinet and place the file on the desk. Open the file. Use the camera to take pictures of the material (missile diagrams, informant pictures) inside the file. Make sure that the file materials are in the same order as when you opened it. Close the file and place it back in the bottom drawer of the file cabinet at the same place you took it out. Lock the file cabinet using the green key and place the camera in a pocket. Walk to the door of the room and listen for anyone in the hallway. If the area seems quiet, walk into the hallway and shut the office door. Make sure that the office door is locked. **Do not talk to anyone while you are in the building.**

Walk out of the building the same way that you entered. Proceed to the corner of University and Monroe and walk across Monroe Street. Take the diagonal walkway on your left to Theta Pond. Cross the bridge on the walkway and follow the sidewalk. In front of you will be a green bench. Look for an individual standing by the green bench wearing a black baseball cap with a soccer ball on the front. Approach this person and say, **"Do you know where a trashcan is located?"**. The individual will answer, **"No, I am looking at the duck"**. If a mistake occurs in the verbal exchange, that person will cough and you will begin again. Once the verbal exchange has taken place, give the individual the camera (do not give this person the keys). The individual will give you an envelope. Proceed back to the lab in North Murray with the envelope.

REMEMBER, DO NOT TALK TO ANYONE NOT MENTIONED IN THIS SCENARIO. If any staff or student approaches you and asks what you are doing, do not reveal what you are doing or where you are going. Tell the person, **"I am doing research for Dr. Abramson."**

APPENDIX C

CONTROL GROUP SCRIPT

Leave North Murray through the north exit of the basement and walk to the north entrance of the library (the entrance facing the Noble Research Center).

You will enter the library on the 1st floor. Use the right walkway to go south, past the New Books section, to the elevator on the left hand side of the walkway. Take the elevator to the 3rd floor and then locate the shelf containing books **150.82 P - 152.4 E**. Walk along the shelf and find the journal called **Behaviour** with the call number **151.305 B419**. Find volume 39 and remove the book from the shelf. Open the book to page 128. This page has the author **Jerry A. Hogan** written on it. Write down the title of the article, which is just above the author's name. Next, turn directly around and examine the opposite shelf. Look a little to your left. Find the book titled **Regret**, with the call number **152.4 L257r**. Open the front cover of the book and take out the laminated picture. Examine the person and record what expression the person has. Then, place the picture, pen, and paper in the manila envelope.

While you are locating and writing down the article title and expression, a student may ask you, **"Excuse me, are you the assistant on duty?"** You are to answer, **"No, I am not the assistant on duty."** (If a mistake occurs, then cough loudly and begin again). The student then may give you a picture which you will record the person's expression and place in the manila envelope.

Once you have put the paper and pen in the manila envelope and fastened the clasps on the envelope, place the books on a nearby table and go to the elevator. Leave the library out the north exit where you came in.

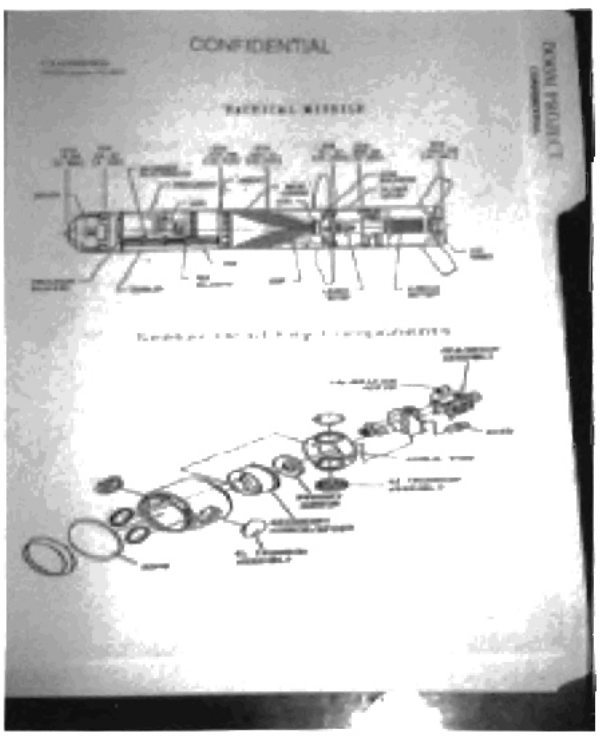
Go to the clock tower south of the library and just north of the Union. Locate a person wearing a plain blue shirt holding a basketball, and tell this person **"you look like a cousin of mine"** (if a mistake occurs then cough loudly and begin again). The person will answer, **"your cousin must be Canadian".**

When the verbal exchange has taken place, give the manila envelope to the person. The person will give you a backpack. Take the backpack and proceed to the laboratory in North Murray through the basement.

APPENDIX D

SLIDES USED AS VISUAL STIMULI

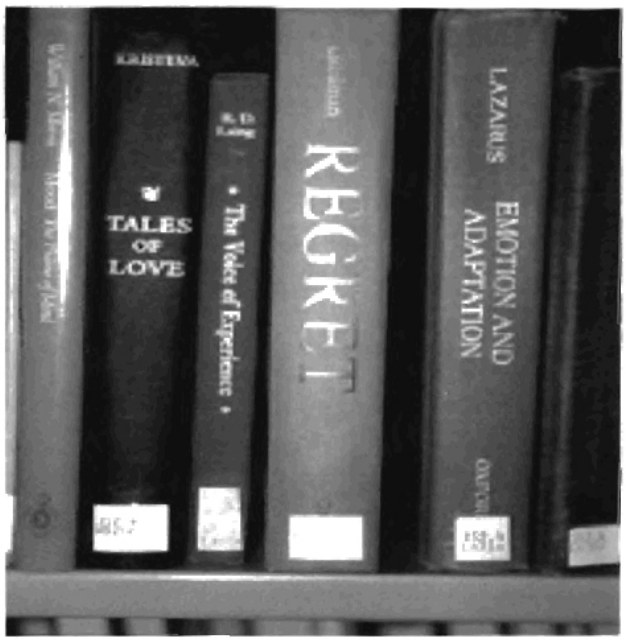
E1. Picture of Southeast Basement Door of South Murray



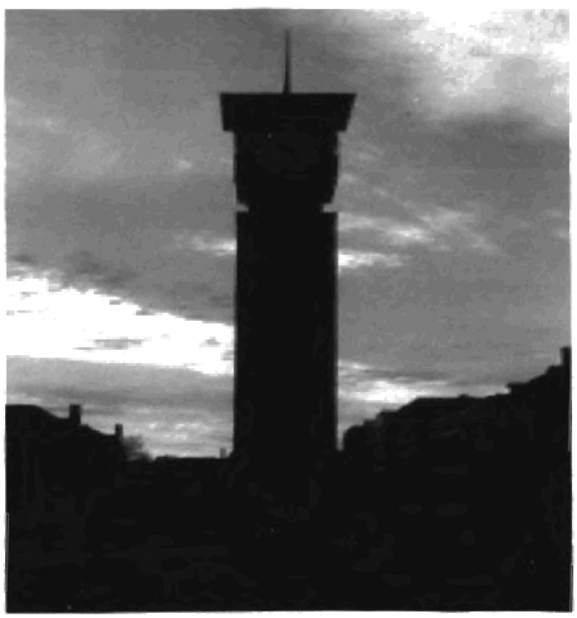
E2. Picture of Schematic Labeled "DOOM PROJECT"

E3. Picture of Theta Pond Area (Park on Campus)

C1. Picture of North Door of Edmon Low Library



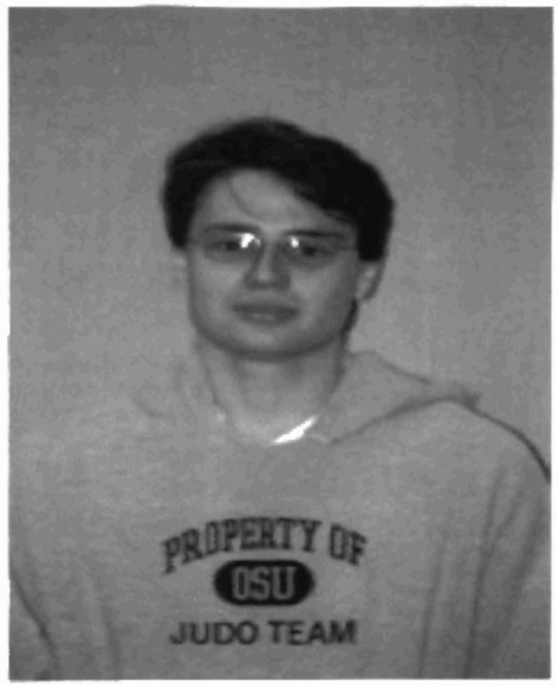
C2. Picture of Book Cover Titled "Regret"



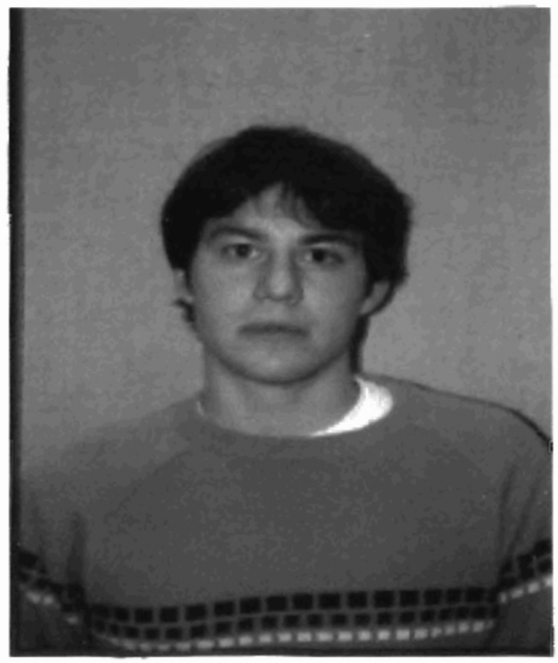
C3. Picture of Chio Clock Tower

FI1. Female Image

FI2. Male Image



CF1. Confederate 1



CF2. Confederate 2

APPENDIX E

EXPERIMENTAL GROUP IRT SCORES BY PARTICIPANT

Experimental Participant 1: 01mf1

IRT data in Milliseconds

Trial	IRT Data in Milliseconds					
E1:	103.0	104.0	102.0	103.0	104.0	
E2:	103.0	104.0	102.0	104.0	104.0	
E3:	103.0	103.0	102.0	104.0	104.0	
C1:	102.0	103.0	102.0	102.0	101.0	101.0
C2:	101.0	100.0	101.0	102.0	103.0	
C3:	102.0	101.0	101.0	103.0	103.0	
FI1:	100.0	100.0	100.0	101.0	101.0	101.0
FI2:	105.0	105.0	106.0	106.0	105.0	105.0
CF1:	100.0	100.0	101.0	101.0	101.0	
CF2:	101.0	101.0	99.0	99.0	101.0	

Experimental Participant 2: 02jk1

IRT data in Milliseconds

Trial	IRT Data in Milliseconds					
E1:	103.0	104.0	102.0	104.0	104.0	
E2:	104.0	104.0	103.0	103.0	105.0	
E3:	105.0	105.0	105.0	105.0	105.0	
C1:	99.0	99.0	96.0	100.0	99.0	
C2:	99.0	100.0	100.0	94.0	92.0	91.0
C3:	97.0	93.0	92.0	91.0	92.0	93.0
FI1:	110.0	109.0	109.0	109.0	110.0	
FI2:	104.0	105.0	104.0	103.0	103.0	
CF1:	100.0	100.0	100.0	101.0	101.0	
CF2:	101.0	101.0	102.0	102.0	101.0	

Experimental Participant 3: 03ct1

IRT data in Milliseconds

Trial	IRT Data in Milliseconds					
E1:	104.0	105.0	105.0	103.0	104.0	
E2:	103.0	104.0	103.0	102.0	102.0	
E3:	104.0	103.0	103.0	104.0	104.0	
C1:	99.0	99.0	100.0	100.0	97.0	
C2:	99.0	97.0	96.0	95.0	92.0	93.0
C3:	96.0	96.0	94.0	97.0	98.0	99.0
FI1:	100.0	101.0	101.0	101.0	100.0	100.0
FI2:	98.0	98.0	98.0	99.0	100.0	
CF1:	104.0	104.0	105.0	104.0	104.0	103.0
CF2:	103.0	103.0	102.0	102.0	102.0	

Experimental Participant 4: 07hb1

IRT data in Milliseconds

Trial	IRT Data in Milliseconds						
E1:	102.0	103.0	106.0	104.0	100.0		
E2:	105.0	105.0	104.0	105.0	106.0		
E3:	100.0	104.0	104.0	102.0	100.0		
C1:	97.0	97.0	98.0	99.0	94.0	94.0	
C2:	97.0	94.0	93.0	94.0	92.0		
C3:	99.0	99.0	93.0	91.0	95.0	99.0	
FI1:	99.0	99.0	100.0	99.0	98.0	99.0	100.0
FI2:	99.0	99.0	99.0	100.0	101.0		
CF1:	102.0	102.0	102.0	102.0	101.0		
CF2:	99.0	100.0	101.0	101.0	101.0		

Experimental Participant 5: 08kh1

IRT data in Milliseconds

Trial	IRT Data in Milliseconds						
E1:	92.0	93.0	100.0	100.0	98.0		
E2:	92.0	96.0	95.0	96.0	95.0		
E3:	99.0	99.0	98.0	99.0	96.0		
C1:	89.0	88.0	86.0	89.0	90.0		
C2:	87.0	88.0	85.0	86.0	87.0	87.0	
C3:	92.0	94.0	91.0	91.0	90.0	87.0	91.0
FI1:	97.0	98.0	98.0	99.0	100.0		
FI2:	95.0	96.0	97.0	98.0	98.0	99.0	
CF1:	91.0	92.0	93.0	94.0	95.0		
CF2:	98.0	99.0	100.0	101.0	101.0	101.0	

Experimental Participant 6: 11mt1

IRT data in Milliseconds

Trial	IRT Data in Milliseconds					
E1:	98.0	96.0	97.0	98.0	92.0	
E2:	84.0	88.0	82.0	84.0	84.0	
E3:	89.0	87.0	86.0	85.0	88.0	
C1:	84.0	86.0	88.0	84.0	71.0	
C2:	77.0	82.0	82.0	81.0	80.0	
C3:	82.0	80.0	80.0	78.0	77.0	79.0
FI1:	84.0	84.0	85.0	86.0	87.0	
FI2:	84.0	84.0	85.0	85.0	86.0	
CF1:	95.0	95.0	96.0	96.0	97.0	
CF2:	83.0	84.0	85.0	85.0	85.0	

Experimental Participant 7: 17ch1

IRT data in Milliseconds

Trial	IRT Data in Milliseconds						
E1:	105.0	107.0	107.0	104.0	104.0		
E2:	102.0	104.0	104.0	102.0	103.0		
E3:	113.0	112.0	111.0	111.0	116.0		
C1:	97.0	97.0	98.0	97.0	96.0		
C2:	94.0	98.0	95.0	97.0	96.0		
C3:	99.0	80.0	104.0	105.0	100.0	99.0	92.0
FI1:	101.0	101.0	102.0	103.0	102.0		
FI2:	107.0	107.0	108.0	108.0	107.0	107.0	
CF1:	100.0	100.0	100.0	99.0	99.0		
CF2:	103.0	103.0	103.0	104.0	104.0		

Experimental Participant 8: 18bm1

IRT data in Milliseconds

Trial	IRT Data in Milliseconds					
E1:	101.0	103.0	105.0	102.0	101.0	
E2:	103.0	101.0	105.0	104.0	102.0	
E3:	101.0	103.0	101.0	102.0	103.0	
C1:	98.0	96.0	94.0	98.0	100.0	
C2:	90.0	95.0	94.0	96.0	91.0	
C3:	93.0	96.0	94.0	99.0	96.0	98.0
FI1:	102.0	101.0	101.0	102.0	102.0	102.0
FI2:	100.0	101.0	101.0	101.0	100.0	
CF1:	100.0	100.0	101.0	101.0	102.0	
CF2:	99.0	100.0	99.0	100.0	100.0	

Experimental Participant 9: 19jf1

IRT data in Milliseconds

Trial	IRT Data in Milliseconds					
E1:	99.0	99.0	97.0	99.0	103.0	
E2:	103.0	104.0	103.0	104.0	101.0	
E3:	102.0	104.0	103.0	103.0	103.0	99.0
C1:	98.0	96.0	99.0	100.0	100.0	
C2:	93.0	99.0	96.0	100.0	100.0	
C3:	88.0	88.0	89.0	87.0	91.0	93.0
FI1:	90.0	91.0	91.0	92.0	93.0	93.0
FI2:	108.0	109.0	109.0	108.0	107.0	
CF1:	95.0	95.0	95.0	95.0	94.0	
CF2:	102.0	103.0	103.0	103.0	103.0	

Experimental Participant 10: 20pw1

IRT data in Milliseconds

Trial	IRT Data in Milliseconds						
E1:	106.0	106.0	110.0	105.0	103.0		
E2:	105.0	110.0	111.0	112.0	109.0		
E3:	108.0	116.0	117.0	115.0	114.0	110.0	
C1:	100.0	104.0	102.0	100.0	99.0		
C2:	98.0	100.0	100.0	101.0	103.0		
C3:	100.0	100.0	101.0	101.0	99.0	98.0	100.0
FI1:	106.0	106.0	106.0	107.0	108.0		
FI2:	108.0	108.0	109.0	108.0	107.0	107.0	
CF1:	105.0	105.0	105.0	104.0	106.0		
CF2:	108.0	109.5	109.4	108.2	108.1		

Experimental Participant 11: 21kc1

IRT data in Milliseconds

Trial	IRT Data in Milliseconds							
E1:	95.0	96.0	100.0	97.0	94.0			
E2:	92.0	91.0	93.0	94.0	95.0			
E3:	96.0	82.0	90.0	89.0	87.0	82.0		
C1:	91.0	90.0	89.0	96.0	82.0			
C2:	90.0	89.0	87.0	87.0	91.0			
C3:	92.0	93.0	78.0	77.0	77.0	80.0	85.0	82.0
FI1:	90.0	91.0	92.0	93.0	94.0			
FI2:	85.0	86.0	87.0	88.0	88.0			
CF1:	94.0	96.0	99.0	100.0	100.0			
CF2:	87.0	89.0	89.0	90.0	91.0			

Experimental Participant 12: 24In1

IRT data in Milliseconds

Trial	IRT Data in Milliseconds					
E1:	103.0	102.0	104.0	103.0	103.0	
E2:	105.0	105.0	103.0	104.0	103.0	
E3:	99.0	99.0	100.0	100.0	100.0	
C1:	92.0	91.0	92.0	92.0	92.0	99.0
C2:	96.0	97.0	98.0	96.0	96.0	
C3:	90.0	86.0	87.0	88.0	89.0	
FI1:	98.0	98.0	99.0	100.0	98.0	
FI2:	98.0	99.0	99.0	100.0	99.0	
CF1:	100.0	100.0	100.0	101.0	100.0	
CF2:	99.0	99.0	100.0	101.0	100.0	

Experimental Participant 13: 25jb1

IRT data in Milliseconds

Trial	IRT Data in Milliseconds						
E1:	104.0	104.0	103.0	105.0	105.0		
E2:	103.0	103.0	103.0	103.0	102.0		
E3:	109.0	108.0	108.0	106.0	107.0		
C1:	101.0	100.0	100.0	100.0	100.0		
C2:	99.0	100.0	100.0	100.0	100.0		
C3:	101.0	99.0	100.0	99.0	97.0	96.0	95.0
FI1:	104.0	104.0	104.0	105.0	103.0		
FI2:	101.0	101.0	101.0	101.0	100.0		
CF1:	104.0	105.0	105.0	104.0	104.0		
CF2:	109.0	108.0	109.0	110.0	109.0		

Experimental Participant 14: 28ha1

IRT data in Milliseconds

Trial	IRT Data in Milliseconds						
E1:	110.0	110.0	111.0	108.0	105.0		
E2:	103.0	104.0	104.0	105.0	104.0		
E3:	107.0	107.0	109.0	108.0	106.0		
C1:	101.0	102.0	104.0	101.0	100.0		
C2:	101.0	100.0	100.0	100.0	99.0	98.0	
C3:	97.0	100.0	99.0	97.0	98.0	100.0	100.0
FI1:	100.0	100.0	99.0	99.0	101.0		
FI2:	100.0	100.0	101.0	101.0	100.0		
CF1:	97.0	98.0	99.0	100.0	100.0		
CF2:	103.0	103.0	103.0	102.0	103.0		

Experimental Participant 15: 35ks1

IRT data in Milliseconds

Trial	IRT Data in Milliseconds					
E1:	107.0	106.0	105.0	106.0	108.0	
E2:	105.0	105.0	104.0	104.0	105.0	
E3:	104.0	106.0	104.0	104.0	105.0	105.0
C1:	96.0	97.0	97.0	98.0	99.0	99.0
C2:	96.0	95.0	96.0	97.0	98.0	98.0
C3:	96.0	97.0	97.0	98.0	99.0	
FI1:	104.0	104.0	103.0	104.0	104.0	
FI2:	101.0	101.0	102.0	102.0	102.0	102.0
CF1:	103.0	103.0	104.0	104.0	103.0	
CF2:	100.0	100.0	100.0	101.0	101.0	

Experimental Participant 16: 36gj1

IRT data in Milliseconds

Trial	IRT Data in Milliseconds					
E1:	99.0	99.0	99.0	98.0	99.0	
E2:	99.0	98.0	98.0	97.0	99.0	
E3:	98.0	97.0	98.0	100.0	96.0	
C1:	88.0	89.0	90.0	92.0	93.0	
C2:	89.0	90.0	91.0	90.0	93.0	81.0
C3:	90.0	95.0	97.0	94.0	95.0	
FI1:	95.0	95.0	96.0	97.0	99.0	
FI2:	92.0	92.0	93.0	92.0	92.0	
CF1:	97.0	97.0	98.0	99.0	99.0	
CF2:	96.0	97.0	99.0	100.0	100.0	

Experimental Participant 17: 37kt1

IRT data in Milliseconds

Trial	IRT Data in Milliseconds						
E1:	104.0	104.0	106.0	102.0	105.0		
E2:	109.0	110.0	106.0	108.0	109.0		
E3:	111.0	112.0	114.0	110.0	110.0		
C1:	100.0	100.0	100.0	101.0	101.0	101.0	
C2:	102.0	101.0	100.0	100.0	102.0		
C3:	100.0	102.0	100.0	102.0	100.0	101.0	102.0
FI1:	106.0	106.0	106.0	106.0	107.0	107.0	
FI2:	107.0	107.0	108.0	107.0	106.0		
CF1:	105.0	105.0	105.0	104.0	105.0		
CF2:	105.0	105.0	106.0	106.0	106.0		

Experimental Participant 18: 38ct1

IRT data in Milliseconds

Trial	IRT Data in Milliseconds						
E1:	105.0	106.0	105.0	103.0	103.0		
E2:	104.0	103.0	103.0	103.0	104.0		
E3:	113.0	114.0	114.0	111.0	109.0	108.0	
C1:	103.0	104.0	102.0	105.0	103.0		
C2:	101.0	100.0	101.0	100.0	103.0	102.0	
C3:	102.0	101.0	100.0	102.0	101.0	100.0	99.0
FI1:	108.0	108.0	109.0	109.0	108.0		
FI2:	108.0	108.0	108.0	108.0	109.0		
CF1:	102.0	102.0	103.0	103.0	104.0		
CF2:	110.0	112.0	111.0	110.0	109.0		

Experimental Participant 19: 39ta1

IRT data in Milliseconds

Trial	IRT Data in Milliseconds						
E1:	99.0	96.0	98.0	97.0	94.0	98.0	
E2:	98.0	95.0	99.0	97.0	98.0	99.0	
E3:	99.0	100.0	98.0	99.0	100.0		
C1:	90.0	91.0	92.0	93.0	93.0		
C2:	93.0	95.0	79.0	67.0	66.0		
C3:	69.0	67.0	69.0	68.0	65.0	64.0	62.0
FI1:	93.0	93.0	94.0	94.0	92.0		
FI2:	94.0	94.0	95.0	95.0	93.0		
CF1:	93.0	93.0	94.0	93.0	92.0	92.0	
CF2:	93.0	94.0	95.0	94.0	91.0		

Experimental Participant 20: 40rs1

IRT data in Milliseconds

Trial	IRT Data in Milliseconds						
E1:	103.0	104.0	103.0	102.0	102.0		
E2:	101.0	102.0	102.0	102.0	102.0	104.0	
E3:	104.0	105.0	105.0	104.0	103.0	103.0	102.0
C1:	99.0	100.0	96.0	99.0	99.0		
C2:	99.0	100.0	100.0	100.0	98.0	98.0	
C3:	97.0	96.0	98.0	99.0	99.0	99.0	
FI1:	96.0	96.0	97.0	95.0	98.0		
FI2:	99.0	100.0	100.0	101.0	99.0	99.0	
CF1:	100.0	100.0	101.0	101.0	102.0		
CF2:	107.0	109.0	110.0	106.0	106.0		

Experimental Participant 21: 41cg1

IRT data in Milliseconds

Trial	IRT Data in Milliseconds						
E1:	92.0	100.0	94.0	100.0	100.0		
E2:	99.0	100.0	98.0	99.0	97.0		
E3:	97.0	95.0	97.0	98.0	99.0	100.0	100.0
C1:	89.0	89.0	90.0	92.0	90.0	90.0	
C2:	87.0	86.0	86.0	89.0	90.0	92.0	
C3:	94.0	99.0	97.0	95.0	96.0	97.0	
FI1:	95.0	96.0	97.0	99.0	94.0		
FI2:	98.0	98.0	100.0	100.0	100.0		
CF1:	94.0	95.0	97.0	92.0	92.0		
CF2:	97.0	99.0	100.0	101.0	99.0		

APPENDIX F

CONTROL GROUP IRT SCORES

BY PARTICIPANT

Control Participant 1: 04dm2

IRT data in Milliseconds

Trial	IRT Data in Milliseconds						
E1:	106.0	106.0	106.0	106.0	105.0	108.0	
E2:	105.0	108.0	110.0	105.0	105.0	105.0	
E3:	106.0	106.0	106.0	106.0	104.0	104.0	
C1:	104.0	105.0	105.0	105.0	106.0	105.0	
C2:	105.0	108.0	110.0	105.0	105.0		
C3:	105.0	106.0	105.0	104.0	104.0	103.0	103.0
FI1:	107.0	107.0	106.0	106.0	106.0		
FI2:	107.0	107.0	107.0	108.0	107.0	106.0	
CF1:	105.0	104.0	105.0	105.0	104.0		
CF2:	106.0	106.0	106.0	107.0	105.0	105.0	

Control Participant 2: 05nb2

IRT data in Milliseconds

Trial	IRT Data in Milliseconds							
E1:	104.0	104.0	104.0	105.0	105.0			
E2:	105.0	104.0	104.0	104.0	100.0	100.0		
E3:	101.0	100.0	103.0	105.0	104.0	104.0	105.0	
C1:	104.0	104.0	105.0	105.0	105.0			
C2:	106.0	105.0	105.0	104.0	103.0	104.0		
C3:	102.0	102.0	101.0	101.0	100.0	100.0	99.0	99.0
FI1:	100.0	100.0	101.0	100.0	99.0			
FI2:	85.0	86.0	83.0	86.0	87.0			
CF1:	102.0	103.0	102.0	102.0	102.0			
CF2:	93.0	93.0	96.0	97.0	97.0	98.0		

Control Participant 3: 06bh2

IRT data in Milliseconds

Trial	IRT Data in Milliseconds						
E1:	105.0	105.0	106.0	106.0	106.0		
E2:	105.0	104.0	104.0	104.0	104.0	104.0	
E3:	104.0	105.0	104.0	104.0	103.0	103.0	
C1:	105.0	105.0	105.0	106.0	105.0		
C2:	106.0	105.0	104.0	104.0	102.0	103.0	
C3:	103.0	102.0	101.0	100.0	106.0	107.0	105.0
FI1:	83.0	93.0	83.0	82.0	83.0	83.0	
FI2:	97.0	97.0	97.0	98.0	99.0		
CF1:	102.0	101.0	101.0	102.0	101.0		
CF2:	90.0	91.0	92.0	95.0	90.0	90.0	

Control Participant 4: 13jn2

IRT data in Milliseconds

Trial	IRT Data in Milliseconds						
E1:	101.0	100.0	101.0	101.0	101.0		
E2:	102.0	99.0	99.0	99.0	96.0	94.0	
E3:	97.0	98.0	97.0	98.0	97.0	97.0	96.0
C1:	100.0	100.0	100.0	101.0	102.0	100.0	
C2:	100.0	99.0	99.0	98.0	97.0	94.0	
C3:	93.5	96.0	97.0	96.0	97.0	97.0	98.0
FI1:	92.0	92.0	92.0	92.0	93.0	91.0	
FI2:	83.0	83.0	84.0	86.0	82.0	81.0	81.0
CF1:	92.0	92.0	92.0	91.0	90.0		
CF2:	89.0	89.0	89.0	88.0	87.0		

Control Participant 5: 14kw2

IRT data in Milliseconds

Trial	IRT Data in Milliseconds						
E1:	101.0	100.0	101.0	101.0	101.0	102.0	
E2:	99.0	99.0	99.0	96.0	94.0		
E3:	97.0	98.0	97.0	98.0	97.0	97.0	96.0
C1:	100.0	100.0	100.0	101.0	102.0	100.0	
C2:	100.0	99.0	99.0	98.0	97.0	94.0	94.0
C3:	96.0	97.0	96.0	97.0	97.0	98.0	
FI1:	95.8	95.6	95.9	96.2	97.1	97.0	
FI2:	96.0	97.0	98.0	98.0	95.0	94.0	
CF1:	100.0	100.0	101.0	101.0	99.0		
CF2:	94.0	95.0	96.0	92.0	91.0		

Control Participant 6: 15df2

IRT data in Milliseconds

Trial	IRT Data in Milliseconds							
E1:	99.0	99.0	100.0	99.0				
E2:	98.0	98.0	99.0	99.0	99.0	99.0		
E3:	99.0	100.0	99.0	98.0	99.0	100.0	100.0	100.0
C1:	101.0	100.0	99.0	99.0	98.0	98.0	100.0	
C2:	99.0	99.0	98.0	97.0	98.0			
C3:	98.0	98.0	97.0	98.0	98.0			
FI1:	98.0	99.0	97.0	96.0	96.0	99.0		
FI2:	99.0	100.0	100.0	101.0	98.0			
CF1:	100.0	100.0	101.0	99.0	98.0			
CF2:	97.0	97.0	98.0	96.0	95.0	97.0		

Control Participant 7: 16jb2

IRT data in Milliseconds

Trial	IRT Data in Milliseconds						
E1:	101.0	101.0	101.0	101.0	100.0		
E2:	101.0	101.0	100.0	103.0	102.0	102.0	
E3:	104.0	103.0	103.0	103.0	104.0	103.0	
C1:	102.0	102.0	102.0	100.0	100.0		
C2:	100.0	101.0	102.0	102.0	102.0	100.0	
C3:	102.0	104.0	103.0	103.0	103.0	103.0	102.0
FI1:	106.0	106.0	105.0	105.0	105.0		
FI2:	100.0	100.0	101.0	100.0	99.0		
CF1:	103.0	103.0	103.0	103.0	103.0		
CF2:	100.0	100.0	101.0	102.0	99.0		

Control Participant 8: 22hk2

IRT data in Milliseconds

Trial	IRT Data in Milliseconds					
E1:	96.0	96.0	95.0	96.0	96.0	
E2:	96.0	95.0	94.0	92.0	93.0	
E3:	92.0	92.0	93.0	93.0	94.0	93.0
C1:	95.0	95.0	97.0	98.0	96.0	95.0
C2:	94.0	95.0	95.0	95.0	95.0	94.0
C3:	90.0	90.0	90.0	91.0	89.0	
FI1:	87.0	88.0	88.0	87.0	86.0	86.0
FI2:	87.6	87.2	87.0	86.2	86.9	87.8
CF1:	91.0	91.0	91.0	90.0	91.0	92.0
CF2:	79.0	80.0	81.0	81.0	82.0	81.0

Control Participant 9: 23cb2

IRT data in Milliseconds

Trial	IRT Data in Milliseconds					
E1:	101.0	101.0	102.0	101.0	101.0	
E2:	101.0	102.0	102.0	102.0	102.0	
E3:	101.0	101.0	99.0	100.0	100.0	101.0
C1:	101.0	101.0	101.0	101.0	101.0	102.0
C2:	102.0	102.0	100.0	100.0	99.0	99.0
C3:	100.0	100.0	101.0	101.0	100.0	
FI1:	103.0	103.0	103.0	104.0	102.0	
FI2:	101.0	101.0	100.0	100.0	102.0	
CF1:	100.0	101.0	100.0	100.0	101.0	
CF2:	98.0	100.0	99.0	99.0	98.0	

Control Participant 10: 26tl2

IRT data in Milliseconds

Trial	IRT Data in Milliseconds					
E1:	95.0	95.0	95.0	95.0	94.0	
E2:	94.0	94.0	93.0	94.0	93.0	
E3:	92.0	92.0	92.0	92.0	92.0	
C1:	92.0	92.0	92.0	93.0	94.0	
C2:	94.0	94.0	94.0	95.0	95.0	
C3:	95.0	95.0	96.0	95.0	95.0	95.0
FI1:	89.0	89.0	90.0	91.0	87.0	
FI2:	91.0	91.0	91.0	92.0	90.0	
CF1:	90.0	91.0	91.0	90.0	90.0	
CF2:	95.0	96.0	95.0	95.0	94.0	

Control Participant 11: 27md2

IRT data in Milliseconds

Trial	IRT Data in Milliseconds					
E1:	101.0	101.0	101.0	100.0	102.0	
E2:	101.0	101.0	100.0	101.0	102.0	
E3:	101.0	101.0	101.0	101.0	100.0	101.0
C1:	101.0	102.0	102.0	102.0	101.0	100.0
C2:	101.0	101.0	101.0	101.0	101.0	100.0
C3:	99.0	99.0	99.0	99.0	98.0	99.0
FI1:	100.0	99.0	100.0	101.0	102.0	
FI2:	100.0	101.0	101.0	100.0	100.0	
CF1:	101.0	102.0	102.0	101.0	100.0	
CF2:	100.0	100.0	101.0	102.0	100.0	

Control Participant 12: 29bc2

IRT data in Milliseconds

Trial	IRT Data in Milliseconds					
E1:	97.0	97.0	97.0	97.0	97.0	
E2:	97.0	97.0	98.0	98.0	100.0	99.0
E3:	99.0	98.0	98.0	98.0	97.0	
C1:	97.0	97.0	98.0	97.0	97.0	
C2:	98.0	98.0	98.0	99.0	99.0	98.0
C3:	98.0	97.0	98.0	98.0	98.0	99.0
FI1:	76.0	77.0	80.0	73.0	75.0	76.0
FI2:	97.0	98.0	100.0	95.0	95.0	
CF1:	95.0	99.0	98.0	94.0	93.0	
CF2:	101.0	100.0	102.0	103.0	101.0	100.0

Control Participant 13: 30ml2

IRT data in Milliseconds

Trial	IRT Data in Milliseconds					
E1:	102.0	101.0	101.0	100.0	100.0	
E2:	101.0	101.0	101.0	100.0	101.0	
E3:	100.0	99.0	98.0	99.0	98.0	
C1:	101.0	99.0	98.0	98.0	98.0	98.0
C2:	99.0	100.0	99.0	100.0	100.0	99.0
C3:	100.0	101.0	102.0	101.0	100.0	
FI1:	102.0	101.0	102.0	103.0	99.0	99.0
FI2:	99.0	99.0	102.0	101.0	98.0	
CF1:	95.0	97.0	95.0	94.0	93.0	
CF2:	100.0	101.0	102.0	100.0	99.0	

Control Participant 14: 31mt2

IRT data in Milliseconds

Trial	IRT Data in Milliseconds						
E1:	97.0	98.0	97.0	97.0	98.0		
E2:	97.0	98.0	99.0	100.0	100.0		
E3:	100.0	99.0	95.0	94.0	94.0	94.0	
C1:	96.0	96.0	97.0	95.0	95.0		
C2:	95.0	99.0	99.0	100.0	100.0	99.0	99.0
C3:	98.0	97.0	96.0	96.0	97.0		
FI1:	93.0	94.0	96.0	92.0	95.0		
FI2:	97.0	96.0	97.0	98.0	100.0	95.0	
CF1:	99.0	99.0	100.0	101.0	96.0		
CF2:	93.0	94.0	96.0	92.0	91.0		

Control Participant 15: 32jm2

IRT data in Milliseconds

Trial	IRT Data in Milliseconds					
E1:	97.0	98.0	97.0	98.0	97.0	98.0
E2:	98.0	97.0	97.0	95.0	95.0	
E3:	95.0	89.0	90.0	90.0	91.0	91.0
C1:	98.0	99.0	100.0	98.0	99.0	100.0
C2:	101.0	100.0	100.0	95.0	95.0	94.0
C3:	94.0	95.0	96.0	95.0	95.0	96.0
FI1:	93.0	94.0	94.0	94.0	92.0	
FI2:	93.0	92.0	92.0	95.0	95.0	
CF1:	95.0	95.0	94.0	94.0	96.0	96.0
CF2:	90.0	90.0	91.0	91.0	90.0	

Control Participant 16: 33ca2

IRT data in Milliseconds

Trial	IRT Data in Milliseconds							
E1:	95.0	95.0	96.0	95.0	96.0			
E2:	95.0	95.0	95.0	95.0	95.0	93.0		
E3:	92.0	93.0	93.0	93.0	93.0			
C1:	92.0	92.0	91.0	91.0	91.0	91.0		
C2:	90.0	90.0	93.0	93.0	94.0			
C3:	93.0	95.0	95.0	95.0	95.0	96.0	96.0	96.0
FI1:	88.0	87.0	90.0	89.0	86.0			
FI2:	91.0	92.0	92.0	93.0	90.0	91.0		
CF1:	94.0	94.0	95.0	96.0	92.0	93.0		
CF2:	96.0	97.0	99.0	93.0	94.0			

Control Participant 17: 34js2

IRT data in Milliseconds

Trial	IRT Data in Milliseconds					
E1:	101.0	101.0	100.0	100.0	99.0	
E2:	101.0	100.0	101.0	101.0	101.0	101.0
E3:	101.0	101.0	100.0	100.0	100.0	
C1:	101.0	102.0	101.0	101.0	100.0	100.0
C2:	100.0	100.0	100.0	100.0	101.0	101.0
C3:	101.0	102.0	101.0	100.0	100.0	
FI1:	101.0	102.0	102.0	101.0	102.0	
FI2:	100.0	100.0	101.0	101.0	99.0	100.0
CF1:	100.0	100.0	100.0	101.0	101.0	
CF2:	101.0	102.0	102.0	103.0	100.0	100.0

Control Participant 18: 42am2

IRT data in Milliseconds

Trial	IRT Data in Milliseconds						
E1:	94.0	94.0	94.0	94.0	95.0		
E2:	95.0	94.0	93.0	93.0	93.0		
E3:	93.0	94.0	95.0	94.0	95.0	95.0	
C1:	95.0	95.0	94.0	95.0	95.0	96.0	
C2:	95.0	94.0	93.0	92.0	92.0		
C3:	92.0	94.0	95.0	95.0	95.0	94.0	94.0
FI1:	95.0	95.0	96.0	97.0	94.0		
FI2:	96.0	96.0	97.0	92.0	99.0		
CF1:	93.0	94.0	95.0	95.0	92.0		
CF2:	97.0	98.0	98.0	96.0	95.0	95.0	

Control Participant 19: 43kd2

IRT data in Milliseconds

Trial	IRT Data in Milliseconds					
E1:	73.0	72.0	73.0	72.0	75.0	76.0
E2:	76.0	76.0	76.0	77.0	76.0	
E3:	76.0	76.0	77.0	77.0	76.0	76.0
C1:	74.0	75.0	75.0	75.0	75.0	
C2:	76.0	75.0	76.0	76.0	76.0	
C3:	75.0	74.0	73.0	74.0	75.0	75.0
FI1:	75.0	76.0	76.0	77.0	74.0	
FI2:	78.0	79.0	80.0	80.0	77.0	
CF1:	76.0	77.0	76.0	75.0	77.0	
CF2:	94.0	96.0	96.0	93.0	94.0	94.0

Control Participant 20: 44ds2

IRT data in Milliseconds

Trial	IRT Data in Milliseconds					
E1:	96.0	96.0	95.0	95.0	96.0	
E2:	95.0	95.0	95.0	95.0	95.0	
E3:	94.0	93.0	93.0	93.0	93.0	
C1:	95.0	95.0	94.0	94.0	95.0	
C2:	95.0	95.0	96.0	96.0	95.0	
C3:	95.0	95.0	93.0	93.0	93.0	94.0
FI1:	92.0	92.0	93.0	93.0	91.0	91.0
FI2:	93.0	95.0	95.0	94.0	93.0	
CF1:	89.0	90.0	90.0	89.0	88.0	
CF2:	87.0	88.0	88.0	89.0	86.0	86.0

Control Participant 21: 45ch2

IRT data in Milliseconds

Trial	IRT Data in Milliseconds					
E1:	98.0	98.0	98.0	98.0	98.0	
E2:	99.0	99.0	99.0	99.0	94.0	
E3:	95.0	97.0	99.0	99.0	100.0	
C1:	99.0	100.0	100.0	100.0	99.0	
C2:	100.0	98.0	95.0	94.0	95.0	
C3:	95.0	94.0	98.0	99.0	99.0	
FI1:	96.0	96.0	97.0	97.0	98.0	98.0
FI2:	88.0	88.0	89.0	89.0	87.0	
CF1:	99.0	88.0	87.0	89.0	86.0	
CF2:	95.0	95.0	96.0	96.0	96.0	

Control Participant 23: 46cw2

IRT data in Milliseconds

Trial	IRT Data in Milliseconds					
E1:	80.0	80.0	80.0	80.0	81.0	
E2:	81.0	82.0	81.0	80.0	79.0	79.0
E3:	79.0	80.0	81.0	82.0	82.0	
C1:	78.0	79.0	79.0	79.0	79.0	
C2:	80.0	81.0	81.0	81.0	82.0	
C3:	82.0	81.0	81.0	80.0	79.0	
FI1:	77.0	78.0	78.0	76.0	76.0	76.0
FI2:	70.0	71.0	72.0	72.0	74.0	
CF1:	88.0	88.0	89.0	90.0	87.0	
CF2:	71.0	71.0	71.0	70.0	70.0	

APPENDIX G

INSTITUTIONAL REVIEW BOARD APPLICATION

Pursuant to 45 CFR 46 www.vpr.okstate.edu/irb

IRB Number
For Office Use Only

APPLICATION FOR REVIEW OF HUMAN SUBJECTS RESEARCH

Submitted to the
OKLAHOMA STATE UNIVERSITY INSTITUTIONAL REVIEW BOARD

Title of Project: Conditioned Suppression as an Indicator of Deception: A Tool for Interrogation

Is The Project externally funded? ___Yes _X_ No If yes, complete the following ___Private ___State ___Federal

Name of Agency | Grant Number | OSU Routing Number

Type of Review Requested: ___Exempt _X_ Expedited ___Expedited Special Population ___Full Board

Principal Investigator(s): *I acknowledge that this represents an accurate and complete description of my research.*

John J. Gallagher | | | gallaj@okstate.edu
Name of Primary PI (typed) | Signature of PI | Date | E-Mail

School of International Studies | Graduate
Department | College

804 Blackjack Stillwater, OK 74074 | (405) 743-1780 | same
PI's Address | Phone | E-Mail

Name of PI (typed) | Signature of PI | Date | E-Mail

Department | College

PI's Address | Phone | E-Mail

Adviser (complete if PI is a student): *I agree to provide the proper surveillance of this project to ensure that the rights and welfare of the human subjects are properly protected.*

Charles Abramson Ph D | | | charles@okstate.edu
Adviser's Name | Signature of Adviser | Date | E-Mail

Psychology | Arts & Sciences
Department | College

Murray 401, OSU, Stillwater 74078 | (405) 744-7492 | same
Adviser=s Address | Phone | E-Mail

NOTE: If sufficient space is not provided below for a complete answer in sufficient detail for the reviewer to fully understand what is being proposed, please use additional pages as necessary.

1. Describe the purpose of the research

   The purpose of this experimental study is to identify a new system of deception detection that utilizes a conditioned suppression technique. The purpose of this study is to develop a database of behavioral measures for the detection of concealed information in adults. A group of participants will be asked to enact a simulated "criminal" scenario and then directed to conceal their knowledge of the objects and events from the Examiner during a second day of testing. These individuals will be compared to a control contrast group, which will perform a similar, but non-crime related scenario. These participants will be asked to conceal nothing from the Examiner. This research design will allow for examination of differences between truthful and concealed information groups. This research can potentially replace existing methods of deception detection, such as the polygraph.

2 Describe the subjects of this study, including: 1) sampling procedures, 2) sampling population, 3) number of subjects expected to participate, 4) how long the subjects will be involved, 5) any follow-up procedures planned, and 6) any anticipated risks. Please state explicitly if subjects are under 18 years of age. Include a copy of the script or other mechanisms to be used to solicit subjects.

   1) The participants are asked to sign up for a two-part study. Participants will be randomly selected to be in either an experimental or a control group
   2) All participants will be adults between the ages of 18 and 50 years of age, have normal or corrected to normal vision, no history of neurological disorders or learning disabilities, and who have no prior experience with interrogative polygraphy. The participants will be college students, age range of 18 and above, at Oklahoma State University (OSU) enrolled in introductory or lower-level psychology and business courses.
   3) There will be 40 participants (N=40) 20 for the experimental condition and 20 for the control condition
   4) Each phase is approximately 1 hour long, totaling 2 hours of participation Phase one takes place prior to Phase two. Each group will spend approximately 1 hour in phase one and 30 minutes to an hour the following day in phase two. The two phases are separated by at least 24 hours
   5) The follow-up will be a deception detection test in which all participants will participate The Stimuli, in phase two (follow-up), will be identical for both groups.
   6) There are no anticipated risks to the participants found outside of everyday life All participants sign a consent form outlining the risks and what the experiment is about. (Appendix B) Participants will have the option of leaving the study at any time At the end of the semester the participants will be given a debriefing form that describes what they participated in and the benefits of the research.

3. Describe each proposed condition, intervention, or manipulation of human subjects or their environments. Include a copy of any questionnaires, tests, or other written instruments, instructions, scripts, etc., to be used

   a Participants will be randomly selected to be in either an experimental or a control group The participants in the experimental group are asked to take part in a simulated "criminal" act (phase one) and then conceal any information about that act during a lie detection test (phase two), the following day. The participants in the control group will take part in an errand task (phase one) and then take the lie detection test the next day

   b Experimental participants will enact a simulated "criminal" scenario (Appendix B) while the control participants will enact an errand scenario (Appendix C) The experimental (criminal) group will meet in 024 North Murray where they will meet with a trainer who will explain what they need to do and help fill out the consent package. They are then instructed, by the trainer, to proceed to another location in a nearby building (007 South Murray) and proceed to a set of locked file drawers said to contain various blueprints and pictures that identify informants (two face images) They will unlock the file drawer, locate and remove any documents or pictures located in a file named "DOOM Project." (Appendix D) photograph them with a small pocket camera given to

them by the trainer, and return the documents to their correct folder From that location, they will exit the building and proceed to the park located across the street As subjects exit the corridor, they will encounter an experimental confederate, posing as one of the janitors, who asks them casually why they are in the building after-hours Subjects will have been coached to only reveal that they are doing research for Dr. Abramson From the building, subjects will approach another experimental confederate wearing a black baseball cap and exchange the camera for an envelope containing a note. Subjects will then go to 024 North Murray Hall for a debriefing with the trainer Following the debriefing, the trainer will instruct experimental subjects to conceal any information about the scenario but to remain truthful about all other information during the computer task the next day

The control (errand) group will be given a pen, paper sack, and piece of paper, and will be told to go to the library. Once in the library, subjects will go to the third floor and proceed to find a pre-specified journal and book where they will write down information from these materials While the subjects are finding the journal and book, they will be encountered by a confederate, who, after making a pre-specified verbal exchange, will give each subject a face image which they will place in the paper sack. Once the subjects finish writing down information from the library materials, subjects will proceed to the clock tower where they will approach a confederate in a blue shirt and exchange the paper sack for a backpack. Subjects will then return to the laboratory for a debriefing with the trainer. Following the debriefing, the trainer will instruct contrast subjects to remain truthful about all information during the computer task the next day.

c On day two of the experiment the participants are asked to come in to take a recognition test. A set sequence of pictures, pictures linked to the simulated "criminal" act and neutral pictures, are put into a slide projector that is hooked up to a computer. The pictures are the same for the experimental and the control group. The participant is taken into a room with a screen in front of them. The participant is told that they will need to press a button, which is attached to a computer, while pictures are presented on a screen. The pictures stay on the screen for approximately one minute.

A baseline of responses will be attained in accordance with a variable interval of rewards for reinforcement of the desired behavior. The reward could be a voice that verbally rewards the participant with a positive statement The computer program runs a series of neutral pictures, which are not associated with the simulated "criminal" act, and conditioned pictures, that are associated with the simulated "criminal" act. The pictures stay on the screen for approximately one minute While these pictures are being presented the participant is still pressing a button

The expected result will be a decrease in responses, suppression of the preconditioned emotion, in response to the CS+ pictures being presented. The pictures could also produce an increase in responses, based not on suppression but elation in response to the pictures In either case of responses an investigator will be able to determine if a suspect had prior conditioning to the simulated "criminal" act or individuals in question The deception is analyzed by measuring time between responses (button presses) and the number of responses (button presses) between the pictures A computer can measure the time between the pictures and the response of the suspect.

d. What we expect to find are changes (variation in responses) from the baseline reading There should be no change in responses when neutral pictures are presented However, the pictures that are connected to the preconditioned act or event should influence the responses of the participant, establishing conditioned suppression. The suppression or variation from the baseline reading indicates that the participant recognizes the picture The control group should not respond as the experimental group to the same pictures due to the control groups' task, which is non-deceptive. The level of variation from the baseline of the experimental group, when compared to the variation from the base line in the control group, should show that deception can be measured using a conditioned suppression technique.

4 Will the subjects encounter the possibility of stress or psychological, social, physical, or legal risks that are greater than those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations or tests?

[X] Yes [ ] No If Yes, please explain below

Subjects in the experimental group will be asked to perform a simulated "criminal" scenario and then conceal their knowledge of the events and objects from the Examiner on day two. Because this might induce psychological stress beyond daily life in some subjects, any for whom this may pose a problem will have the opportunity to enact the non-crime-related scenario instead. Subjects in this group are not required to conceal their knowledge. In practice, other researchers have found that most college students enjoy the challenge of successfully concealing information from a blind experimenter in similar mock-crime scenarios Moreover, subjects will have been/told that there is no legal risk involved in performing the mock-criminal scenario and that they can decline to participate or suspend participation if they wish at any time.

5. Will medical clearance be necessary for subjects to participate because of tissue or blood sampling, administration of substances such as food or drugs, or physical exercise conditioning?

[ ] Yes [X] No If Yes, please explain how the clearance will be obtained.

6. Will the subjects be deceived or misled in any way?

[ ] Yes [X] No If Yes, please explain below.

7 Will information be requested that subjects might consider to be personal or sensitive?

[ ] Yes [X] No If Yes, please explain below.

8 Will the subjects be presented with materials that might be considered to be offensive, threatening, or degrading?

[ ] Yes [X] No If Yes, please explain below, including measures planned for intervention if problems occur

9 Will any inducements be offered to the subjects for their participation?

[X] Yes [ ] No If Yes, please explain below.

Participants will earn extra course credit for their participation Most introductory and lower-level psychology and business courses offer students a small amount of course credit (usually less that 5 % of their grade) for the participation in the research process In psychology courses, students are required to earn two "unit" of research experience The requirement may be fulfilled in one of three ways. 1) serving as human participants in one or two current research project(s), 2) attending two Undergraduate Research Colloquiums, or 3) researching and writing two 3-4 page papers on two designated research topics. Each hour of participation in a research project as a participant is generally regarded as satisfying one "unit" of the requirement, and students participating in this study will earn one hour (or unit") of credit. Since the Fall semester of 2001, our department has had an agreement with the School of Business to expand our numbers of available participants and opportunities for students by combining out subject pools. As a part of this agreement, we have agreed to insure that students in both departments have comparable expectations and alternatives to research participation

If extra course credit is offered, describe the alternative means for obtaining additional credit available to those students who do not wish to participate in the research project

Students of Introductory Psychology classes have the opportunity to gain course ("unit") credit by attending a psychological colloquium, writing a short research paper over a psychological topic, or participating in research studies

10 Will a written consent form (and assent form for minor) be used?
[X] Yes [ ] No

If Yes, *please include the form(s). A suggested format and checklist for the consent form may be useful as a guide. Elements of informed consent can be found in 45 CFR 46, Section 116*

If No, *a waiver of written consent must be obtained from the IRB. Explain in detail why a written consent form will not be used and how voluntary participation will be obtained. Include any related material, such as a copy of a public notice, script, etc., that you will use to inform subjects of all the elements that are required in a written consent.*

*See Appendix B

11 Will the data be a part of a record that can be identified with the subject?

[ ] Yes [X] No If Yes, please explain below.

12 Describe the steps you are taking to protect the confidentiality of the subjects.

Consent forms, which contain subject name only, will be filed separately from the data. Only randomly assigned subject codes will appear on completed questionnaires, and behavioral performance data. Subject codes will only be identified to subject names on a master list used during the experiment to match subjects to their subject code. After each subject completes the experiment, the corresponding master list will be destroyed. No identifying information will be included in any summary of results. All data will be kept in locked file cabinets (401 North Murray) accessible only to the principal investigator, and data will be destroyed no sooner than 5 years following publication of results (in accordance with guidelines of the American Psychological Association).

13 Will the subjects' participation in a specific experiment or study be made a part of any record available to his or her supervisor, teacher, or employer?

[X] Yes [ ] No If Yes, please describe below

The professor will receive the participants' names so that he/she may assign course ("unit") credit to fulfill the students' requirement for the two "units" of research experience

14. Describe the benefits that might accrue to either the subjects or society. *Note that 45 CFR 46, Section 46.111(a)(2) requires that the risks to subjects be reasonable in relation to the anticipated benefits. The investigator should specifically state the importance of the knowledge that reasonably may be expected to result from this research.*

Participants will not benefit from this study in any way. However, society may benefit one day if the results lead to better techniques in detecting deception in criminal interrogations.

The Department of Defense Polygraph Institute (DODPI) is exploring alternative deception detection methods. These other methods as well as the traditional polygraph are used for counterintelligence cases, foreign counterintelligence and counterintelligence operations, and other security issues.

Unlike polygraphs and EEGs, that require technical training to operate, our model is simple to operate. This means that every law enforcement agency can utilize the design. Federal, state, county and city agencies can have access to the same measure allowing for a standardization of technique.

This research will aid in a cheap effective means to detect deception and to direct an investigation. If the expected results are found this design has the potential to replace many costly and technically complex deception detection designs that are used today.

Concurrence:

Department Head (type)	Signature	Date	Department

College Dean or Research Director	Date	College

Checklist for application submission:

X Research plan* or grant proposal
X Informed consent/assent forms
X Outline or script to be provided prior to subjects agreement to participate
X Instrument(s) [questionnaire, survey, testing]
X Curriculum vitae
X Department/college/division signatures

*Research plan should be a brief summary of research, the methodology, risks to subjects, and benefits. This plan is generally used for thesis or dissertation research or other unfunded research.

Number of copies to be submitted (based on type of review required):

Exempt	2
Expedited	3
Expedited Special Population	5
Full board	12

NOTE:

1 ANY CHANGES IN THE PROJECT AFTER APPROVAL BY THE IRB MUST BE RESUBMITTED AS A MODIFICATION FOR REVIEW BY THE IRB BEFORE APPROVAL IS GRANTED. MODIFICATIONS DO NOT CHANGE THE PERIOD OF INITIAL APPROVAL.

2 APPROVAL IS GRANTED FOR ONE YEAR MAXIMUM. ANNUAL REQUESTS MUST BE MADE TO THE IRB FOR CONTINUATION. AS LONG AS THE RESEARCH CONTINUES. FORMS FOR CONTINUATION AND MODIFICATION ARE AVAILABLE ON THE WEB AND IN THIS PACKET.

APPENDIX H

INSTITUTIONAL REVIEW BOARD APPROVAL FORM

Oklahoma State University
Institutional Review Board

Protocol Expires: 7/7/03

Date Monday, July 08, 2002 IRB Application No AS0271

Proposal Title CONDITIONED SUPPRESSION AS AN INDICATOR OF DECEPTION A TOOL FOR INTERROGATION

Principal Investigator(s)

John Gallagher
804 Blackjack
Stillwater, OK 74074

Charles Abramson
401 N Murray
Stillwater, OK 74078

Reviewed and Processed as Exempt

Approval Status Recommended by Reviewer(s) Approved

Dear PI

Your IRB application referenced above has been approved for one calendar year Please make note of the expiration date indicated above It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46

As Principal Investigator, it is your responsibility to do the following

1. Conduct this study exactly as it has been approved Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year This continuation must receive IRB review and approval before the research can continue
3. Report any adverse events to the IRB Chair promptly Adverse events are those which are unanticipated and impact the subjects during the course of this research, and
4. Notify the IRB office in writing when your research project is complete

Please note that approved projects are subject to monitoring by the IRB. If you have questions about the IRB procedures or need any assistance from the Board, please contact Sharon Bacher, the Executive Secretary to the IRB, in 415 Whitehurst (phone: 405-744-5700, sbacher@okstate edu)

Sincerely,

Carol Olson

Carol Olson, Chair
Institutional Review Board

VITA

John Joseph Gallagher IV

Candidate for the Degree of

Master of Science

Thesis: CONDITIONED SUPPRESSION AS AN INDICATOR OF DECEPTION; A TOOL OF INTERROGATION

Major Field: International Studies

Biographical:

Personal Data: Born in Siloam Springs, Arkansas, On July 11, 1975, the son of John and Carol Gallagher.

Education: Graduated from Jay High School, Jay Oklahoma, in May 1993; received a Bachelor of Arts degree in Psychology from Oklahoma State University, Stillwater, Oklahoma in May, 2001. Completed the requirements for the Master of Science degree with a major in International Studies at Oklahoma State University in May, 2003.

Experience: After graduating from Jay High School enlisted in the United States Navy. After being Honorably discharged in 1997 enrolled at Oklahoma State University. Worked part time at the Oklahoma State University Police Department as a Police Dispatcher.

Professional Memberships: Phi Kappa Phi National Honors Society.