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Jacobs, Carrie-Ellen

The Effects of Dextro-Amphetamine Therapy Versus Behavioral Training, Alone and in Combination on Social Behavior and Responsiveness to Training on Hyperactive Dogs.

The Ohio State University, Ph.D., 1979

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THE EFFECTS OF DEXTRO-AMPHETAMINE THERAPY VERSUS BEHAVIORAL TRAINING, ALONE AND IN COMBINATION ON SOCIAL BEHAVIOR AND RESPONSIVENESS TO TRAINING ON HYPERACTIVE DOGS

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy in the Graduate School of The Ohio State University

By

Carrie-Ellen Jacobs, B.S., M.A.

* * * * *

The Ohio State University

1979

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DEDICATION

Special thanks to my mother, father, and the Department of Veterinary Physiology and Pharmacology: Cardio-Pulmonary Medicine, whose humor and support helped prevent me from "going to the dogs."
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CHAPTER ONE

INTRODUCTION

The problem of hyperkinesis is not a new one. The first written account was published over one hundred years ago by the German physician, Heinrich Hoffman, who wrote a poem about, "fidgety Phil who couldn't sit still" (Cantwell, 1975; Appendix A). Today hyperkinesis is one of the most common terms describing childhood problems in usage. Typically, hyperkinesis refers to a vaguely defined syndrome characterized by perceptual and learning difficulties and poor coordination (Cantwell, 1975a; Arnold, 1973; Wender, 1973, 1971).

Estimates as to the frequency of the disorder range from 3% (Department of Health, Education and Welfare, 1970) to 15% (Millchap, 1975) of elementary school children in the United States. This implicates between 1.4 to five million children (Ross & Ross, 1976). Boys exhibit characteristics of hyperkinesis over girls by a ratio of 4:1 (Cantwell, 1975; Renshaw, 1974).

The fluctuations in the estimates of the frequency of hyperkinesis reflect the general inaccuracy of diagnosis as pointed out by many investigators (Rie, Rie, Stewart & Ambuel, 1976a & b; Ross & Ross, 1976; Cantwell, 1975; Renshaw, 1975; Satterfield, 1975). As Schrag and Divoky (1975, p. 37) state, "Since there are no clear
definitions, no standard symptoms, and no guidelines for diagnosis, there is no ceiling on the incidence of affliction." In fact, Arnold, Kiriluk, Corson, and Corson (1973) refer to the identification of hyperkinesis as a "diagnostic cesspool" indicating that it is a catch-all term containing many different etiologies.

Historically, in the United States, hyperkinesis was referred to as the "Strauss Syndrome" after Alfred Strauss who specified a cluster of traits observed in children who suffered brain damage. These behavioral symptoms included: emotional instability, hyperactivity, high distractability, and perceptual disabilities (Strauss & Lehtinen, 1947).

In 1957, Maurice Laufer referred to a syndrome called the "Hyperkinetic Impulse Disorder" (Laufer, Denhoff & Solomons, 1957). He pointed out the similarities between the behaviors of children with brain injuries and hyperactive children with no overt signs of brain damage.

It has long been recognized and accepted that a persistent disturbance of a characteristic kind may be noted after severe head injury, epidemic encephalitis, and communicable disease encephalopathies, such as measles in children. It has often been observed that a pattern of a similar nature may be found in children who present no clear cut history of any of the causes mentioned. (Laufer, Denhoff & Solomons, 1957, p. 38)

Thus, research in the past has focused mainly on the interrelationships of hyperkinesis and brain damage.

In recent years, other etiological factors have been implicated. These include toxic conditions such as lead poisoning (David, Clark, & Voeller, 1972), hypersensitivities such as food allergies
(Feingold, 1975), and maturational lags (Kinsbourne, 1973). Evidence also suggests that there is a genetic predisposition to hyperkinesis (Cantwell, 1975b; Morrison, & Stewart, 1971). These components must be considered within psychological and environmental contexts thus presenting a complex interplay of factors (Arnold, 1973; 1976). Indeed, as Laufer (1975, p. 123) states, "To know the hyperkinetic impulse disorder is to know every aspect of our field of child psychiatry, from the psychodynamic to the most exquisitely organic."

Although many of the characteristics of the hyperkinetic syndrome including impulsivity and high activity levels tend to abate around puberty, evidence suggests that hyperkinesis is often the antecedent of severe behavioral disorders that appear in adolescence and adulthood. Stewart (1976) suggests that the normally difficult period of adolescence is exacerbated both by the poor self image the hyperactive child is likely to have developed and the discontinuation of the accustomed regimen of medication thus presenting the child with a new post-drug personality. Longitudinal and retrospective studies indicate that problems such as juvenile delinquency, sociopathy, schizophrenia, and alcoholism may develop secondary to childhood hyperkinesis (Metoyer & Townsend, 1974; Morrison & Minkoff, 1975; Wender, 1973).

Wender (1973, p. 49) asks, "Is the persistence of the symptoms due to the persistence of the temperamental (biochemical) problem, or is the persistence due to maladjusted patterns of behavior that were learned because of the (no longer existing) temperamental
problem?" In either case, the treatment of hyperkinesis becomes of vital importance. However, since the etiologies of the hyperkinetic symptoms have not been established, there is no clear rationale for successful therapy (Sechzer, 1977).

Currently there are three major treatment modalities: 1) environmental manipulation, 2) psychotherapy, and 3) medication. Of these three types of intervention, a unimodal approach utilizing stimulant medication (e.g., amphetamine or methylphenidate) is typically the treatment of choice (Ross & Ross, 1976; Cantwell, 1975; Wender, 1973). The use of stimulant drugs to treat children's behavior problems began in the mid-1930's under Bradley (1937). However, Bradley did caution his colleagues that the use of amphetamines should not replace, but complement, psychotherapeutic or environmental manipulations for the management of hyperkinesis.

Clinicians and researchers are again cautioning against a unitary dependence on medication to alleviate the symptoms of hyperkinetic disorders. Investigators warn that children may develop serious behavioral problems during adolescence and adulthood if attention is not paid towards helping the individual develop appropriate social behaviors (Sechzer, 1977; Ross & Ross, 1976; Laufer, 1975; Rie, Rie, Stewart & Ambuel, 1976 a, 1976 b; Arnold, 1973). Research is needed to shed light on two possible mechanisms of drug action; 1) stimulant drugs modulate the underlying causes of hyperkinetic behavior and/or 2) stimulant drugs, by modifying the
biochemistry of the brain, produces a behavioral baseline which facilitates behavioral therapy. At the present time, there is no research which clearly demonstrates that psychotherapeutic or pharmaceutical interventions, singly or in combination, effectively affect the long-term prognosis of the hyperactive child (Ross & Ross, 1976).

There are two major obstacles in conducting research with children. These include ethical considerations as well as methodological problems in controlling environmental variables. An alternative approach to research which circumvents these problems involves the use of animal models to explore etiologies and treatments of hyperkinesis.

The existing animal models of hyperkinesis utilize three major research strategies: 1) administration of drugs which interfere with the metabolism of neurotransmitters in the brain (Shaywitz, Yager & Klopper, 1976), 2) mechanical damage (Robinson, Bloom, Shlumpf & Valk, 1975), and 3) observation of naturally occurring symptoms (Corson, Corson, Arnold & Knopp, 1976; Corson, Note 5; Scott, Note 1). The first two strategies have two major drawbacks. They have been conducted on rat populations with crudely constructed measures of hyperactivity and they assume structural damage which is not always evident in cases of childhood hyperkinesis.

Corson (Note 5); Corson, Corson, Arnold and Knopp (1976), Corson, Corson, Bicker, Ginsburg, Trattmer, Conner, Lucas, Panksepp and Scott (Note 2), and Scott (Note 1) offer a naturally occurring
model of hyperkinesis in dogs. The symptoms of hyperkinesis observed in these dogs appear to be genetically transmitted. The use of dogs is advantageous because they exhibit a wide range of emotions which offer some parallels to human behavior. The dogs in these studies exhibited hyperkinetic symptoms similar to those seen in children in a classroom situation such as restlessness and inability to respond to task demands.

In the Corson (Note 5), Corson, et al. (1976), Corson, et al. (Note 2) and Scott (Note 1) studies, the hyperactive dogs responded to the stimulant drugs in a manner similar to hyperkinetic children administered drug therapy. When the drugs were effective, they were effective in doses similar to those given to children. The dogs, however, did not demonstrate the lessening of hyperactive behavior merely with age as observed in children. In one dog, Jackson, socialization procedures and conditioning experiments were combined with a six week period of amphetamine therapy. After several weeks of combined treatment, his violent and hyperactive behavior was ameliorated and did not reappear for an observation period of several years after the medication was discontinued.

The purpose of this study was to examine the effect of dextro-amphetamine therapy vs. behavioral training vs. a combination of dextroamphetamine therapy and behavioral training on the social behavior and responsiveness to training of dogs which were bred to be hyperkinetic. The treatment groups consist of: 1) a group receiving amphetamines, 2) a group undergoing training procedures, and
3) a group receiving both amphetamines and training. The results will indicate the comparative efficacy of the three treatments in a situation in which variables of heredity and life history can be controlled and the variables of behavioral therapy and medication are systematically introduced. Although the results of this study cannot be directly generalized to human populations, they will be suggestive of properties to look for in considering therapeutic interventions with hyperkinetic children.
CHAPTER TWO

REVIEW OF THE LITERATURE

Problems of Definition

"Do you think you can find the answer to it?" said the March Hare. "Exactly so," said Alice. "Then you should say what you mean," the March Hare went on. "I do," Alice hastily replied. "At least I mean what I say--that's the same thing you know." "Not the same thing a bit," said the Mad Hatter. "Oh Well! It means much the same thing," said the Duchess . . . , "and the moral of that is - take care of the sense and the sounds will take care of themselves." (Carroll, 1865(1974), p. 97).

The problem of defining what constitutes the hyperactive syndrome is twofold, for as Rie (1975, p. 783) points out there is "ambiguity on the conceptual side and contradictory evidence on the empirical side." On the conceptual side of the problem there is disagreement and confusion whether hyperkinesis is one symptom of, or an integral part of minimal brain dysfunction (MBD). On the empirical side there is a general lack of agreement of what behavioral, neurological, and/or biochemical signs indicate hyperactivity. As Fish (1971, p. 193) states, "In past years, there has been a subtle tendency to oversimplify and overgeneralize the concept and even to wipe out diagnostic landmarks."

Investigators generally agree that the large range of psychopathology covered by the concept of MBD raises the question of
whether it can be called a syndrome. Klein and Klein (1974) point out that it is not a "monothetic category" which could be specified by a single operationally definable trait. They consider MBD a "polythetic" category, in which no single trait defines the group, but certain common traits have high intercorrelations. These symptomologies tend to covary, not presenting discrete constellations for identification. Werry (1968) and Crinella (1971) have attempted to do factor analyses on the various symptoms to help solve this problem.

The conceptual problem of the relationship between hyperactivity and brain damage is obvious when one examines the various names which are used interchangeably in the literature. These include: 1) the hyperactive child syndrome, 2) the hyperkinetic syndrome, 3) minimal brain dysfunction, 4) minimal cerebral dysfunction, 5) minimal brain damage, 6) the brain damaged child, 7) the perceptually handicapped child, 8) the clumsy child, 9) chronic brain syndrome, 10) the Strauss Syndrome, 11) learning disorder, and 12) central nervous system dysfunction (Millichap, 1975).

Part of the problem in the confusion of terms can probably be related back to Laufer (Laufer, Denhoff, & Solomons, 1957) who defined a pattern called "Hyperkinetic Impulse Disorder" which he compared to behavior patterns resulting from obvious brain insult. He said that this pattern, consisting of hyperactivity, short attention span, poor concentration, impulsiveness, and perceptual learning problems, could be found in children with no clear-cut
history of brain damage, but that it more or less implied some central nervous system (CNS) dysfunction.

More recently, researchers have been voicing the concern that terms such as "minimal brain dysfunction" are misleading. Although hyperactivity is associated with obvious brain damage, there is no evidence that brain dysfunction is a necessary condition for the occurrence of such behaviors (Cole, 1975; Rie, 1975; Satterfield, Cantwell, Saul, & Husin, 1974; Palkes & Stewart, 1972; Fish, 1971). Investigators also point to the diversity of the underlying conditions of which hyperactivity can be symptomatic. These include factors such as brain dysfunction (Laufer, et al., 1957), toxic conditions such as lead poisoning (David, Clark, & Voeller, 1972), food sensitivities (Conners, Coyette, Southwick, Lees & Andralones, 1976; Harley, Note 4; Feingold, 1975), allergies (Kittler & Baldwin, 1970; and Goldstein, Moyer & Heiner, 1970), maternal smoking (Denson, Nanson & McWatters, 1975), maturational lag (Kinsbourne, 1973) and genetic predisposition (Cantwell, 1975c, 1972; Morrison & Stewart, 1971). Table 1 lists some of the disorders and resulting conditions to be considered when a child exhibits symptoms of hyperactivity (Ross & Ross, 1976). Another difficulty in establishing a conceptual agreement on hyperkinesis stems from the varied theoretical approaches researchers take to the problem. Educators tend to view hyperkinesis behaviorally, from the perspective of what can help the child meet educational objectives (Cruickshank, 1961; 1975; and Hewett, 1970). The medical approach emphasizes etiology
### TABLE 1
Disorders and Conditions Characterized by Hyperactivity

<table>
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<tr>
<th>Category</th>
<th>Example</th>
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<tr>
<td>Metabolic and Endocrine disorders</td>
<td>hyperthyroidism</td>
</tr>
<tr>
<td>Toxic conditions</td>
<td>lead poisoning</td>
</tr>
<tr>
<td>Allergy</td>
<td>particularly food allergies</td>
</tr>
<tr>
<td>Sensory disorders</td>
<td>deafness, blindness</td>
</tr>
<tr>
<td>Temperament</td>
<td>normal variant of psychological functioning</td>
</tr>
<tr>
<td>Maturational lag</td>
<td>immaturity of central nervous system</td>
</tr>
<tr>
<td>Central nervous system</td>
<td>acute encephalitis, chronic brain syndrome</td>
</tr>
<tr>
<td>impairment</td>
<td></td>
</tr>
<tr>
<td>Learned reaction</td>
<td>response to environmental social stressors</td>
</tr>
<tr>
<td>Psychoneurosis</td>
<td>phobia</td>
</tr>
<tr>
<td>Personality disorder</td>
<td>pathological personality traits</td>
</tr>
<tr>
<td>Psychosis</td>
<td>severe behavioral disturbance such as schizophrenia</td>
</tr>
</tbody>
</table>

(Ross & Ross, 1976, p. 7)
and organic factors (Wender, 1971) and psychometric explanations tend to base the diagnosis on the statistical concept of the normal curve (Bryan & Bryan, 1978). As Keogh (1971, p. 545) suggests, "Disturbance, like beauty, may be in the eye of the beholder."

"Hyperkinesis," whatever organic condition it may legitimately refer to, has become a convenient label with which to dismiss this phenomenon as a physical "disease" rather than treating it as the social problem it is. (p. 547)

Investigators are now examining hyperkinesis from a holistic perspective. This involves looking at the interaction of the child operating within his/her environment. With this orientation the social environment of the child becomes as important as any possible underlying medical condition (Bryan & Bryan, 1968; Kalverboer, 1976; Conrad, 1976; Stewart, 1976; Arnold, 1973; Chess & Thomas, 1976; Freedman, 1976).

Prevalence. It is generally agreed that between three to four percent of elementary school-age children exhibit characteristics of hyperkinesis (U.S. Federal Office of Child Development, 1971; U.S. Department of Health, Education, and Welfare, 1970). Estimates of frequency above this figure range from seven percent (Renshaw, 1974) to 15% (Müllichap, 1975; Rodda, 1974 in Schrag & Divoky, 1974). This would implicate approximately 3,000,000 children in the United States. It has also been estimated that about 50% of all children between the ages of six and twelve are described by their mothers as hyperactive although their activity levels seem to be within the norms (Sykes, Douglas, Weiss & Minde, 1971).
Boys exhibit hyperactivity more than girls by a ratio of 4:1 (Cantwell, 1975; Renshaw, 1974). The typical Hyperactive child is between the ages of six and twelve, with the frequency of recognition highest between the ages of five and seven when the child enters school and is expected to conform to the classroom situation (Ross & Ross, 1976; Renshaw, 1974). In fact, the CIBA Pharmaceutical Company (1974), in a brochure on Ritalin distributed to physicians, warns them to expect a greater frequency of referrals of hyperkinesis in the autumn when children return to school.

Several investigators have traced components of hyperactivity back to infancy, relating it to temperamental factors (Chess & Thomas, 1977; Anders & Ciaranello, 1977). "The infant is described as not being in 'synchrony' with his environment" (Anders & Ciaranello, p. 430).

In recent years there have been referrals of younger children, aged three to four years, with complaints of hyperkinesis. Diagnosis at this age is still difficult as young children characteristically exhibit a higher activity level than older children and this over-activity normally disappears as a function of maturity (Schleifer, Weiss, Cohen, Elman, Cvejic & Kruger, 1975).

This maturation process begins to play a major role again around the age of 12 when many children seemingly outgrow their behavior problems and develop more self control. Although many characteristics of hyperkinesis tend to abate around puberty, longitudinal and retrospective studies indicate that secondary problems develop in
adolescence and adulthood. These difficulties include: juvenile delinquency, sociopathy, schizophrenia and alcoholism (Iachtman, Weiss, Finklestein, Werner & Benn, 1976; Heussy et al., 1974; Morrison & Minkoff, 1975; Maletzky, 1974; Wender, 1973; Mendelson, Johnson & Stewart, 1971). Thus, the importance of identification and effective treatment of hyperkinetic children becomes clear.

**Empirical Measurements**

**Statistical Models.** The statistical/psychometric approach to the diagnosis of hyperkinesis is based on the concept of the normal curve. Bryan and Bryan (1978) suggest that the medical and statistical models have become meshed into what may be referred to as the "clinical perspective." Diagnosticians use a statistical device to identify the problem and the medical model to understand its dynamics. Using the statistical approach, the symptoms of hyperactivity are typically divided into two major categories, behavioral signs and perceptual-cognitive difficulties.

The earliest and most common classifications of hyperkinesis were based on behavioral observations of the child's motor behavior. Chess' (1960) simple definition typifies this, "The hyperkinetic child is one who carries out activities at a higher rate of speed than the average child or who is constantly in motion or both" (p. 142).

Excessive motor activity is the most commonly thought of aspect of hyperkinesis and the literature is replete with statements describing this aspect of the child. The hyperkinetic child is described as
being driven by an "inner tornado" (Cole, 1975), his behavior seems to be "random and purposeless" (Millichap, 1975) and he has great difficulty settling down to tasks, tending to "wiggle in his seat" (Stroufe, 1975; Wedell, 1973).

Many devices have been used to measure activity levels of children including actometers (Johnson, 1971), ballistographic chairs (Foshee, 1958), photoelectric devices (Ellis & Pryer, 1959), motion pictures (Hutt & Hutt, 1970), and questionnaires (Werry & Sprague, 1970; Burks, 1960; Davids, 1971; Conners, 1969). However, the results from these devices are often inconclusive and the reliability of the measures has proven to be low. "In fact, we lack norms of activity level . . . we lack measures of the quality of the behavior even when the level of activity is not in doubt" (Rie, 1975, p. 284).

Several studies have examined the situational and qualitative aspects of activity levels between hyperactive and control groups and have found relationships between difficulty of task demands and activity levels (Kalverboer, 1976; Conners, 1968; Pope, 1970; Comly, 1971).

Early investigators attributed the often poor academic performance of hyperactive children to global cognitive impairment (Paruka, 1976). More recently, emphasis has been placed on evaluating variables which play an integral part in cognitive performance such as impulsivity (Koegh, 1971; Campbell, Douglas & Morgenstern, 1971) and perceptual deficits (Cruickshank, 1975; Wedell, 1973; Rephart, 1967).
Attentional problems of hyperactive children have been demonstrated by investigators on tasks involving span of word apprehension (Denton & McIntyre, 1978), experimenter-placed tasks (Sykes, Douglas, Weiss & Minde, 1971), partial vs. continuous reinforcement conditions (Paruka, 1976; Freibergs & Douglas, 1969), and vigilance (Dykman, Ackerman, Clements & Peters, 1971; Doyle, 1976). Whalen and Henken (1976) after a review of the literature report that a common finding is that hyperkinetic children have special difficulties sustaining attention on tasks which are structured by someone else.

Dykman et al. (1971) define attention as consisting of four components: alertness, stimulus selection, focusing, and vigilance. They interpret the difficulties the hyperkinetic children have with language perception, and motor skills as stemming from their difficulties in sustaining and focusing attention (cf Sprague & Gadow, 1976).

**Medical Models.** Bryan and Bryan (1978) define the medical model as a "conceptual tool to interpret the nature of biological disease processes in order to cure persons afflicted with disease" (p. 21). Traditionally, it focuses on finding biological explanations for problems and tends to overlook social and environmental factors. There are two major problems if one strictly adheres to this approach: 1) it cannot be assumed that all hyperactive children suffer from neurological abnormalities (Bryan & Bryan, 1978; Kornetsky, 1975; Wender, 1971), and 2) environmental factors which interact with the child's behavior become inseparably intertwined with the postulated biological mechanisms of hyperkinesis (Safer & Allen, 1975; Conrad,
1976; and Kornetsky, 1975). In fact, it has been pointed out that this is one case in which the diagnosis is usually made by the parents and educators and the physician's role becomes one of confirmation and prescription of medication (Johnson, Kenney & Davis, 1976; Weithorn & Ross, 1976; Kornetsky, 1975). Behavioral signs are the indicators most physicians use in diagnosing hyperkinesis. Measures such as soft neurological signs (Freedman, 1976; Kornetsky, 1975) and electroencephalograms (EEG's) (Anders & Ciaranello, 1977; Hughes, 1976; Feinberg et al., 1974) have been found to be inconclusive as diagnostic clinical tools.

Physiological Studies. Experimental neurological studies have focused mainly on finding autonomic or CNS correlates of hyperactive behavior. EEG patterns and skin conductance levels (GSR) of hyperactive children in a resting state or while attending to presentation of various stimuli indicate that they often have low CNS arousal levels (Grunewald-Zuberbier, Grunewald & Rasche, 1975; in Sheer, 1976; Satterfield, 1975; Satterfield, Cantwell, Saul & Husin, 1974; Satterfield, Cantwell, Lesser & Podosin, 1972; Cohen & Douglas, 1972). It is hypothesized that low CNS arousal levels in hyperactive children indicates insufficient CNS inhibition (Satterfield, 1975; Corson, 1976). Lack of inhibitory control helps to explain the child's excessive distractibility and activity.

Cohen and Douglas (1972) found that when hyperactive and normal subjects attended to a tone and were required to make active responses
on a continuous reinforcement task, they did not differ with respect to GSR levels. When the subjects were required to respond to the tone on noncontinuous reinforcement schedules, the hyperactive group did show a lower level of autonomic arousal.

Satterfield *et al.* (1974) found that on certain tasks, a group of hyperactive subjects had a higher level of arousal than the control group. Kalverboer (1975) suggests that there is no fixed relationship between neurological conditions and behavior. Behavior depends on the type of situation to which the child is exposed.

It has been postulated that hyperkinetic children are overdependent on environmental factors. They may become overaroused in situations with high levels of stimulation and underaroused in situations with low levels of stimulation (Satterfield, *et al.*, 1974). Hyperkinetic children are thus thought of as having "marginal arousal systems" (Sheer, 1976). There is a degree of adaptability inherent in the nervous system, but limits are placed on the system's ability to cope when subjected to varying degrees of stress.

**Biomedical Studies.** Investigators such as Wender (1971, 1976) are also examining the so-called "paradoxical" effects of stimulant drugs, such as amphetamine, to help develop a biochemical explanation of hyperkinesis. Stimulant drugs are known to have several potential effects on the nervous system: 1) they can promote the release of transmitter substances, 2) they can inhibit its reuptake, 3) they can inhibit monoamine oxidase (a catecholamine degrader), and
4) they can act as a sympathomimetic (Cooper, Bloom & Ross, 1974). Many neuropharmacologists currently believe that the major action of amphetamines in the brain deals with the inhibition of reuptake and the direct synaptic release of catecholamines (Spyder & Meyerhoff, 1973).

This model of hyperkinesis postulates two reciprocal arousal systems, inhibitory and excitatory, in the CNS. Both systems are monoaminergic with differential responses to catecholamine transmitters. Hyperkinesis could be the result of a deficit of transmitters in the inhibitory system, thus the excitatory system is more active.

This model also explains the biphasic effect stimulant medications seem to have on children. At lower doses they affect the inhibitory system and are calming. At higher doses they affect the excitatory system and become "stimulants."

Within the human research literature Wender (1976) cites two other lines of evidence as supporting his theory. First, descriptions of the postencephalitis behavioral disorders which followed the epidemic of Von Economo encephalitis during WW I resembles hyperkinesis. It is known that the virus destroyed dopaminergic neurons. Secondly, studies of urinary adrenaline from hyperkinetic children (Rapoport, Lott, Alexander & Abramson, 1970) and fluid HVA, a dopamine metabolite, in cerebrospinal fluid (Shaywitz, 1975, in Wender, 1976) provides evidence of decreased dopaminergic functioning.

The paucity of human studies relating to the biochemical aspects of hyperkinesis is due to methodological and ethical problems.
The role of animal models in relation to this issue will be discussed in a later section of this paper.

**Drug Treatment**

**History**

Ideally, a drug used in the treatment of the minimal brain dysfunction syndrome should have several characteristics. Naturally, the drug should control hyperactivity; increase frustration tolerance and attention span; reduce impulsive and aggressive behavior, and improve deficits in visual and auditory perception, reading ability, and fine motor coordination. In addition, the drug should have few side effects of toxic manifestations.

(Anders & Ciaranello, 1977, p. 431)

Although a drug as miraculous as the one Anders and Ciaranello describe does not exist, the use of stimulant medications such as amphetamine or methylphenidate to treat hyperkinetic children is widespread. Estimates of the number of children in the United States who are on these drugs range from 200,000 (Weithorn & Ross, 1976; Ross & Ross, 1976; Grinspoon & Singer, 1973) to 500,000 to 1,000,000 (Schrag & Divoky, 1975). Stimulant medication is not only prescribed to help to control the behavior problems of the hyperkinetic child, but associated learning difficulties as well (Rie, Rie, Stewart & Ambuel, 1976a, b; Cole, 1975; Millichap, 1975; Schleifer, Weiss, Cohen, Elman, Cvejic & Kruger, 1975; Renshaw, 1974).

While the use of amphetamines for the treatment of hyperkinesis began about 45 years ago, there is evidence that an ancient Chinese precursor of amphetamine was in use over five thousand years ago for the treatment of respiratory diseases (Patrick, 1977;
Kornetsky, 1975). The drug called codification was extracted from the herb *ma huang* (*Ephedra vulgaris*).

The alkaloid ephedrine was isolated from *ma huang* in 1925 by Chen and Schmidt (Patrick, 1977). Ephedrine became the drug of choice for symptomatic treatment of bronchial asthma (See Figure 1). In 1927 Alles and Leake produced d,l-phenylalkylamine (amphetamine) in an attempt to find a synthetic substitute for ephedrine (Patrick, 1977). The racemic drug was tradenamed Benzedrine by Smith, Kline, and French Laboratories. In 1932 the Benzedrine inhaler was marketed for the symptomatic relief of respiratory infections. The dextroisomer of amphetamine was marketed under the tradename Dexedrine. Its clinical effects include increased alertness and wakefullness with suppressed appetite.

The use of amphetamines was widespread during World War II. After the war Japan put large supplies on the open market leading to an epidemic of amphetamine abuse. Abuse was also widespread in the United States and Europe (Patrick, 1977). One of the most striking side-effects of amphetamine abuse are symptoms which closely resemble acute paranoid schizophrenia (Barchas, Elliot, & Berger, 1977).

Bradley discovered the behavioral effects of amphetamine on children with behavioral disorders by accident in 1934. As part of the screening procedures to detect neurological problems in children admitted to his hospital, Bradley had pneumoencephalograms performed routinely. One of the side-effects of this procedure was severe
Figure 1. Ephedrine and Amphetamine Molecules
headache. In an effort to ameliorate the discomfort the newly discovered vasopressor Benzedrine was prescribed and its behavioral effects thus noted (Laufer, 1975). By 1935 amphetamines were used on a routine basis with children with neurological disabilities and/or difficult behavior although there was no clear rationale for its effects. Laufer notes Bradley's explanation of Benzedrine's observed effects,

When Dr. Bradley was questioned concerning these results and why this agent should have such an effect, he communicated the concept that the children came to Bradley (Hospital) because of difficult behavior, which was their way of showing they were desperately unhappy or unsatisfied in their lives, that amphetamines are euphoriant and that as the children were enabled to feel happier as the result of the medication there was less need for them to display their deviant behavior. This rationale allowed the consideration of the use of amphetamines in almost any situation, and so it could be tried in a liberal manner.

(1975, p. 107)

Evidently by 1937 Bradley's hypothesis on the mechanism of amphetamines' observed effects had changed. In the first article published on the use of amphetamines with behavioral problems he wrote:

It appears paradoxical that a drug known to be a stimulant should produce subdued behavior in half of the children. It should be borne in mind, however, that portions of the higher levels of the central nervous system have inhibition as their function, and that stimulation of these portions might indeed produce the clinical picture of reduced activity. . . .

(1937, p. 582)

At this time Bradley cautioned that the use of stimulant medication for the treatment of behavioral disorders should augment but not replace psychotherapeutic or environmental intervention.
The use of amphetamines to treat hyperactive children became popular in the early 1950's (Ross & Ross, 1976) and methylphenidate was introduced in 1957 (Laufer, 1975). However, there was little promotion of the drugs by pharmaceutical firms prior to the early 1960's (Conrad, 1976). At this time Smith, Kline and French (Dexedrine) and CIBA (Ritalin) began to advertise heavily in the medical journals.

Stimulant drugs became the treatment of choice for hyperactivity in the early and mid 1960's. In the late 1960's and early 1970's the use of these drugs fell under criticism. Many of the reports were angry and emotional such as the exaggerated report by the Washington Post that 5 to 10 percent of the 62,000 grammar school children in Omaha, Nebraska were being treated with "behavior modification drugs to improve deportment and increase learning potential" (1970, in Conrad, 1976, p. 14). This type of media pronouncement prompted government investigation of the use of stimulant medication (Office of Child Development, 1971). The middle 1970's saw a more balanced approach to the treatment of hyperkinetic children, rediscovering Bradley's (1937) concept that psychotherapeutic intervention should supplement drug therapy.

Drugs Used in the Treatment of Hyperkinesis. In addition to amphetamines, other drugs are currently in use for the treatment of hyperkinesis in children. These include: methylphenidate hydrochloride (Ritalin), magnesium pemoline (Cylert), phenothiazines
(i.e., Thorazine and Mellaril), chlordiazapoxide (Librium), imipramine (Trofanil), and diethylamino-ethanol (Deanol).

There are three forms of amphetamines available, the racemic form (Benzedrine), dextroamphetamine (Dexedrine), and levoamphetamine (Cydril). Of these, dextroamphetamine is shown to have the most potent effects in reducing hyperactivity (Arnold et al., 1973, 1976; Corson et al., 1976). The usual oral dosage is from 5 mg to 10 mg, given two to three times daily. The effects of the drug last from four to eight hours and are observable 30 minutes to one hour after the medication is taken. It is usually not given in the late afternoon to escape its insomniac effects.

At the present time the use of amphetamine runs second to methylphenidate. Ritalin is considered to be the drug of choice as it has less tendency to cause side effects such as anorexia and insomnia (Anders & Ciaranello, 1977; Kornetsky, 1975). It is a mild CNS stimulant having many of the same sympathomimetic actions of amphetamine. Typical doses range from 5-100 mg daily (Anders & Ciaranello, 1977). Indicative of its popularity are figures showing that CIBA Pharmaceutical Company earned a 13 million dollar profit from Ritalin sales in 1971, comprising 15% of its total profits (Conrad, 1976).

Magnesium pemoline (Cylert) is a CNS stimulant which is structurally distinguishable from amphetamine and methylphenidate. It has many of the same side effects such as anorexia and insomnia. One advantage of its use is its long half-life so that a single dose in the morning is adequate for the day.
Phenothiazines such as chlorpromazine (Thorazine) and thiordazine (Mellaril) have CNS depressant effects. They are not considered to be as effective as amphetamine or methylphenidate and are chiefly used for the treatment of hyperactivity in mentally retarded children (Anders & Ciaranello, 1977). The most common side effects associated with their usage in children are drowsiness, dry mouth, nasal stuffiness, and skin rash (Kornetsky, 1975).

Chlordiazapoxide (Librium) is a minor tranquilizer which is sometimes prescribed to treat forms of hyperkinesis associated with anxiety. Its side effects include drowsiness, ataxia, and occasionally nausea and skin rash.

Antidepressants such as imipramine (Tofranil) are occasionally prescribed when a depressive reaction or seizure disorder is associated with the hyperkinesis (Anders & Ciaranello, 1977). The most common side effects are dry mouth, nasal stuffiness, hypotension, constipation, and urine retention (Kornetsky, 1975).

Response Prediction. A problem exists in that the psychoactive drugs used to treat hyperactivity do not have beneficial effects on all of the children that they are administered to. This reflects the point made earlier by Corson (Note 5) and Arnold et al. (1973) that hyperkinesis is a "wastebasket diagnosis" probably containing several different etiologies. Arnold compares the problem of treating hyperkinesis with the position of the nineteenth century physicians' attempt to treat dropsy,
Lacking adequate diagnostic sophistication and laboratory backup resources to distinguish among cardiac, renal, hepatic, endocrine, and other causes of edema, they were in the position of trial and error therapeutics, knowing that a certain number of dropsy patients, the subgroup whose edema was cardiac in origin, would respond to digitalis. (1975, p. 84)

There are three types of problems present concerning the variation of drug response. These are quantitative, qualitative, and idiosyncratic differences (Knopp, Arnold, Andras & Smeltzer, 1973). Quantitative variations are ones which reflect the large range of dosages needed to be minimally effective across the population of hyperkinetic children.

Qualitative differences reflect a predictive problem. In various situations, 40-90% of the children diagnosed as hyperactive respond favorably to medication (Knopp et al., 1973). Ten percent of the children get worse on medication and the rest remain unaffected. Idiosyncratic specificity refers to the fact that children respond differentially to various medications.

Various researchers have tried to determine measures of physiological activity which would help predict drug response in children. These include: rates of drug excretion in the urine (Epstein, Lasagna, Conners & Rodriguez, 1968), EEG and physiological measures of arousal (Ferguson, Simpson & Trites, 1976; Halliday, Rosenthal, Naylor & Calloway, 1976; Saletu, Viamotes & Itil, 1975; Andreason, Peters & Knott, 1974; Cantwell, Lesser & Podosin, 1972; Shetty, 1971), and pupillary response (Knopp, Arnold, Andras & Smeltzer, 1973). At the present time, none of these methods has proven to be totally
satisfactory for predicting drug response (Barkley, 1976).

Side Effects. With reference to the use of drugs in treating psychological problems, Lennard et al. remarks:

... specific psychotropic drugs are described as directly altering specific emotional states and affecting specific psychological processes. This paradigm of drug action seems patterned largely after a traditional conception of drug specificity exemplified by Paul Ehrlich's notion of the "magic bullet" wherein a given chemical agent is believed to seek out a specific target in the organism... (but) it is well established that, with any agent, there is a diffusion of effects, generally referred to as side effects. (1970, p. 439)

Although much of the research attention has been focused on the specific cognitive and behavioral effects of stimulant medication, investigators are now becoming more concerned with side effects associated with their usage (Anders & Ciaranello, 1977; Ross & Ross, 1976).

Studies by Aman and Werry (1975) and Greenberg and Yellin (1975) have examined the changes in heart rate and blood pressure in children treated with imipramine and methylphenidate. Results show little to no effect on either blood pressure and heart rate. However, as Greenberg and Yellin suggest, there is need for further study on the long-term effects of these drugs on cardiac function.

Studies by Safer, Allen, and Barr (1975) and Safer and Allen (1975) indicate that long-term use of dextroamphetamine is associated with a highly significant suppression of height and weight growth. While tolerance seems to develop to the weight suppressant effects, the use of the drug over time increases the degree of growth
suppression. However, Gross (1976) in a study which followed the
growth patterns of children treated with stimulant drugs for two to
five years found no significant height or weight differences after a
six year followup.

In a study examining the effects of d-amphetamine and methylpheni-
date on growth hormones in adult men, Brown, Corriveau and Ebert (1978)
found that 20 mg doses of each drug was correlated with significant
raises in the level of serum growth hormone. Aarskog, Fevang, Klove,
Stoa, and Thorsen (1977) examined the effects of amphetamine and
methylphenidate on the secretion of growth hormone in children over an
eight month period. They found that therapeutic doses of these drugs
caused changes in serum growth hormone concentrations which persisted
until the end of the experiment. Aarskog, et al. state that their
findings indicate an "acute and probable long term effect of dextro-
amphetamine and methylphenidate on growth hormone. The possible
long-term adverse effects of these drugs on the growth of children
indicates the need for caution in the widespread use of these agents
(p. 136)."

Other side effects to stimulant drugs which have been reported
in the literature include: insomnia (Arnold, 1973; O'Leary &
Pelham, 1976), gastrointestinal cramps (Arnold, 1973) and psychotic
reactions (Greenberg, McMahon & Deem, 1974).

Another area of concern which has been neglected in the research
literature, is the possible "psychological cost" (Ross & Ross, 1976,
p. 297) to the hyperactive child from being on stimulant medication.
The "psychological cost" should be measured in several ways including the effects on the child's self-esteem and social interactions. One psychological side-effect of the use of medication to treat hyperkinetic children potentially affects not only the child, but his parents and teachers as well. This is the belief that the child's problems are strictly medical with no other intervention required (Renstrom, 1978; Conrad, 1976; Ross & Ross, 1976; Rie, 1975; Kehne, 1974; Grinspoon & Singer, 1973). Thus, while drugs may make it easy for others to cope with the hyperkinetic child, they may not remedy the social patterns which may have helped to exacerbate the situation. Sole dependence on drugs may also deprive the child of the ability to develop self control and insight into his problems (Kehne, 1974; Grinspoon & Singer, 1973).

Children who are on drug treatment are sometimes described as having bland or flat affect (Rie, Rie, Stewart & Ambuel, 1976a, 1976b). Rie et al. (1976a) report that during a twelve week study, no positive effects of Ritalin on social behavior were noted. A classroom sociogram indicated a tendency toward less socially acceptable behavior, and the teacher's ratings, in one instance, favored the placebo group.

There is also some concern that stimulant drugs narrow the range of the child's attention and thus deprives him/her of incidental social learning (Ross & Ross, 1976). The relationship of drug action to learning will be considered in the next section.
Effects on Learning

There are several difficulties associated with drug research concerning the therapeutic actions of stimulants on hyperkinetic children. The lack of agreement on definitions of hyperkinesis leads to variability in sampling and difficulties in comparing results across studies. Experimental designs are often inadequate with respect to determination of drug dosage. The researcher either uses a standardized dose across subjects which does not consider individual response variation, or else relies on subjective clinical judgement to adjust the dosage.

Another problem concerns the intricate system of variables related to learning. The efficacy of stimulant medication has been demonstrated on component skills such as attention (Sykes, Douglas & Morgenstern, 1972; Sykes, Douglas, Weiss & Minde, 1971; Conners, Rothschild, Eisenberg, Schwartz & Robinson, 1969; Conners & Rothschild, 1968) and impulsivity (Campbell, Douglas & Morgenstern, 1970). Improvements after administration of stimulant medication have also been noted on the performance subtests of the Wechsler Intelligence Scale for Children-Revised (WISC-R) (Conners, 1971) and several sub-tests of the Illinois Test of Psycholinguistic Abilities (ITPA) (Butler & Lapierre, 1974). The validity of these measures as representative of complex learning tasks is questioned. Certainly, they are necessary but not necessarily sufficient skills to promote cognitive growth (Kornetsky, 1975). "Education involves the acquisition
of knowledge and skills as well as the ability to use them effectively" (McGaugh, 1976, p. 174).

A two-year prospective study on 72 hyperactive boys by Riddle and Rapoport (1976) indicated that for his population, although drugs had a suppressant effect on impulsivity, peer status and academic achievement were not improved.

Rie, Rie, Stewart, and Ambuel (1976a) and Rie (1975) suggest that the popular conception that stimulant drugs improve learning and scholastic performance is due to the improved behavioral response which offers "the illusion that the child is functioning better in all respects" (Rie, 1975, p. 283).

In two studies on underachieving children, aged 6-2 to 10-7 years over periods of twelve and fifteen weeks, Rie et al. (1976a, 1976b) examined the effects of Ritalin, in doses of 5 to 20 mg/day on learning and scholastic achievement. Use of the Bender Test of Visual-Motor Gestalt, ITPA, and the Iowa Test of Basic Skills demonstrated no significant improvement on any of the subtests except for the vocabulary subtest of the Iowa test (1976a) and the auditory association (1976a) and auditory closure (1976b) subtests of ITPA.

The teachers' ratings of the children's behavior did show significant drug effects, including their impressions of the children's scholastic achievement, which were not borne out by the results of the standardized tests utilized. This suggests that the teachers' "impressions of achievement are not sufficiently reliable
and that they may be influenced by more obvious and welcome changes in behavior" (Rie et al. 1976b, p. 258).

Three types of studies have attempted to examine the reasons why there is an apparent lack of beneficial drug effects on long term academic performance. These are: 1) the effect of dosage response curves on various aspects of performance (Sprague & Sleator, 1976); 2) the interaction between training conditions and drug effects; and 3) state-dependent learning (Swanson & Kinsbourne, 1976).

From a series of three investigations of children, with a mean age of approximately nine years, in both the United States and New Zealand, Sprague and Sleator (1976) have generated three Ritalin dose-response curves based on three different "target behaviors." The first target behavior was cognitive performance (peak dosage = .7 to 1.00 mg/kg) as defined by the children's performance on a picture recognition task developed by K. S. Scott (1971; in Sprague & Sleator, 1976). The authors report that they chose this task because of its extensive use in pediatric psychopharmacological investigations.

The second behavioral domain was labeled social performance based on the Conner's Teacher Rating Scale (peak dosage = 1.4 to 3 mg/kg). The third category was concerned with the appearance of undesirable side effects (dosages above 3 mg/kg). In Figure 2 the authors present a set of theoretical dose response curves based on their data.
Zara (1973, in van Duyne, 1976) found a significant interaction between drug condition and training methods for a color-form association task and its reversal (see Figure 2). They used three groups of hyperactive four-year old children: 1) those who were receiving a placebo after being off methylphenidate for 72 hours; 2) those on methylphenidate; and 3) those who had never received stimulant medication. The task was taught utilizing either visual imitation of the experimenter by the child, or by passive movement of the child's hands by the experimenter to the correct association.

The results showed two significant interactions (see Figure 3). "The drug group receiving imitation training performed better on the initial task than those receiving passive movement training; however, on the reversal task those who originally received passive movement training performed better than those who originally received imitation training. For the children who had never received drug therapy the opposite was true. . . . The placebo group did better on both the initial and reversal tasks when they received passive movement training (p. 384)."

Thus, not only was a difference in interaction noted between the drug and no drug condition, but a difference was also noted between the group which had been off methylphenidate for 72 hours and the group which had never received drug treatment, thus indicating that methylphenidate may have longer lasting effects than previously supposed. It also demonstrates that importance of further
Figure 2. Theoretical dose-response curves

(Sprague & Sleator, 1976, p. 394)
Figure 3. Graph showing the relationship between initial and reversal task for initial training using passive movements and imitation with hyperactive children receiving stimulant drug therapy, placebo, and those who never received drug therapy related to verbal control of nonverbal behavior.

(van Duyne, 1976, p.385)
investigating the effects of stimulant drugs in relation to specific training procedures.

The so called state-dependent learning\(^1\) effect of stimulant medication has been studied with animals (Barrett & Stejanka, 1974; Barrett, Leith & Oakley, 1972; Rech, 1966) but has only recently been considered with human subjects. Swanson and Kinsbourne (1976) studied state-dependent learning of hyperactive children on methylphenidate using a paired-associate task. Four combinations of learning and retention tasks were created in each child; drug-drug, placebo-placebo, drug-placebo, and placebo-drug. Although Ritalin served to facilitate the initial acquisition of the task, a significant bidirectional state-dependent effect in the drug-placebo and placebo-drug conditions was noted.

Fisher (1978) reports similar results in a study of hyperactive boys, aged 6 years 3 months to 11 years, divided into three groups: drug-placebo (DP), placebo-drug (PD), and placebo-placebo (PP). In the DP group, amphetamines (.43 to .6 mg/kg) served to reduce response time and errors for a classification task requiring selective attention. Whereas, performance on subsequent sessions did not show the improvement. However, in the PP group, practice while on the placebo facilitated subsequent performance on placebo. Fisher suggests that overtraining would overcome the possible state-dependent

\(^1\) State-dependence learning refers to the phenomenon "when a drug affects performance during acquisition of new material, performance at a later time may depend on reinstatement of the drug treatment (Swanson & Kinsbourne, 1976, p. 1354)."
effects, although the placebo group results indicate that the same results can be achieved with behavioral methods.

Consideration of this type of effect is important in the formulation of therapeutic techniques. Investigators suggest that stimulant drugs could be used to set up a behavioral baseline which would facilitate learning (O'Leary et al., 1976; Sprague & Gadow, 1976; Simmons, 1975; Werry, 1968). Procedures could then be instituted to transfer the "stimulus control of the response from the drug to non-drug related cues" (Barrett et al., 1972, p. 331).

Several studies have considered the effects of stimulant medication used in conjunction with behavior modification programs in public schools (Wolraich, Drummond, Solomon, O'Brien & Sivage, 1978; O'Leary & Pelham, 1976; Stableford, Butz, Hasazi, Leitenberg & Peyser, 1976) and institutional populations (Ayllon, Layman & kandel, 1975; Christensen, 1975). The results from these studies are similar, the effectiveness of the behavior modification programs alone in controlling hyperactive behavior was comparable to that of stimulant medication in a classroom situation. Behavior modification procedures were more effective for increasing academic performance. Little or no drug x behavior modification interactions were noted.

It may be argued from the results of the above studies that stimulant drugs play little part in the establishment of behavior modification programs. However, drugs may be used initially to calm the child, thus making him/her more attractive to his parents and teachers to work with. It should also be noted that these were
short-term studies (about 12 weeks) and they only looked at behavior in relatively structured classroom situations.

Educational Approaches

Ross and Ross (1977) point out that relatively few educationally based programs for the hyperactive child have been developed. They attribute the lack of research in this area to: 1) the popularity of drug treatment and behavior modification programs, and 2) the traditional lack of interest educators have towards research. The two approaches discussed here, the minimal stimulation type program (Cruickshank, Bentzen, Razeburg & Tannhauser, 1961) and the Engineered Classroom (Hewett, 1970), have not been adequately researched, according to Ross and Ross (1976) and Bryan and Bryan (1978).

Cruickshank's method stems from Strauss and Lehtinen (1947) and Strauss and Kephart's (1955) approach to the hyperkinetic child. He proposes four elements as the essentials for a good teaching environment:

1) Reduced Environmental Stimuli: "A stimulating environment appropriate for a normal child is completely inappropriate for the hyperactive or distractible child who because of an apparent lack of control, is unable to adapt negatively or to refrain from reacting to the unessential stimuli in the classroom" (p. 15).

He suggested that color of the walls and furniture should match the floor, windows should be covered and bulletin boards removed. All unnecessary furniture should be removed and the number of children kept small. In short, everything should be done
to reduce distraction to increase the opportunity for the child to attend to learning.

2) Reduced Space: "As space increases, the number of stimuli in that space decreases, the number of stimuli is reduced" (p. 16).

Cruickshank suggests that a learning cubicle should be constructed around each child's desk to structure learning activities to the smallest possible space.

3) A Structured School Program and Life Plan: "It is hypothesized that, if the learning environment can be simplified and highly structured, the hyperactive child will have a greater opportunity for success experience" (p. 18).

Cruickshank et al. reasons that hyperactive children experience an abundance of failure experiences because their distractibility leads them to trial-and-error reactions. They should be provided with a structured program which places them in a position to achieve success.

4) Increased Stimulus Value of the Teaching Materials: "It is hypothesized that if hyperactive children are distracted to stimuli; then their attention can be drawn to stimuli which are purposely organized and specifically placed within their visual field."

By increasing the stimulus value of learning materials with colors and shapes, the child's attention may be drawn to them long enough to permit learning.

**Engineered Classroom**

Hewett (1970) has developed an educational approach incorporating a behavior modification program into a developmental
paradigm. He has proposed a developmental sequence of skills and responses necessary for educational mastery. The child's behavior is assessed through a series of rating scales aimed at determining at which levels the child is functioning. He is then provided with tasks within his capabilities so he can experience success. Gradually the task difficulty is increased. Eventually, the child is phased into a regular classroom.

Hewett's model involves the following sequential levels:

LEVEL 1. ATTEND ("the ability to focus on relevant cues in the environment" (1970, p. 48)).

LEVEL 2. RESPONSE ("Noticing something starts the learning process; the child must next do something, that is, make a response, in order to learn" (1970, p. 49)).

LEVEL 3. ORDER (capacity to understand). ("A child must follow directions and develop order in his attending and responding" (p. 50)).

LEVEL 4. EXPLORATORY ("multi-sensory exploration provides the child with raw material, the basic facts which he needs in learning" (p. 51)).

LEVEL 5. SOCIAL RESPONSES (child orients self to others).

LEVEL 6. MASTERY (child's attainment of traditional academic skills).

LEVEL 7. ACHIEVEMENT ("This is the enrichment level where self-motivation in learning is developed and where pursuit of intellectual and adaptive skills in depth is important" (p. 54)).

The strong points of Hewett's model include its developmental approach and emphasis on providing the child with success experiences. However, it seems to suffer from a lack of emphasis on social skills.
Animal Models

We have defined experimental neurosis in our animals (dogs) and in the same animals what is analogous to human psychosis, and we know their treatment.

(Pavlov, 1941, p. 39)

Abramson and Seligman (1977) note that Pavlov's assertion that he could experimentally produce and treat psychopathology in dogs marked "a turning point in the history of man's attempt to understand psychopathology" (p. 9). It provided an argument that the study of human psychopathology could be enriched by the examination of animal models. A perusal of the current literature reveals a diversity of human disorders being investigated with experimental animal models. These include: obesity (Rodin, 1977), addiction (Solomon, 1977), depression (Miller, Rosellini & Seligman, 1977; Suomi & Harlow, 1977); phobias (Marks, 1977); neurosis (Thomas & DeWald, 1977); and schizophrenia (Paul, 1977).

There are two major advantages in the use of animal models to study human pathologies. The first advantage is an ethical one. Manipulation can be carried out on animals which would either be totally unwarranted in humans, or too hazardous in light of what is known about the disorder. These manipulations take two forms (Hinde, 1976). The first is experimental manipulation of causal variables, experimental and psychological to produce the disorder. The second type of manipulation involves the kinds of experimental treatments designed to alleviate the symptoms of the disorder. The other advantage associated with the use of animal models is that greater
control over experimental variables can be gained including genetics
and life history.

The use of the term "animal model" implies a resemblance to
the original human phenomena (Hinde, 1976). This resemblance should
be examined and evaluated, not only in terms of its similarities
to the prototype, but also in terms of its differences. The model
should be close enough to the original to raise relevant questions,
yet not be so close that the investigator assumes that all the proper­
ties of the model and the original are the same (Hinde, 1976).

Pichot (1976) refers to three possible sources of discrepancy
between animal and human behavior which must be considered when
dealing with experimental models. These are: 1) differences in
the structures of the nervous systems, 2) seemingly identical
behaviors may correspond to different mechanisms, and 3) considera­
tion of what Pichot refers to as the human's "psychological super­
structure."

Research in the past has neglected the interacting effects of
variables such as environment experience, emotional reactivity and
exploratory behavior (Hinde, 1976; Corson, 1975). What must be
attempted is a synthesis of experiential and biological factors.

When developing an animal model of hyperkinesis, various
guidelines should be met which provide definitive aspects of the
syndrome. However, as Scott (Note 3) points out with reference
to hyperkinesis, "the difficulty with setting up an animal model is
that no one seems to be sure exactly what is being modeled."
The following is a synthesis of the necessary criteria for an animal model of hyperkinesis as proposed by Shaywitz (1976) and Kalatt (Note, 6).

I. The animal model should behave in ways that resemble the behavior of the hyperkinetic child. This includes such factors as cognitive problems, attentional difficulties, and difficulties in habituating to new stimuli.

II. The animal model should consider developmental factors which are evident in the child. These factors include early onset of hyperactivity and the usual lessening of activity in adolescence. Cognitive difficulties may continue through adulthood.

III. The hyperkinetic syndrome should be produced and/or observed in a young animal, not in one with a mature nervous system.

IV. The response to medication should parallel the responses seen in hyperkinetic children.

V. The model must consider the interaction of the environmental milieu, psychological, and physiological factors.

Much of the animal research in hyperkinesis has focused on attempting to identify abnormalities in catecholamine metabolism. Investigators have used three major strategies to study the mechanisms of hyperkinesis including: 1) administration of precursor amines and blockers of amine synthesis (Shaywitz, Yager & Klopper, 1976); 2) mechanical damage (Robinson, Bloom, Shlumpf & Valk, 1975; Robinson & Bloom, 1976) and 3) administration of drugs with known mechanisms of action (Corson, Note 5; Corson, Corson, Arnold & Knopp, 1976).

Shaywitz, Yager and Klopper (1976) administered 6-hydroxydopamine (6-OHDA) to neonatal rats. This had the effect of producing
a rapid depletion of brain dopamine (DA). Dopamine is considered to act as a regulator of excitatory noradrenergic activity. They found that the activity pattern of treated animals was significantly greater than their littermates (2-3 weeks). When the rats approached maturity (4 weeks) the activity subsided. They also showed some learning deficits as adults. The authors propose that this parallels the developmental stages of hyperkinesis observed in children.

This model has met with criticism. Biochemically, it has been questioned on several points: 1) an increase in locomotor activity is also noted with depletion of central norepinephrine, demonstrating that alteration of dopamine concentration may not be the only biochemical cause of hyperactivity (McLean, Kostzews & May, 1976); 2) the use of 6-OHDA causes hypohagia and weight loss, thus the rat pups may have been deprived of nourishment during critical periods; 3) the use of 6-OHDA causes severe depletion of norepinephrine (NE) in peripheral structures. Behavioral changes could, therefore, be related to the rats being sympathectomized (McLean, et al., 1976; Pappas, Ferguson & Saari, 1976). Behaviorally, the validity of the use of heightened skeletal activity as a measure of hyperkinesis should be questioned. As discussed previously, situational effects on the occurrence of hyperactivity are important, and activity measures of children diagnosed as hyperkinetic have yet to be determined.

The effects of mechanical damage have been used to explore changes in the NE:DA ratio associated with hyperkinesis. Robinson
and Bloom (1976) and Robinson et al. (1975, Note 5) have artificially produced strokes in rats by ligating the middle cerebral artery. It was found that rats exhibited what they termed "post-shock hyperactivity." This was measured as an increase in horizontal activity which hit a peak level at 15 days and then curved down toward normal.

A correlation between the activity level changes and the NE:DA ratio was observed. They also found that the lesioned rats which were treated with dismethylimipramine (DMI), an antidepressant which blocks the reuptake of NE, showed no increase in activity over the sham operated rats.

Cautions in interpreting this set of studies are twofold: 1) the measures of activity are very crude; and 2) they assume structural damage which is not always evident in cases of childhood hyperkinesis.

Corson (1975); Corson, Corson, Arnold, and Knopp (1976) and Corson, Corson, Bicker, Ginsburg, Trattner, Conner, Lucas, Panksepp and Scott (Note 2) offer a naturally occurring model of hyperkinesis in dogs utilizing Teloman x beagle hybrids. The hyperkinetic syndrome often appears in dogs which have been raised in an isolated environment until six months of age and then moved to another environment (Corson et al., Note 2). The use of dogs, as the authors point out, is advantageous because they offer a wide range of emotions which more closely parallel human behavior.

The dogs in these studies presented hyperkinetic symptoms (e.g. inability to restrain motoric activity) when placed in a Pavlovian
conditioning stand. This can be compared to the elicitation of hyperkinetic symptoms in children when they are placed in a classroom situation.

The hyperactive dogs responded in a similar manner to drug therapy as children who are hyperkinetic. The drugs, when they were effective, were effective in doses similar to those given to children. However, the dogs did not demonstrate the lessening of excessive motoric activity which is a maturational pattern usually seen in hyperkinetic children.

Arnold, Kiriluk, Corson, and Corson (1973); Arnold, Heustis, Smeltzer, Scheib, Wemmer, and Colner (1976) and Corson, Corson, Arnold, and Knopp (1976) have further refined the biochemical model by proposing different biochemical mechanisms for two subgroups of hyperkinesis. These are what they term the "aggressive and nervous components of the hyperkinetic syndrome." Arnold et al. (1973, 1976) and Corson et al. (1976) found that in dogs and in children, the aggressive group benefited equally from administration of either dextro or levo amphetamine. Dextro amphetamine, however, was the most effective isomer for the "nervous" subgroup.

Cooper, Bloom and Roth (1974), Phillips and Fibiger (1973) and Snyder, Taylor, and Cole (1970, in Arnold et al., 1973) present evidence that d-amphetamine is more potent than l-amphetamine in blocking catecholamine uptake at dopaminergic receptor sites. Arnold et al. (1973, 1976) and Corson et al. (1976) thus suggest that the aggressive subgroup of hyperkinetic children are helped
either by dextro- or levo-amphetamine through a dopaminergic pathway. The nervous subgroup is helped by dextroamphetamine through a norepinephric pathway.

Summary

This review of the literature has examined the empirical and conceptual problems in defining the hyperkinetic syndrome. Statistical/psychometric and medical approaches to diagnosis and examining etiology have been reviewed pointing up a complex interplay of factors. Studies indicate that problems in adolescence and adulthood often develop secondary to childhood hyperkinesis. The major treatments for hyperkinesis include drug therapy, behavior modification, and educational approaches. At the present time there are no studies which indicate the long-term effectiveness of the treatment modalities in either social or cognitive realms.
CHAPTER THREE

METHODS

The purpose of this experiment was to determine the effects of dextro-amphetamine alone, behavioral training alone, and the combination of dextro-amphetamine and training procedures on responsiveness to training and the social behavior of hyperkinetic dogs. The following three treatment groups of dogs were utilized; Group 1: medication, Group 2: training, and Group 3: training and medication.

The design consisted of five experimental conditions: 1) pre-test (1 week), 2) treatment (5 weeks), 3) post-test (1 week), 4) post-post test (1 week), and 5) post-post-post test (1 week). The pre and post-tests consisted of behavioral scores obtained for a Sit-Stay Inhibitory Training Task, behavioral scores based on the dogs' activity while they were restrained in a Pavlovian Stand, and scores from The Handling Test, a measure of Socialization. After the pre-tests the dogs were matched in terms of the amount of activity displayed in a Sit-Stay Inhibitory Training Task and were assigned to one or another of the three treatment groups.
Sample

The subjects were three Telomian (T), four T x Beagle (B) F<sub>1</sub> hybrids, and nine T x TBF<sub>1</sub> hybrids between 6 and 14 months of age. The dogs were obtained from Bowling Green University from Dr. J. P. Scott.

Sessions

Because of the limited availability of cage space and dogs, the experiment was conducted in three 10 week sessions at intervals of approximately five weeks. Four dogs participated in session 1 and six dogs apiece participated in sessions 2 and 3.

Personnel

Four handlers, Ohio State University students who received scholastic credit for their work, were trained in the experimental procedures by the investigator. Each dog had contact with a single handler throughout the experimental procedures. The investigator was the recorder for every session.

Experimental Room

Figure 4 illustrates the experimental room. It was 9 feet by 12 feet and furnished with one chair, a table and a stand which held procedural information for the handler. One wall of the room

<sup>1</sup>F<sub>1</sub> refers to the first filial generation produced by crossing two individuals.
Figure 4. Layout of the Experimental Room
had a peephole leading to an anteroom that was utilized by the handler for observational purposes during a Pavlovian stand procedure (See Treatment and Measures).

**Treatment**

The dogs were maintained at The Ohio State University Veterinary School in 30 inch square, single occupancy metal cages. They were visually but not auditorally isolated from each other. The cages were cleaned daily by the Veterinary School custodial staff who were instructed to keep their interactions with the dogs to a minimum.

The dogs were allowed to acclimate to their cages for one week before the experimental procedures began. During the last two days of the acclimation period, the dogs were individually familiarized with the experimental room by placing them in it alone for one ten minute period each day. Following a week of pretests (see Measures) treatment procedures were initiated with the three groups. The treatment period lasted five weeks.

**Group 1.** The dogs in Group 1 (medication) were provided with water *ad lib* and fed 14 to 18 ounces of Beef Flavor Kal Kan daily for one hour prior to the experimental sessions, Monday through Friday, during the five week treatment period. The dogs were weighed and dextro-amphetamine was administered in standardized doses of 1.5 mg/kg (days 1 and 2), 1.0 mg/kg (days 3 and 4), and 5 mg/kg (the remainder of the treatment sessions) hidden in a one ounce
portion of their food just prior to feeding. Dosages were adjusted to the nearest 2.5 mg.

To control for exposure to the experimental room the dogs were carried to the room and placed in it alone for a ten minute period 60 to 90 minutes post medication, Mondays through Fridays.

**Group 2.** The maintenance of these dogs was similar to that of those in Group 1 except that they received a one ounce portion of their food without medication prior to feeding and for a five week period participated in training procedures which began 60 to 90 minutes post-feeding, Mondays through Fridays. All of the dogs participated in each procedure individually and, except where noted, were returned to their cages before the next training procedure was instituted. Their training, which began the week after the pre-tests (see Measures) consisted of four procedures:

1) The handler used Sit-Stay Inhibitory Training, Mondays through Fridays to teach the dog to inhibit its motor activity upon command. During the first week of the treatment period, the dog was carried to the experimental room. In subsequent sessions a choke-collar leash was utilized in walking the dog to and from the room (see Treatment Procedure 2). The handler commanded the dog to a sit position using pressure on the dog's rump to enforce the position. The number of commands necessary to maintain the dog's position was recorded. This procedure was carried out twice each session separated by a two minute
inter-trial period. During the inter-trial period and for a one minute period before and after the training, the dog was allowed to explore the room (see Appendix B for the procedure and recording form).

2) The handler placed a choke collar leash on the dog and walked it to and from the experimental room at the beginning and the end of the Sit-Stay Inhibitory Training Session. This procedure took place Mondays through Fridays, beginning the second week of the treatment period (see Appendix B for the procedure and recording form).

3) During the first week of the treatment period, Mondays through Fridays, a Passive Handling Procedure was used to familiarize the dogs with the handler. After completion of the Sit-Stay Inhibitory Training, the dog was placed approximately four feet from the front of the handler's chair and the handler sat down initiating no further physical or verbal contact with the dog until the end of a ten minute session. During these sessions, the handler recorded the number and duration of times the dog approached and had at least two paws within a 16 inch radius which was lightly penciled on the floor in front of the handler's chair. The dog's activities were anecdotally recorded. The dog was carried back to its cage after completion of this procedure (see Appendix B for the procedure and recording form).
4) To habituate the dog to being physically restrained, the handler carried it to the experimental room, Mondays through Fridays, and harnessed it in a Pavlovian Stand (18" Animal Controller) for 20 minute sessions. An electronic meter (Tuber, note 7) was suspended from the sling at the dog's midsection, one inch from the insertion of the dog's front limbs (see Figure 5) to provide a record of the dog's gross motor activity during the period. The handler observed the session through a peephole located out of the dog's line of vision and made anecdotal recordings at five minute intervals. The dog was carried back to its cage at the end of the session (see Appendix B for the procedures and the recording form).

**Group 3.** The dogs in Group 3 (medication and training) received dosages of dextro-amphetamine according to the procedures used with Group 1. They also participated in the treatment procedures as described with Group 2.

**Measures**

Pre-tests on each dog were obtained on three measures. All of the dogs were carried to the experimental room by the handler and, except where noted, were returned to their cages before the next measure was administered.
Figure 5. Dog in Pavlovian Stand
The Handling Test. (Scott & Fuller, 1965; Scott, 1974; note 8)
During the last three days of the pre-test period, the Handling Test was used to measure the social behavior of the dog. This procedure utilizes the computation of weighted scores based on the responses of the dogs to activities of the handler. As described in Appendix B, scores are obtained for Avoidance and Defensive Behavior, Playful Fighting, Social Contact and Investigative Behavior, Attraction and Following, Elimination, and Miscellaneous Behaviors.

The Sit-Stay Inhibitory Training Test (Sit Test). (Corson et al., 1979; Scott & Fuller, 1965; Scott, note 8). The Sit Test measures the ability of the dog to inhibit its motor activity on command and indicates the dog's reactions to a simple form of training. On Monday and Tuesday of the pre-test period, the handler carried the dog to the experimental room and began the procedure. On Wednesday, Thursday, and Friday the Sit Test took place after completion of the Handling Test. The data consisted of the frequencies of the sit commands, the total number of seconds the dog sat, and anecdotal recordings. (Refer to Appendix B for procedures and scoring)

Activity in a Pavlovian Stand. Mondays through Fridays during the pretest period the handler carried the dog to the experimental

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1The Handling Test was developed as a measure of differences in socialization behaviors of dogs of different breeds and of dogs which have been exposed to different environmental experiences. It has been extensively employed in research by Scott and Fuller (1965). The procedures are described in a manual of testing procedures for dogs by Scott (Note 8).
room and harnessed it in a Pavlovian Stand for 20 minutes each day. An electronic meter\(^2\) (Tuber Note 7) was suspended from the dog's midsection to measure the dog's gross motor activity. Activity scores and anecdotal reports were recorded every five minutes (refer to Appendix B for procedures and scoring).

Following the fifth week of the treatment procedures, post-tests were given on the measures described above. Medication was then discontinued for groups 2 and 3. During the following two weeks, post-post and post-post-post tests were administered on the above measures.

\(^2\)A description of the activity meter is contained in Appendix C.
CHAPTER FOUR

RESULTS

The findings from the present study are discussed in this chapter. The first section presents data on the subject population. Secondly, the activity and socialization measures are described. Next the group means and standard deviations on the 10 dependent measures for Groups 1, 2, and 3 on the pre, post, post-post, and post-post-post tests are presented. This is followed by the section which discusses the multivariate analysis of variance, the statistic used to analyze the differences within and between groups across the four times of measurement. The last section presents the correlational analyses run to examine the relationships between the 10 dependent activity and socialization variables.

The hypotheses of this study were concerned with the comparative effects of three treatments; medication, training, and medication and training, on the social behavior and activity levels of dogs bred to be hyperkinetic. The subjects were 16 dogs obtained from Bowling Green State University. Originally 17 dogs were obtained, but one dog died as the result of distemper during the first week of treatment. Its data were omitted from the analyses of the results. Table 2 contains descriptive information pertaining to the dogs.
As can be noted in Table 2 Group 1 was made up of 2 female T x TBF₁ hybrids, 2 male T, and 2 male T x TBF₁ hybrids with a mean age of 10.3 months. Group 2 was made up of 2 male T x TBF₁ hybrids, 2 male B x TBF₁ hybrids and 1 female T x TBF₁ hybrid with a mean age of 9.6 months. Group 3 contained one male T, 2 female T x TBF₁ hybrids, and one male B x TBF₁ hybrid with a mean age of 10.2 months. The population of available dogs was too small to permit meaningful comparisons of activity levels by sex or breed within or between groups.

Social behavior was assessed in terms of the following six sub-tests of Scott's (1965, Note 3) Handling Test: 1) Avoidance and Defensive Behavior, 2) Playful Fighting, 3) Social Contact and Investigation, 4) Attraction and Following, and 6) Miscellaneous Behaviors. Descriptions of these measures are included as Appendix B.

One measure of activity level was the Sit Test. The data from the Sit Test were examined in three ways: The number of forces (see page 57 for description) used per session were considered as one dependent variable; the total number of seconds the dog sat during each session was the second variable. Then, the average length of sit score was computed for each dog by dividing the total seconds sitting by the number of forces for each session. This average was computed because neither the number of forces nor the duration of sitting fully reflect the activity of the dogs during the Sit Test. For example, Dog A and Dog B may have had similar number of forces applied during their sessions, but scored differently in
TABLE 2
Name, Sex, Breed, Whelping Date, and Age of Dogs at Time of Experiment

<table>
<thead>
<tr>
<th>Group</th>
<th>#</th>
<th>Name</th>
<th>Sex</th>
<th>Breed</th>
<th>Whelped</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group 1</strong></td>
<td>1</td>
<td>Henrietta</td>
<td>F</td>
<td>T x TBF</td>
<td>10/30/77</td>
<td>6 mo.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Alvin</td>
<td>M</td>
<td>T</td>
<td>11/28/77</td>
<td>10 mo.</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Kiriel</td>
<td>M</td>
<td>T</td>
<td>11/28/77</td>
<td>10 mo.</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Abner</td>
<td>M</td>
<td>T x TBF</td>
<td>10/6/77</td>
<td>14 mo.</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Jackson II</td>
<td>M</td>
<td>T x TBF</td>
<td>10/6/77</td>
<td>14 mo.</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Mojo</td>
<td>F</td>
<td>T x TBF</td>
<td>6/10/77</td>
<td>12 mo.</td>
</tr>
<tr>
<td><strong>Group 2</strong></td>
<td>7</td>
<td>Sam</td>
<td>M</td>
<td>T x TBF</td>
<td>10/30/77</td>
<td>6 mo.</td>
</tr>
<tr>
<td>(Training)</td>
<td>8</td>
<td>Fred</td>
<td>M</td>
<td>B x TBF</td>
<td>3/20/78</td>
<td>6 mo.</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>Kasha</td>
<td>M</td>
<td>B x TBF</td>
<td>10/20/77</td>
<td>11 mo.</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Frances</td>
<td>M</td>
<td>T x TBF</td>
<td>10/6/77</td>
<td>14 mo.</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>Lucy</td>
<td>F</td>
<td>T x TBF</td>
<td>10/6/77</td>
<td>14 mo.</td>
</tr>
<tr>
<td><strong>Group 3</strong></td>
<td>12</td>
<td>Kolya</td>
<td>M</td>
<td>B x TBF</td>
<td>3/20/78</td>
<td>6 mo.</td>
</tr>
<tr>
<td>(medication</td>
<td>13</td>
<td>Bear</td>
<td>M</td>
<td>T</td>
<td>10/30/77</td>
<td>11 mo.</td>
</tr>
<tr>
<td>and training</td>
<td>14</td>
<td>Barbara</td>
<td>F</td>
<td>T x TBF</td>
<td>10/30/77</td>
<td>6 mo.</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>Gloria</td>
<td>F</td>
<td>T x TBF</td>
<td>10/6/77</td>
<td>14 mo.</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>George</td>
<td>M</td>
<td>T x TBF</td>
<td>10/6/77</td>
<td>14 mo.</td>
</tr>
</tbody>
</table>

*Note: Group 1 received medication.*
terms of the total number of seconds sitting. Table 3 illustrates this hypothetical situation. This situation would arise if Dog A were more resistive to "sit" commands than Dog B; or Dog A might be harder to catch than Dog B, thus decreasing the number of forces that could be exerted during the three minute test period.

The other measure of activity was the amount of gross motor movements exerted by the dogs while restrained in a Pavlovian Stand. Movements were recorded by an activity meter which was attached to the Pavlovian Stand (for a complete description of the activity meter see Appendix C).

Tables 4 through 13 list the groups means and standard deviations for Duration in Seconds of Sitting on Sit Test, Number of Forces on Sit Test, Duration in Seconds of Sitting on Sit Test Divided by Number of Forces Applied, Activity Count on Pavlovian Stand Measure, Avoidance and Defensive Behavior, Playful Fighting, Social Contact and Investigation, Attraction and Following, Miscellaneous Behaviors, and Elimination Behaviors, respectively, for Groups 1, 2, and 3 on the pre, post, post-post, and post-post-post tests. Illustration of these tables are provided by Figures 6 through 15.

Examination of the distribution of the scores, indicated considerable skewness with respect to certain scores and non-homogeneity of variances with respect to others. Despite
TABLE 3

Hypothetical Sit Test Measures for Dogs A and B for Total Number of Forces, Total Seconds Sitting and Average Length of Sit in Seconds

<table>
<thead>
<tr>
<th>Measure</th>
<th>Dog</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>Number of Forces</td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Total Seconds Sitting</td>
<td>15</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>Average Length of Sit</td>
<td>1.5</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>
TABLE 4

Group Means and Standard Deviations of the Duration in Seconds of Sitting on Sit Test for Groups 1, 2, and 3 on Pre, Post, Post-post, and Post-post-post Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Group</th>
<th>Test</th>
<th>Group</th>
<th>Test</th>
<th>Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Pre M</td>
<td>98.32</td>
<td>82.32</td>
<td>96.93</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(SD) (SD)</td>
<td>(46.91)</td>
<td>(61.30)</td>
<td>(56.55)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post M</td>
<td>110.72</td>
<td>123.56</td>
<td>93.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(SD) (SD)</td>
<td>(24.87)</td>
<td>(28.27)</td>
<td>(63.38)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-post M</td>
<td>119.6a</td>
<td>127.56</td>
<td>92.13a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(SD) (SD)</td>
<td>(36.36)</td>
<td>(22.96)</td>
<td>(62.27)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-post post</td>
<td>136.86a</td>
<td>116.86</td>
<td>110.17a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(SD) (SD)</td>
<td>(28.10)</td>
<td>(34.25)</td>
<td>(59.65)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

amedication discontinued prior to post-post tests
**TABLE 5**

Group Means and Standard Deviations of the Number of Forces on Sit Test by Groups 1, 2, and 3 on Pre, Post, Post-post, and Post-post-post Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Group</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre M (SD)</td>
<td></td>
<td>19.47</td>
<td>16.9</td>
<td>20.58</td>
</tr>
<tr>
<td>Post M (SD)</td>
<td></td>
<td>22.52</td>
<td>12.64</td>
<td>18.3</td>
</tr>
<tr>
<td>Post-post M (SD)</td>
<td></td>
<td>17.04&lt;sup&gt;a&lt;/sup&gt;</td>
<td>12.80</td>
<td>19.4&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Post-post-post M (SD)</td>
<td></td>
<td>14.58&lt;sup&gt;a&lt;/sup&gt;</td>
<td>11.70</td>
<td>16.28&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup>Medication discontinued prior to post-post test
TABLE 6

Group Means and Standard Deviations of the Duration in Seconds of Sitting on Sit Test Divided By Number of Forces Applied for Groups 1, 2, and 3 on Pre, Post, Post-post, and Post-post-post Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Pre</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>(SD)</td>
</tr>
<tr>
<td>Post</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>(SD)</td>
</tr>
<tr>
<td>Post-post</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>(SD)</td>
</tr>
<tr>
<td>Post-post-post</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>(SD)</td>
</tr>
</tbody>
</table>

amedication discontinued prior to post-post test
TABLE 7

<table>
<thead>
<tr>
<th>Test</th>
<th>Group</th>
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<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>M</td>
<td>211.9</td>
<td>182.0</td>
<td>195.98</td>
</tr>
<tr>
<td>(SD)</td>
<td></td>
<td>(89.23)</td>
<td>(194.51)</td>
<td>(219.99)</td>
</tr>
<tr>
<td>Post</td>
<td>M</td>
<td>105.0</td>
<td>105.2</td>
<td>117.93</td>
</tr>
<tr>
<td>(SD)</td>
<td></td>
<td>(111.04)</td>
<td>(126.34)</td>
<td>(121.36)</td>
</tr>
<tr>
<td>Post-post</td>
<td>M</td>
<td>43.51a</td>
<td>81.90</td>
<td>106.95a</td>
</tr>
<tr>
<td>(SD)</td>
<td></td>
<td>(51.26)</td>
<td>(88.58)</td>
<td>(115.03)</td>
</tr>
<tr>
<td>Post-post-post</td>
<td>M</td>
<td>52.0a</td>
<td>84.14</td>
<td>133.5a</td>
</tr>
<tr>
<td>(SD)</td>
<td></td>
<td>(68.92)</td>
<td>(91.57)</td>
<td>(191.37)</td>
</tr>
</tbody>
</table>

*a medication discontinued prior to post-post tests
TABLE 8

Group Means and Standard Deviations of the Scores on the Avoidance and Defensive Behavior Subtest of the Handling Test by Groups 1, 2, and 3 on Pre, Post, Post-post, and Post-post-post Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Group</th>
<th>1</th>
<th>2</th>
<th>3</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>M</td>
<td>12.56</td>
<td>24.26</td>
<td>23.9</td>
</tr>
<tr>
<td></td>
<td>(SD)</td>
<td>(15.44)</td>
<td>(23.37)</td>
<td>(23.0)</td>
</tr>
<tr>
<td>Post</td>
<td>M</td>
<td>6.4</td>
<td>10.7</td>
<td>26.67</td>
</tr>
<tr>
<td></td>
<td>(SD)</td>
<td>(7.16)</td>
<td>(4.80)</td>
<td>(19.62)</td>
</tr>
<tr>
<td>Post-post</td>
<td>M</td>
<td>8.46a</td>
<td>10.12</td>
<td>16.72a</td>
</tr>
<tr>
<td></td>
<td>(SD)</td>
<td>(7.93)</td>
<td>(4.31)</td>
<td>(8.78)</td>
</tr>
<tr>
<td>Post-post-post</td>
<td>M</td>
<td>6.00a</td>
<td>14.22</td>
<td>14.22a</td>
</tr>
<tr>
<td></td>
<td>(SD)</td>
<td>(5.0)</td>
<td>(8.44)</td>
<td>(5.25)</td>
</tr>
</tbody>
</table>

a medication discontinued prior to post-post tests
TABLE 9

Group Means and Standard Deviations of the Scores on the Playful Fighting Subtest of the Handling Test by Groups 1, 2, and 3 on Pre, Post, Post-post, and Post-post-post Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Group</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Pre M</td>
<td>7.48</td>
<td>7.26</td>
<td>6.17</td>
<td></td>
</tr>
<tr>
<td>(SD) (6.75)</td>
<td>(7.56)</td>
<td>(7.17)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post M</td>
<td>3.2</td>
<td>11.42</td>
<td>8.43</td>
<td></td>
</tr>
<tr>
<td>(SD) (5.17)</td>
<td>(5.54)</td>
<td>(8.51)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-post M</td>
<td>12.94</td>
<td>11.52</td>
<td>10.18</td>
<td></td>
</tr>
<tr>
<td>(SD) (15.87)</td>
<td>(5.17)</td>
<td>(7.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-post-post M</td>
<td>11.72</td>
<td>13.4</td>
<td>12.28</td>
<td></td>
</tr>
<tr>
<td>(SD) (16.65)</td>
<td>(9.49)</td>
<td>(14.62)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*medication discontinued prior to post-post tests*
TABLE 10

Group Means and Standard Deviations of the Scores on the Social Contact and Investigation Subtest of the Handling Test by Groups 1, 2, and 3 on Pre, Post, Post-post, and Post-post-post Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Pre</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>26.16</td>
</tr>
<tr>
<td>(SD)</td>
<td>(23.60)</td>
</tr>
<tr>
<td>Post</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>14.76</td>
</tr>
<tr>
<td>(SD)</td>
<td>(15.83)</td>
</tr>
<tr>
<td>Post-post</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>9.34(^a)</td>
</tr>
<tr>
<td>(SD)</td>
<td>(13.67)</td>
</tr>
<tr>
<td>Post-post-post</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>11.48(^a)</td>
</tr>
<tr>
<td>(SD)</td>
<td>(17.80)</td>
</tr>
</tbody>
</table>

\(^a\)medication discontinued prior to post-post test
**TABLE 11**

Group Means and Standard Deviations of the Scores on the Attraction and Following Subtest of the Handling Test for Groups 1, 2, and 3 on Pre, Post, Post-post, and Post-post-post Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Group</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pre</td>
<td>Post</td>
<td>Post-post</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(SD)</td>
<td>(SD)</td>
<td>(SD)</td>
</tr>
<tr>
<td>Pre</td>
<td>M</td>
<td>5.08</td>
<td>5.86</td>
<td>5.24a</td>
</tr>
<tr>
<td></td>
<td>(SD)</td>
<td>(4.22)</td>
<td>(4.33)</td>
<td>(4.58)</td>
</tr>
<tr>
<td>Post</td>
<td>M</td>
<td>4.8</td>
<td>5.58</td>
<td>4.18</td>
</tr>
<tr>
<td></td>
<td>(SD)</td>
<td>(4.43)</td>
<td>(4.60)</td>
<td>(4.53)</td>
</tr>
<tr>
<td>Post-post</td>
<td>M</td>
<td>15.5</td>
<td>2.83</td>
<td>2.42a</td>
</tr>
<tr>
<td></td>
<td>(SD)</td>
<td>(31.57)</td>
<td>(3.85)</td>
<td>(2.79)</td>
</tr>
<tr>
<td>Post-post-post</td>
<td>M</td>
<td>7.0a</td>
<td>4.36</td>
<td>3.3a</td>
</tr>
<tr>
<td></td>
<td>(SD)</td>
<td>(4.93)</td>
<td>(4.11)</td>
<td></td>
</tr>
</tbody>
</table>

*a* medication discontinued prior to post-post tests
TABLE 12

Group Means and Standard Deviations of the Scores on the Miscellaneous Behavior Subtest of the Handling Test for Groups 1, 2, and 3 on Pre, Post, Post-post, and Post-post-post Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Group</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>1.02</td>
<td>.56</td>
<td>.20</td>
</tr>
<tr>
<td></td>
<td>(SD)</td>
<td>(2.06)</td>
<td>(.67)</td>
<td>(.23)</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>.36</td>
<td>1.18</td>
<td>.42</td>
</tr>
<tr>
<td></td>
<td>(SD)</td>
<td>(.64)</td>
<td>(1.56)</td>
<td>(.56)</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>.60a</td>
<td>.30</td>
<td>.35a</td>
</tr>
<tr>
<td></td>
<td>(SD)</td>
<td>(4.12)</td>
<td>(.27)</td>
<td>(.47)</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>.42a</td>
<td>2.08</td>
<td>.13a</td>
</tr>
<tr>
<td></td>
<td>(SD)</td>
<td>(.38)</td>
<td>(2.14)</td>
<td>(.18)</td>
</tr>
</tbody>
</table>

*medication discontinued prior to post-post tests
TABLE 13

Group Means and Standard Deviations of the Scores on the Elimination Behaviors Subtest of the Handling Test for Groups 1, 2, and 3 on Pre, Post, Post-post, and Post-post-post Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Group</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre</td>
<td>M</td>
<td>.82</td>
<td>2.02</td>
<td>.50</td>
</tr>
<tr>
<td></td>
<td>(SD)</td>
<td>(.25)</td>
<td>(3.91)</td>
<td>(.27)</td>
</tr>
<tr>
<td>Post</td>
<td>M</td>
<td>.54</td>
<td>2.72</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>(SD)</td>
<td>(.33)</td>
<td>(2.87)</td>
<td>(1.72)</td>
</tr>
<tr>
<td>Post-post</td>
<td>M</td>
<td>.68&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.76</td>
<td>.57&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>(SD)</td>
<td>(.23)</td>
<td>(2.38)</td>
<td>(.21)</td>
</tr>
<tr>
<td>Post-post-post</td>
<td>M</td>
<td>.72&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.84</td>
<td>1.63&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>(SD)</td>
<td>(.36)</td>
<td>(2.3)</td>
<td>(2.88)</td>
</tr>
</tbody>
</table>

<sup>a</sup>medication discontinued prior to post-post tests
Figure 6. Mean Number of Total Seconds Sat on Sit Test by Individuals in Groups 1, 2, and 3 for Pre, Post, Post-post, and Post-post-post Tests.
Figure 7. Mean Number of Forces on Sit Test by Individuals in Groups 1, 2, and 3 for Pre, Post, Post-post, and Post-post-post Tests.
Figure 8. Mean Duration of Sitting Divided by Number of Forces on Sit Test in Seconds by Individuals in Groups 1, 2, and 3 for Pre, Post, Post-post, and Post-post-post Tests.
Figure 9. Mean Activity Count on Pavlovian Stand Measure by Individuals in Groups 1, 2, and 3 for Pre, Post, Post-post, and Post-post-post Tests.
Figure 10. Mean Score on Avoidance and Defensive Behavior Subtest of the Handling Test by Individuals in Groups 1, 2, and 3 for Pre, Post, Post-post, and Post-post-post Tests.
Figure 11. Mean Scores on Social Contact and Investigation Subtest of the Handling test by Individuals in Groups 1, 2, and 3 for Pre, Post, Post-post, and Post-post-post Tests.
Figure 12. Mean Scores on Playful Fighting Subtest of the Handling Test by Individuals in Groups 1, 2, and 3 for Pre, Post, Post-post, and Post-post-post Tests.
Figure 13. Mean Scores on Attraction and Following Subtest of the Handling Test by Individuals in Groups 1, 2, and 3 on Pre, Post, Post-post, and Post-post-post Tests.
Figure 14. Mean Scores on Elimination Behavior Subtest of the Handling Test by Individuals in Groups 1, 2, and 3 on Pre, Post, Post-post, and Post-post-post Tests.
Figure 15. Mean Scores on Miscellaneous Behavior Subtest of the Handling Test by Individuals in Groups 1, 2, and 3 on Pre, Post, Post-post, and Post-post-post Tests.
this the multivariate analysis of variance (MANOVA) was judged to be the most appropriate statistic. It is robust with respect to nonhomogeneity of variance when sample sizes are similar (Hayes, 1973). The large variance in combination with the small sample size tends to mask any significant treatment effects. Therefore, the trends observed \((p \leq .1)\) should be carefully considered upon examination of the data.

**MANOVA**

To test the hypothesis that there were no significant differences for social behavior and activity scores as the result of treatment among Groups 1 (medication), 2 (training), and 3 (medication and training) as measured by the Handling Test, the Pavlovian Stand, and the Sit Test, two 3 (treatment) \(\times\) 4 (times of measurement) MANOVA\(^1\) were computed using the Wilks Lambda Criterion. The results of the MANOVA are displayed on Tables 14 through 18.

**Treatment as main effect.** The multivariate test of main effect of treatment showed a significant treatment effect with an \(F\) ratio of 3.4 (df 8, 20) \(p \leq .05\): As shown by the rightmost 3 columns in Table 14. Therefore, the three groups differed from each other as a function of treatment. However, this MANOVA does not indicate

\(^1\) Two 3 \(\times\) 4 MANOVA were conducted, on the same data, each generating a different set of comparisons. Although it is not standard procedure to conduct two MANOVA on the same set of data, this procedure is gaining wider acceptance (Isaac, Note 9). For a brief discussion of MANOVA by Amick and Crittenden (1975) see Appendix D.
PLEASE NOTE:

In all cases this material has been filmed in the best possible way from the available copy. Problems encountered with this document have been identified here with a check mark ✓.

1. Glossy photographs
2. Colored illustrations
3. Photographs with dark background
4. Illustrations are poor copy
5. Print shows through as there is text on both sides of page
6. Indistinct, broken or small print on several pages throughout
7. Tightly bound copy with print lost in spine
8. Computer printout pages with indistinct print
9. Page(s) lacking when material received, and not available from school or author
10. Page(s) seem to be missing in numbering only as text follows
11. Poor carbon copy
12. Not original copy, several pages with blurred type
13. Appendix pages are poor copy
14. Original copy with light type
15. Curling and wrinkled pages
16. Other
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<th>Weeks of</th>
<th>Total Female</th>
<th>Total Male</th>
<th>Pelvic</th>
<th>Fetal</th>
<th>Uterine</th>
<th>Fetal Distortion</th>
<th>Abscess</th>
<th>Blister</th>
<th>Wound</th>
<th>Necrosis</th>
<th>Hemorrhage</th>
<th>Wound</th>
<th>Necrosis</th>
<th>Hemorrhage</th>
<th>Wound</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7</td>
<td>12.34</td>
<td>10.98</td>
<td>14.12</td>
<td>7.67</td>
<td>8.69</td>
<td>14.31</td>
<td>8.64</td>
<td>13.56</td>
<td>9.87</td>
<td>14.31</td>
<td>0.15</td>
<td>8.64</td>
<td>13.56</td>
<td>0.15</td>
<td>8.64</td>
</tr>
<tr>
<td>2</td>
<td>14</td>
<td>10.98</td>
<td>14.12</td>
<td>7.67</td>
<td>8.69</td>
<td>14.31</td>
<td>0.15</td>
<td>8.64</td>
<td>13.56</td>
<td>9.87</td>
<td>14.31</td>
<td>0.15</td>
<td>8.64</td>
<td>13.56</td>
<td>0.15</td>
<td>8.64</td>
</tr>
<tr>
<td>3</td>
<td>21</td>
<td>14.12</td>
<td>7.67</td>
<td>8.69</td>
<td>14.31</td>
<td>0.15</td>
<td>8.64</td>
<td>13.56</td>
<td>9.87</td>
<td>14.31</td>
<td>0.15</td>
<td>8.64</td>
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Table 56

Title of Table: Analysis of Various Factors of Incidence of Various Types of Infection

Note: Each factor and interaction of time and treatment for infection and various factors.
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**Table 10**

*Results of Wilkinson and Brown's A test of variance of sample mean after post-estimation.*

*Post-estimation test for use in analysis of interaction data.*

*Andrews's test of variance of sample mean.*

*Data not available.*
at what points in the treatment the groups differed. Thus, the contrasts which are crucial to the hypothesis are the time by treatment and the a priori MANOVA which are discussed in later sections of this chapter.

To determine which socialization and activity variables significantly differed among the treatment groups, a univariate analysis of variance (ANOVA) was computed. The results of this computation are presented in the labeled columns of Table 14. A significant F ratio was noted for one socialization variable, Social Contact and Investigatory Behavior with an F ratio of 5.1 (df 2, 13) p ≤ .05 (see Figure 11).

In order to determine the comparative results of the three treatment groups, a priori MANOVA were performed. The first compared the effects of Group 1 (medication) versus Group 2 (training). These results are also presented, as labeled, in Table 14. There was a significant difference between the two groups with an F ratio of 8.23 (df 4, 10) p ≤ .05. That is, for the socialization and activity variables, there are significant differences between the mean scores of the dogs in Group 1 and the mean scores of the dogs in Group 2.

The ANOVA performed on the Group 1 versus Group 2 contrast between the groups showed a significant difference on one variable. This was the Social Contact and Investigatory Behavior subtest of the Handling Test with an F ratio of 10.12 (df 10, 130) at the
p ≤ .01 level (see Figure 11). Thus, the dogs in Group 2, across the four testing periods, obtained significantly higher scores on the Social Contact and Investigatory Behavior subtest than did the dogs in Group 1.

The second a priori MANOVA examined the combined effects of Groups 1 and 2 versus Group 3 as shown in the fourth row of Table 14. Although the MANOVA yielded no overall difference, the ANOVA showed one variable, the Miscellaneous Behavior subtest of the Handling Test as significant at the .05 level (F=4.68, df 10, 130). That is, the treatment for dogs in Group 3 did not produce significantly different effects than the pooled scores across time for treatment for the dogs in Groups 1 and 2 except for the results on the Miscellaneous Behaviors subtest which was significantly lower for Group 3.

Pre-test vs. post-test. Table 15 presents the results in the rightmost 3 columns for the MANOVA which considers time as main effect on the combined seven of the three groups between the pre-test and the post-test. No overall differences were demonstrated although the ANOVA showed a trend, p ≤ .1, for the Pavlovian Stand measure with an F of 3.23 (df 1, 13) (see Figure 9). That is the scores for activity on the Pavlovian Stand for the combined groups showed a trend of being lower on the post-test than on the pre-test.

A MANOVA was computed for the time by treatment effect for the pre-test versus post-test. As seen in the rightmost column of
Table 15 there was no overall significant effect, the ANOVA also did not yield any significant F ratios.

The a priori multivariate tests which compared the effects of Group 1 versus Group 2 and the effects of Groups 1 and 2 versus Group 3 yielded no significant multivariate group effects between the pre and the post tests. The ANOVA yielded a trend significant at the P ≤ .1 level (F=4.36, df 10,130) towards higher scores for Group 2 in the Group 1 versus Group 2 contrast for the Playful Fighting subtest of the Handling Test (see Figure 12).

**Pre-test vs. post, post-post, and post-post-post tests.**

Table 16 presents the results for the MANOVA which considers time as main effect on the combined results of the three groups between the pre-test and the combination of the three post-tests. The MANOVA yielded no significant overall differences; however, the ANOVA showed a downward trend for scores on the Pavlovian Stand (F=6.34, df 1, 13) and an upward trend for the scores on the Playful Fighting subtest (F=2.96, df 1, 3) at the p ≤ .1 level (see Figure 12).

The MANOVA computed for the time by treatment effect to determine the comparative results of Groups 1, 2, and 3 from the pre-test versus the combination of the three post-tests yielded no overall significant F ratios. Table 16 also demonstrates that no significant F ratios were found on the ANOVA.

Similarly, the two a priori MANOVA, Group 1 versus Group 2 and Groups 1 and 2 versus Group 3, did not demonstrate significant multivariate or univariate F ratios.
Post-test vs. post-post and post-post-post tests. The contrast for this MANOVA was conducted to examine the differences between the post-test, when Groups 1 and 3 were still receiving medication, versus the post-post and post-post-post tests when the medication was discontinued. Table 17 demonstrates that the MANOVA, which considers time as main effect yields significant results at the P < .05 level (F=6.67, df 4, 10). That is, for the socialization and activity variables there are significant differences between the mean scores of the combined groups from the post-test to the post-post and post-post-post tests.

Univariate F tests were computed to determine which socialization and activity variables significantly differed in the combination of the three groups from the post-test to the post-post and post-post-post tests. As seen on Table 17, significant F ratios were yielded for two activity variables; the total seconds sitting on the Sit Test (F=6.26, df 1, 13; p < .05) and the Pavlovian Stand (F=6.34; df 1, 13; p < .05). A downward trend was noted for the number of sit commands on the Sit Test (F=4.9; df 1, 13, p < .1). Examination of the data on Table 4 reveals that for the total seconds sitting variable, Groups 1 and 3 showed an increase while Group 2 showed a decrease in scores. The data on Table 7 for the Pavlovian Stand measure shows a decrease in scores on Table from the post-test to the post-post and post-post-post tests for Group 2 and an increase in scores for Groups 1 and 3 (see Figure 9). Table 5 shows that the number of Sit Commands decreased for all
three Groups from the post to the post-post and post-post-post tests (see Figure 6). That is, Groups 1 and 3 showed decreased activity levels (increased length of sit) on the sit test following discontinuation of the medication and increased activity on the Pavlovian Stand, while Group 2 (training) showed increased activity on the Sit Test and decreased activity on the Pavlovian Stand measure.

The ANOVA also yielded a significant F ratio for the Social Contact and Investigatory Behavior of the Handling Test (F=14.24; df 1, 13, p < .05) and a trend on the Playful Fighting Subtest of the Handling Test (F=3.16, df 1, 13, p < .1). That is, the scores on the Social Contact and Investigatory Behavior Subtest were significantly higher for the combination of the three groups in the post-post and post-post-post tests versus the post-test and the scores on the Playful Fighting Subtest showed a downward trend (see Figure 12).

A MANOVA was computed for the time by treatment interaction for Groups 1, 2, and 3 from the post-test to the post-post and post-post-post tests. As seen in Table 17 there were no overall significant effects. The ANOVA also did not yield any significant F ratios.

Although the a priori MANOVA which compared the contributions of Group 1 (medication) versus Group 2 (training) yielded no significant overall effects, the ANOVA did demonstrate significant differences on two variables; the number of sit commands, (F=3.11;
and the total number of seconds sitting on the Sit Test ($F=2.70; df=10, 130; p\leq .05$) as seen on Table 4. That is, Group 1 showed a decrease in the number of forces used on the Sit Test over Group 2 from the post to the post-post tests and an increase in the number of seconds sitting (see Figures 6 & 7).

Table 17 shows the results of the a priori MANOVA computed to examine the means of the variables of Groups 1 and 2 versus Group 3. Again no significant multivariate effects were found, however, one significant variable was yielded on the ANOVA. Avoidance and Defensive Behavior Subtest had an $F$ of 5.6 ($df=10, 130; p\leq .03$). That is, the dogs in Group 3 showed a larger decrease in Avoidance and Defensive Behavior Scores from the post to post-post and post-post-post tests than the dogs in Groups 1 and 2 (see Figure 10).

Post-post test vs. post-post-post tests. This MANOVA was conducted to continue to examine the effects of withdrawal of medication from Groups 1 and 3 from the post-post test to the post-post-post test. Table 18 demonstrates that the MANOVA which considers time as a main effect yielded a significant $F$ ($4, 10$) ratio of 2.25 ($df=4, 10; p\leq .05$). That is, that for the combined groups, there is a difference of the mean scores from the post-post to post-post-post tests.

The ANOVA was computed to determine which individual variables differed over time. Table 18 shows that significant F-ratios were yielded for the number of forces variable ($F=11.54; df=2, 13; p\leq .005$) and the Pavlovian Stand measure ($F=20.81; df=1, 13; p\leq .001$).
Trends were noted for the total number of seconds sitting measure 
\( (F=3.73; \, \text{df} \, 2, \, 13; \, p \leq .1) \), and the Social Contact and Investigation 
variable \( (F=3.73; \, \text{df} \, 2, \, 13; \, p \leq .1) \).

A MANOVA was computed for the time by treatment effect for the 
post-post test versus the post-post-post test. Although the MANOVA 
yielded no overall difference, the ANOVA showed one variable, the 
total seconds sitting, as significant at the .04 level \( (F=4.16, \ \text{df} \, 2, \, 13) \). Inspection of the data on Table 4 shows that the number 
of seconds sitting increased from Groups 1 and 3 and decreased for 
Group 2 (see Figure 6). A trend \( (F=5.36; \, \text{df} \, 2, \, 13; \, p \leq .1) \) was 
noted for the Miscellaneous Behavior Subtest of the Handling Test. 
Table 12 demonstrates that the scores on the Miscellaneous Behaviors 
Subtest decreased for Groups 1 and 3 and increased for Group 2 
(see Figure 15).

Table 18 lists the results of the Group 1 versus Group 2 a 
\textit{priori} MANOVA. No significant multivariate F ratios were found 
between the post-post tests and the post-post-post tests, although 
the univariate analysis yielded one significant variable, the 
Miscellaneous Behavior subtest, as significant at the .04 level 
\( (F=5.36, \, \text{df} \, 10, \, 130) \). That is, Group 2 showed an increase in scores 
on the Miscellaneous Behaviors subtest, and Group 3 showed a 
decrease in scores on the subtest (see Figure 15).

The \textit{a priori} MANOVA for Groups 1 and 2 versus Group 3 yielded 
no significant F ratios in the multivariate or univariate analyses.
Correlational Analysis

To determine the relationships among the several measures, intercorrelations were computed. The resulting matrix is presented as Table 19.

As can be noted from Table 19 there is a significant negative relationship between the number of forces administered on the Sit Test and the duration of sitting \( (p \leq .01) \). The significant relationships \( (p \leq .01) \) between both the number of forces and duration of sitting and the average length of sit is, of course, spurious because the average length of sit is comprised of the average length of sit divided by the number of forces.

Activity in the Pavlovian Stand was not related to the Sit Test scores at higher than chance levels.

Some of the Socialization scores from the subtests of the Handling Test were more closely related to the Sit Test than were others. It can be noted from Table 20 that the Avoidance and Defensive Behavior scores were significantly positively related both to the duration of sitting \( (p \leq .01) \) and average length of sit \( (p \leq .05) \), but were not correlated with activity in the Pavlovian Stand. Playful Fighting and Social Contact and Investigation scores were both significantly negatively correlated \( (p \leq .05 \text{ and } p \leq .01 \text{ respectively}) \) with average length of sit. Social Contact and Investigation had a strong positive relationship to number of forces \( (p \leq .01) \). Therefore, the dogs which were more active on the Sit Test also exhibited more playful fighting, social contact, and investigatory
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<td>5. Avoidance and Defensive Behavior</td>
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<td>6. Playful Fighting</td>
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<td>-.62 *</td>
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<td>7. Social Contact and Investigation</td>
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<td>8. Attraction and Following</td>
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<td>10. Miscellaneous Behaviors</td>
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<td>-.55 *</td>
<td>.06</td>
<td>.09</td>
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* *p < .05
** *p ≤ .001
behaviors as defined by the Handling Test subtests. Dogs which were less active were less active on the Sit Test tended to display more avoidance and defensive behaviors on the Handling Test. Activity in the Pavlovian Stand was not related to the Sit Test scores at higher than chance levels.

On the socialization measures, two behavioral scores, Playful Fighting and Social Contact and Investigatory Behavior, were strongly negatively correlated with Avoidance and Defensive Behavior ($p \leq .01$). The Miscellaneous Behaviors subtest correlated negatively ($p \leq .05$) with the Playful Fighting Subtest. None of the other correlations between the socialization measures exceeded chance levels.
The purpose of this study was to examine the comparative effectiveness of dextroamphetamine therapy versus behavioral training, alone and in combination, on the social behavior and responsiveness to training by dogs bred to be hyperkinetic. This study investigated the effects of the three treatments on the dogs' social behavior as assessed by the Handling Test (Scott, 1965; Note 8); on the dogs' levels of activity as measured by the Sit Test (Corson, et al., Note 2; Scott, Note 8); and the amount of their activity while restrained in the Pavlovian Stand.

Subject Population

As described on page 60, the subjects in this study were obtained from purebred and hybrid stock expected to produce hyperactivity as one of its characteristics. The dogs ranged in age from 6 to 14 months.

The dogs that were obtained were not all of the same hybrid cross and perhaps some of the considerable behavioral differences which were observed within each cross were due to the differences in the genetic compositions of the individuals resulting from the hybrid crosses. For example, within one T x TBF₁ litter, three
dogs demonstrated high activity scores on the seconds sitting measure of the Sit Test and high Attraction and Following scores on the Handling Test. In contrast, three dogs from the same litter scored low on the seconds sitting measure and on the Attraction and Following subtest.

Results of the Treatments

The analyses of the data did not indicate any significant overall differences in the three groups as a result of treatment. However, significant differences were noted on several measures between the times of measurement. The following discussion will offer an explanation of the results obtained, without implying the superiority of any one treatment on either social behavior or activity levels of the dogs.

Activity Measures

No significant differences attributable to treatment were obtained on the three measures from the Sit Test (total seconds sitting, number of forces, and mean length of sit) whether between pre-test and post-test, or between the pre-test and the combination of the three post-tests. The lack of significant results might be a consequence of the small sample size and the wide ranges and non-normal distributions of scores.

A reason for the wide range of scores on the Sit Test and perhaps also on several of the other measures, may have been the fear several of the dogs displayed during the pre-tests. Dogs #4 and #5 (Group 1) and #8 (Group 3) remained immobile and trembling
during the pre-test sessions of the Sit Test. For example, #8, Fred, was observed sitting and trembling for four minutes (test and post-trial periods) while a fly crawled on his nose, during a pre-test session of the Sit Test. This seemingly frightened immobility of a few dogs contributed to the variance of scores on the pre-tests. In subsequent sessions (for which the variance of the score distributions decreased) dogs #5 and #8 seemed less frightened and began to move around during the Sit Test, displaying an increase in activity from pre-test to post-tests, thus, becoming behaviorally more homogeneous with others in their groups. The hypothesis that the dogs were frightened receives support from the significant negative correlations between the scores on the Avoidance and Defensive Behaviors subtest of the Handling Test and activity on the Sit Test.

A second reason for the lack of treatment effects on the Sit Test seems to have been the stereotypic responses observed in some of the dogs resulting from the .5 mg/kg dose of dextroamphetamine. All of the dogs in Group 3 (#12, #13, #14, #15, and #16) and two of the dogs in Group 1 (#3 and #4) were noted as displaying stereotypic responses. The dogs which displayed stereotypy were not receptive to training. They did not appear to attend to stimuli in the environment, including the handler.

The stereotypy noted in one dog in Group 3 and in both of the dogs in Group 1 took the form of head-bobbing. The remainder of the dogs in Group 3 stereotypically paced back and forth. The decrease
in stereotypy in Groups 1 and 3 when the medication was discontinued perhaps explains the increase in total seconds sitting that was noted for the combined group means between the post-test and the combined means of the post-post and post-post-post tests.

Group 1, which received medication, and Group 2, which did not, differed significantly on the a priori comparison with respect to the difference between their post and combined post-post and post-post-post test scores on both number of forces and total seconds sitting. One could speculate from the direction of change as shown on Tables 4 and 5 that the amphetamines acted as a stimulant on some of the dogs in Group 1, explaining their initially higher post-treatment means, and thus their greater decrease in activity after medication was discontinued.

Socialization Measures

The changes in the mean scores for the three groups between the pre and post-tests on the Avoidance and Defensive Behavior subtest of the Handling Test are difficult to interpret. The only significant difference was that between Group 3's post and combined post-post and post-post-post test means versus those of Groups 1 and 2. It can be noted that Group 3 was the only group for which the Avoidance and Defensive Behavior post-treatment scores did not decrease at the time of the post-test. This was perhaps due to the stereotypy that was previously discussed. The behaviors scored in the test such as "subject does not contact handler" and "no response
to handler's actions" could be elevated by stereotypic behavior. Consequent to the discontinuation of medication, Group 3's mean Avoidance and Defensive Behavior score decreased to a level similar to that of Group 2's combined means for the post-post and post-post-post-tests.

The changes for the combined mean scores for the three groups between the post, post post, and post-post-post tests on the Social Contact and Investigatory Behavior Subtest may indicate that the dogs became increasingly familiar with the handler over the course of the experiment, thus exhibiting less investigatory behaviors.

Correlations

Prior studies have apparently not looked to see whether scores from the Sit Test, the Handling Test, and the levels of activity in the Pavlovian Stand are related to each other. The correlations, (see Table 19) ranging from -.20 to .50 in this study between the Sit Test measures and the activity count in the Pavlovian Stand possibly indicate a lack of reliability on the part of certain measures. The large range of distribution of scores for all of the measures (0 - 1,000, Pavlovian Stand; 1 - 50, forces; and 20 - 180 seconds sitting) seemingly precludes the possibility that the low correlations were due to restriction of range.

Conceivably, the chance level relationships between scores on the Sit Test and on the Pavlovian Stand were related to the differences in inhibitory cues received by the dogs. The Sit Test
required the dog to learn to inhibit its activity upon verbal command accompanied by a manual prompt from the handler. The Pavlovian Stand measure required the dog to inhibit its activity when strapped into the harness which provides consistent physical restraint. The Pavlovian Stand scores also did not correlate at beyond chance levels with any of the Handling Test subtests.

Two behavioral scores, Playful Fighting and Social Contact and Investigatory Behavior were strongly negatively correlated with Avoidance and Defensive Behavior. That is, the more positive social behaviors within the Playful Fighting or Social Contact and Investigatory Behavior subtests tended not to be demonstrated in conjunction with the less social behaviors contained in the Avoidance and Defensive Behaviors subtest.
LIMITATIONS

Because the canine population for this study was drawn from one kennel and utilized one purebreed of dog (telomian) and two types of Telomian x Beagle hybrids, the findings cannot be generalized beyond this population.

Because of the necessity of transporting these dogs from their home environment to elicit hyperkinetic symptoms (Corson et al., Note 2), and because of the limited availability of these subjects and the difficulty in arranging for the use of the dogs, it was not feasible to individually screen them for drug responsiveness or evidence of hyperactivity on the dependent measures before transporting them to Ohio State University. This, in part, led to the large variances observed on the dependent measures. The small sample size combined with the large variance would also mask differences that might be demonstrated given larger samples from a more homogeneous population.

The limited availability of subjects also affected the decision not to include a control group in the study. Thus, the observed effects can only be compared among the three treatment groups utilized.

In the interest of methodological control, standardized doses of dextroamphetamine, rather than individually adjusted doses were utilized. This did not allow for the determination of the optimum dosage for each dog which, in view of the noted stereotypy
probably differed from the .5 mg/kg dose administered to the subjects in this experiment. However, previous research has found stereotypy to occur in dogs when much higher doses of amphetamine were administered. Corson, Corson, Kiriluk, Kiriluk, Knopp, and Arnold (1973) observed "complete stereotypy in 14 dogs from dosages ranging from 1.2 to 3.6 mg/kg.

The duration of treatment in this study, excluding the pre and post-tests, was five weeks long. It is possible that this was too short a period of time to produce significant training effects on the Sit Test for the dogs. However, Corson, et al. (Note 2) reported dramatic effects on Sit Test scores after the first administration of dextroamphetamine.

Resource limitations in this study necessitated the use of the experimenter as rater for the Sit Test and the Handling Test. This brings up the possibility of experimenter bias. The possibility of observer drift should also be considered due to the long duration of the study.

Four handlers participated in the study, raising the possibility that subtle individual differences in working with the dogs could influence the results. To help control for this, each handler was assigned dogs from all three groups in a random manner.

The handlers knew which dogs were in Group 1 (medication) because they did not work with these dogs in the experimental room. They did not know which dogs were in either Group 2 (training) or Group 3 (medication and training).
Other limitations of the study concern the equipment and measures utilized. The experimental room was not insulated with regard to sound or scent, thus introducing the possibility of interfering stimuli.

There is also the question of the reliability of the several measures utilized. Scott has extensively used the Handling Test in his research (Scott & Fuller, 1965) and it is presently in use by his students at Bowling Green State University (Scott, Note 1), however, the reliability of the Handling Test has never been reported. Also, there are no reliability data available on the Sit Test or measures from the activity meter used with the Pavlovian Stand.
IMPLICATIONS

The implications for this study are mainly concerned with areas of future research.

As discussed, no reliability data is available on either the Handling Test, the Sit Test, or the activity meter for the Pavlovian Stand. Further research is needed to establish the reliability of these measures.

The high scores on the Playful Fighting, Social Contact and Investigatory Behavior subtests of the Handling Test have been interpreted as indicating a high degree of socially appropriate behavior. The scores on the subtests indicate the occurrence of the listed behaviors, not the degree or intensity of their occurrence. It may be that high scores on these subtests indicate a maladaptive amount of social behavior by the dog directed towards the handler, such as licking or pawing the handler too much. Research is needed to establish norms of "socially appropriate" behaviors on the Handling Test.

The use of activity in the Pavlovian Stand as a measure of hyperkinesis seems questionable if results of a study are to be considered as applicable to human populations. Hyperkinetic children are rarely expected to tolerate physical restraint in a classroom situation, however, they are expected to learn to sit quietly in
their seats, a situation which may be considered as similar to the Sit Test.

Further research is also needed along the lines of Sprague and Sleator (1975) to determine dose response curves for the measurements of social behavior and activity levels in different environmental situations.

It would require a well-funded study to control for the possible sources of error noted in the present study. A necessary preliminary step would be a genetic study to establish a group of dogs which would breed true for hyperkinesis and responsiveness to amphetamine. Dose response curves should be individually determined for each dog instead of using standardized doses of drugs. A well equipped laboratory with sound-proofed rooms is essential to eliminate interfering stimuli. Videotape equipment to record the sessions would reduce the possibility of the observer interfering with the dogs' responses to the measures utilized. It would also be desirable to measure the dogs physiological reactions to the drug during different environmental manipulations in order to draw more parallels to human research.
APPENDIX A

Poem by Heinrich Hoffman

"Ob der Philipp heute still
Wohl bei Tische sitzen will?"

Also sprach in ernstem Ton
Der Papa zu sein em Sohn,
Und die Mutter blickte stumm
Auf dem gan zen Tisch herum.

Doch der Philipp horte nicht,
Was zu ihm der Vater spricht
Er gaukelt
Und shaukett,

Er trappelt
Und Zappelt

Auf dem Stuhle hin und her,

"Philipp, das missfallt mir sehr!"

(Hoffman, 1854, in Cantwell, 1975, p. ix)
APPENDIX B

Experimental Procedures and Scoring Sheets
The Handling Test
(Scott & Fuller, 1965; Scott, Note 8)

1. **Purpose:** To measure the development of the relationship between the dog and the handler.

2. **Equipment:** Stopwatch and scoresheets.

3. **Personnel:** Handler and observer.

4. **Time:** Five minutes per animal.

5. **Procedure:**

   (0) Bring dog into room and place at arms length, facing 90° away from you. Stand still for 30 seconds. Observer records behavior on coded score sheets.

   (1) From 4 feet away, walk steadily toward the dog as if you were going to walk through it, stopping short if the dog stays in place. Observer records. Repeat once.

   (2) From a point one or two feet away from the dog, walk steadily away. Be sure the dog is looking at you when you start. Record and repeat.

   (3) From a distance at which the dog is about two feet beyond your reach, squat and hold out your hand slowly to pat it, moving your fingers. After the dog touches your hand, raise it. Get up. Observer records.

   (4) From a distance of about two feet, squat, hold out hand, and in coaxing tone of voice try to call the dog to you (do not use whistle). Hold out hand slowly to dog as if to pat, moving fingers. After the dog touches your hand, raise your hand. Get up. Observer records.

   (5) Walk over to the dog, squat, stroke 6 times, rise, record reactions. Squat again, pat 6 times, record reactions.

   (6) Walk over to the dog and pick it up, support it under the middle. Hold 30 seconds. Record.

   (7) Place animal on ground and repeat #5.

   (8) Stand at arm's length from the dog, facing 90° away from it. Stand still for 30 seconds. Observer records. Repeat once.

6. **Scoring:** Weight scores according to the list on the scoresheet, obtain the total for each behavior item on the list. Add this for each category and for the overall total.
<table>
<thead>
<tr>
<th>Dog</th>
<th>Score</th>
<th>Handler</th>
<th>Observer</th>
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<td>Fighting</td>
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<td>Attention</td>
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<td>Vocal</td>
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<th>Instructions</th>
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Date: [Date]
The Pavlovian Stand

1. **Purpose:** To observe the reactions of the dogs to restraint.

2. **Equipment:** Pavlovian stand, foot restraints, stopwatch, score-sheets, activity meter (Tuber, Note 8).

3. **Personnel:** Handler and assistant.

4. **Time:** Twenty minutes per animal.

5. **Procedure:**

   (a) The handler carries the dog to the observation room where the Pavlovian stand is set up.

   (b) The handler and the observer secure the dog in the sling making sure that its feet are securely, but not tightly fastened to the base of the stand. The activity meter is set in place by threading the straps through the designated holes in the midportion of the sling and tying it around the dog's back.

   (c) The dog is left alone in the room and the handler monitors its activity through the peephole, recording the activity count and behavioral observations every five minutes for twenty minutes.

   (d) The dog is then returned to its cage.
<table>
<thead>
<tr>
<th>Dog</th>
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<th>Stress</th>
<th>Seconds</th>
<th>Observations</th>
<th>Weight</th>
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The Sit Test
(Scott, Note 1)

1. **Purpose:** To measure the ability of the dogs to inhibit motoric actions upon command and to observe the reactions of the dogs to a simple form of training.

2. **Equipment:** Stop-watch, scoresheets.

3. **Personnel:** Handler and observer.

4. **Time:** Ten minutes per dog.

5. **Procedure and Scoring:**

   (a) Bring the dog into the observation room and let it have one minute of free time.

   (b) At the end of the minute of free time, bring the dog (by the nape of its neck) to the position in front of the experimenter's chair. Push the dog's rump into a sitting position while giving the command "sit." Repeat as often as necessary for 3 minutes. Each repetition = one force.

   (c) One minute free time follows before the dogs are returned to their cages.
The Leash Control Test
(Scott & Fuller, 1965; Scott, Note 8)

1. **Purpose:** To observe the reactions of the dogs to a simple form of training.

2. **Equipment:** A choke collar leash, score sheets.

3. **Personnel:** Handler.

4. **Time:** Ten minutes per session for 20 days.

5. ** Procedures and Scoring:**

   (a) The dog is removed from its cage and the choke collar leash is placed around its neck by the handler. The dog is then led from the kennel room to the observation room and back again at the end of the treatment procedures.

   The dog can be trained not to jump on the handler by the handler's lifting his/her leg and hitting the dog in the chest with his/her knee as it jumps. Train the dog to run close to the handler's left side by applying firm pressure on the leash.

   (b) A balk is scored when the dog must be dragged over ground. If a dog balks more than three times it should be carried the rest of the way. Each time the dog balks, the handler should carry it three steps and give it another chance to walk.

   (c) The locations of the dogs' balks should be recorded on the score sheets.
THE LEASH CONTROL TEST

dog: date: handler:

observation room

Stairs 25 24

23

Bathroom

kernel

Scoring: B = bark
\[ \Rightarrow \] = direction
P = person in hallway
The Passive Handler Test
(Scott & Fuller, 1965)

1. **Purpose:** To measure the socialization of dog to handler.
2. **Equipment:** None.
3. **Personnel:** Handler.
4. **Time:** Ten minutes per dog.
5. **Procedure:** The handler sits quietly in the observation room and records how long it takes for the dog to approach and remain in contact. Use a new line on the score sheet for each approach and withdrawal.
Passive Handler Test

Dog: _________  Handler: _________  Date: _________

dog with handler (record in sec.)  
dog away from handler

<table>
<thead>
<tr>
<th>Time</th>
<th>Time</th>
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APPENDIX  C

Description of Activity Meter
Figure 16 illustrates the activity meter which consisted of a telephone jack mounted in a 35 mm film canister. A metallic disc (outside diameter=2 cm) with 4 mm diameter hole in the center was placed on the phone jack to make and break the electrical circuit. A leather bootlace was threaded through the top of the film canister and tied around the dog's back after being threaded through the holes in the Pavlovian sling 1" from the insertion of the dog's front limbs.

A twelve foot wire led from the meter to a 14 volt American Flyer Pike-Master Transformer which also powered a four digit SODECO counter which recorded the number of times the electrical circuit was completed in response to the dog's activity.
Figure 16. Activity Meter with Cut-Away View of Film Canister
APPENDIX D

Description of MANOVA
Multivariate analysis of variance (MANOVA) is the generalization of ANOVA (analysis of variance) to operating on several dependent variables. MANOVA deals with a vector containing several dependent variables with observations on each of these variables for each of the subjects. Instead of means on individual variables, MANOVA analyses vectors of means where each element of the vector is a group's mean for a particular variable. The purpose of MANOVA, like ANOVA, is to determine whether statistically significant differences exist between two or more groups' scores on the set of dependent variables rather than a single variable as in ANOVA.

(Amick & Crittenden, 1975, p. 225)
APPENDIX E

Weights and Drug Dosages Medical Notes
### TABLE 2P

**Daly Record of Weight (Pounds) and Dosages of Dextro-Amphetamine (mg) Administered to Group 1**

<table>
<thead>
<tr>
<th>EXPERIMENTAL DAY</th>
<th>SUBJECTS</th>
<th>DOG 1</th>
<th>DOG 2</th>
<th>DOG 3</th>
<th>DOG 4</th>
<th>DOG 5</th>
<th>DOG 6</th>
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<td></td>
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<td>wt dosage</td>
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TABLE 22

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</table>
The dogs were treated with Telmintic powder once a day for five days to worm them during the acclimation and pre-test periods.

These dogs were donated to the veterinary school after completion of the dissertation. They were given either 10 mg inovare (synthetic morphine) or 10 mg Acepromazine as sedatives. Dr. Hamlin reported (9/29/78) "Dogs all went bananas (after being medicated) when most normal dogs would have been tranquil." They became unmanageable and tried to bite the experimenters.

Developed diarrhea because they could not handle the high fat content of the canned food. During the fourth week of the procedure, they were switched to dry dog chow.

1) DA₂PL (distemper) vaccinations upon arrival to O.S.U. Veterinary School
2) These dogs got their feet caught in the cage bars during the first two weeks. Phisohex and topazone was used locally to treat the lesions.
APPENDIX F

Summary of Ancedotal Recordings
Group: Medication Only
Dog: Henrietta #1
Handler: D. B.

SUMMARY SHEET: ANECDOTAL RECORDINGS

SIT TEST

Pretests:

Day 1:
- pre--whining, jumping, pawing, panting
- during
- post--jumping on handler, whining

Day 2:
- pre--active, pawing handler, whining, dashing around, trying to jump on lap
- during
- post--pawing handler

Day 3:
- pre--whining, pawing, chewing buttons on lab coat
- during
- post--same as pre

Day 4:
- pre--pawing handler, chewing buttons on lab coat
- during
- post--same as pre

Day 5:
- pre--whining, pawing handler
- post--same as pre

Training Sessions: Not Applicable

Week 1

Day 1:

Day 2:

Day 3:

Day 4:

Day 5:

PAVLOVIAN STAND

Pretests:

Day 1:
- Calm while being harnessed
- during session--quiet, chewed off one leg restraint

Day 2:
- Calm while being harnessed
- during session--quiet, leans head forward

Day 3:
- Calm while being harnessed
- during session--quiet, leans head on sling or forward

Day 4:
- Calm while being harnessed
- during session--whines first 5 minutes, then quiet, leans head forward

Day 5:
**Henrietta**

### SIT TEST

**Training Sessions:**

<table>
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<th>Week 2:</th>
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### POST TESTS

- **Post-test, Week A:**
  - pre--stays near handler, explorative, some whining
  - post--same as pre
- **Post-test, Week B:**
  - pre--whining, explorative, stays near handler
  - post--same as pre, except jumps on
- **Post-test, Week C:** handler's lap-2 days
  - pre--quiet, explorative
  - post--same as pre

- **Post-test, Week A:**
  - Calm while being harnessed during session: quiet, head down or looking at door
- **Post-test, Week B:**
  - same as week A
- **Post-test, Week C:**
  - same as week A

---

### ADDITIONAL COMMENTS:

**LEASH CONTROL TEST:**

**PASSIVE HANDLER TEST:**

**ADDITIONAL COMMENTS:**
Group: Medication Only
Dog: Alvin #2
Handler: K. W.

SUMMARY SHEET: ANECDOTAL RECORDINGS

SIT TEST

Pretests:

Day 1:
pre--exploratory
during--scratches self
post--calm exploration

Day 2:
pre--exploratory
during--grooms, scratches
post--exploratory

Day 3:
pre--front paws on handler,
   sniffs handler, explorative
during--grooms, scratches
post--front paws on handler,
   explorative

Day 4:
pre--exploratory
during--scratches, grooms
post--a few barks, explorative

Day 5:
pre--paws handler, sniffs
   handler, explorative
during--grooms, sniffs shoe,
   scratches
post--paws handler, sniffs,
   explorative

Training Sessions: Not Applicable

Week 1
Day 1:

Day 2:

Day 3:

Day 4:

Day 5:

PAVLOVIAN STAND

Pretests:

Day 1:
No struggle harnessing
during session--watches
door, chews sling, rocks
stand out of view

Day 2:
Small struggle harnessing
during session--chews sling,
   watches door, rocks sling
   out of view

Day 3:
Small struggle harnessing
during session--light
   whining, watches door

Day 4:
No struggle harnessing
during session--soft
   whining, rocks sling out
   of view

Day 5:
Small struggle harnessing
during session--chewing
   and whining, rocks sling
   out of view
SIT TEST

Training Sessions:

Week 2:

Week 3:

Week 4:

Week 5:

POST TESTS

Post-test, Week A:
pre--climbs on handler, barks, active
during--yelps, resistive, scratches self, alert to outside noises
post--claws handler, chews lab coat, explorative

Post-test, Week B:
pre--jumps on handler's lap (twice) pants, active
during--attentive to outside noise, scratches, grooms
post--calmer, paws handler, explorative

Post-test, Week C:
pre--runs around, jumps on handler
during--chews lab coat, attentive to outside noise
post--tries to chew handler's shoes (once), explorative

LEASH CONTROL TEST:

PASSIVE HANDLER TEST:

ADDITIONAL COMMENTS:

PAVLOVIAN STAND

Week 2:

Week 3:

Week 4:

Week 5:

POST TESTS

Post-test, Week A:
Struggle harnessing first day only
during session: whining, looking around

Post-test, Week B:
Trouble harnessing first day only
during session: occasional whine, looking around

Post-test Week C:
No trouble harnessing
during session: begins whining when door closes, looks around
Group: Medication Only
Dog: Kiriel #3
Handler: A. L.

SUMMARY SHEET: ANECDOTAL RECORDINGS

SIT TEST

Pretests:

Day 1:
pre--quiet, explorative
during--front paws on
handler
post--front paws on
handler

Day 2:
pre--climbs on handler,
sniffs
during--jumps on handler,
licks
post--front paws on handler

Day 3:
pre--stays near handler,
front paws on lap
------grooms, lays down, paws
handler

Day 4:
pre--wanders, exploratory
during--lays down, jumps up,
sniffs handler
post--exploratory

Day 5:
pre--exploratory
during--walks away just to
edge of handler's reach
post--exploratory

Training Sessions: Not Applicable

Week 1

Day 1:
Day 2:
Day 3:
Day 4:
Day 5:

PAVLOVIAN STAND

Pretests:

Day 1:
No struggle harnessing
during session--moves sling
out of view, overturns at
14'

Day 2:
Struggle harnessing
during session--begins
tyling as door closes,
bites harness

Day 3:
Struggle harnessing
during session--moves sling
out of view

Day 4:
Struggle harnessing
during session--bites on
restraints barking

Day 5:
SIT TEST

Training Sessions:

Week 2: 

Week 3: 

Week 4: 

Week 5: 

POST TESTS

Post-test, Week A:
pre--cautious, quiet, head bobbing
during--
post--stays by handler

Post-test, Week B
pre--stays near handler
during--licks handler, grooms
post--wanders or stays near handler

Post-test, Week C
pre--explorative sniffs handler
during--lays down, sniffs handler, chews chair
post--paws handler

LEASH CONTROL TEST:

PASSIVE HANDLER TEST:

ADDITIONAL COMMENTS:

PAVLOVIAN STAND

Week 2:'

Week 3:

Week 4:

Week 5:

POST TESTS

Post-test, Week A:
Struggle to harness
during session: first 2 days
rocks sling out of view,
occasional whining at beginning of week

Post-test, Week B
Struggle to harness
during session: rocks sling
out of view, chews, whining

Post-test, Week C
Struggle to harness
during session: whining,
chewing, last 2 days rocks
sling out of view
Group: Medication Only
Dog: Abner #4
Handler: K. W.

SUMMARY SHEET: ANECDOTAL RECORDINGS

SIT TEST

Pretests:

Day 1:
pre---stays in middle of room
during---trembles
post---sits

Day 2:
pre---explorative
during---trembles
post---sits

Day 3:
pre---sits across room
during---sits, more relaxed,
  sniffs floor
post---sits

Day 4:
pre---stays where placed
during---more relaxed, sniffs
  floor
post---sits

Day 5:
pre---stays where placed
during---sniffs floor
post---sits

Training Sessions: Not Applicable

Week 1

Day 1: 

Day 2:

Day 3:

Day 4:

Day 5:

PAVLOVIAN STAND

Pretests:

Day 1:
No trouble harnessing
during session---chews
out of harness by 19", whining

Day 2:
No trouble harnessing.
during session---rocked
sling out of view 5'

Day 3:
No trouble harnessing.
during session---started
to chew on harness
as soon as put in, rocked sling out of
view, urinated in
sling

Day 4:
No trouble harnessing
during session---chews
sling, bites through
front of sling 13'30"

Day 5:
No trouble harnessing
during session---chewing, whining
SIT TEST

Training Sessions:

Week 2:

Week 3:

Week 4:

Week 5:

POST TESTS

Post-test, Week A:
--stays where placed, head bobbing
--lays down occasionally
--sits

Post-test, Week B:
--stays near handler
--appears more alert
--sits

Post-test, Week C:
--sits, explorative
--sits, explorative

LEASH CONTROL TEST: N/A

PASSIVE HANDLER TEST: N/A

ADDITIONAL COMMENTS:

PAVLOVIAN STAND

Week 2:

Week 3:

Week 4:

Week 5:

POST TESTS

Post-test, Week A:
first day only--difficult to harness
during session--watches door

Post-test, Week B:
no trouble harnessing
during session--whining and chewing (last day)

Post-test, Week C:
no trouble harnessing
during session--chewing, watching door
SUMMARY SHEET: ANECDOTAL RECORDINGS

SIT TEST

Pretests:

Day 1:
- pre--trembling, urinates, stays in place
- during--sniffs floor where sitting
- post--sits

Day 2:
- pre--stays where placed, tail between legs, trembling, looks around, alert to outside noise
- during--sniffs floor where sitting
- post--sits

Day 3:
- pre--stays in middle of floor where placed
- during--sniffs floor where sitting
- post--sits

Day 4:
- pre--not as nervous, sits, sniffs handler
- during--sits
- post--sits

Day 5:

Training Sessions: Not Applicable

Week 1
- Day 1:
- Day 2:
- Day 3:
- Day 4:
- Day 5:

PAVLOVIAN STAND

Pretests:

Day 1:
- Mild struggle to harness during session--becomes active near end of session

Day 2:
- No struggle to harness during session--no vocalizations, some head movement

Day 3:
- No struggle to harness during session--bites harness and pulls one foot free
- Whines at end

Day 4:
- No struggle to harness during session--quiet and watches door

Day 5:
### SIT TEST

**Training Sessions:**

- **Week 2:**
  - Pre--goes to corner of room
  - During--runs away to corner room
  - Post--sits

- **Week 3:**

- **Week 4:**

- **Week 5:**

### POST TESTS

**Post-test, Week A:**
- Pre--goes to corner of room
- During--sits (3 days),
  - goes to corner (2 days)
- Post--sits

**Post-test, Week C:**
- Pre--goes to corner of room
- During--sits

### PAVLOVIAN STAND

**Week 2:**

**Week 3:**

**Week 4:**

**Week 5:**

### POST TESTS

**Post-test, Week A:**
- No struggle to harness
- During session--whining and barking (first 3 sessions)

**Post-test, Week B:**
- No struggle to harness
- During session--no vocalizations, looking around

**Post-test, Week C:**
- No struggle to harness
- During session--whining and biting on harness

**LEASH CONTROL TEST:** N/A

**PASSIVE HANDLER TEST:** N/A

**ADDITIONAL COMMENTS:**

Report from handler during week C (when getting out of cage)
"Very jovial—whines (happy) jumps about cage, wags tail and seeks contact with handler. Rubs on nibbles and licks arm--grabs arm with paws."
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<thead>
<tr>
<th><strong>PRETESTS</strong></th>
<th><strong>PAVLOVIAN STAND</strong></th>
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<tr>
<td><strong>SIT TEST</strong></td>
<td><strong>PRETESTS:</strong></td>
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<tr>
<td>Day 1:</td>
<td>Day 1:</td>
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<tr>
<td>pre—calm exploration</td>
<td>Resists being put into stand</td>
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<tr>
<td>during—resistive</td>
<td>during session—chews sling, quiet</td>
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<tr>
<td>post—calm exploration</td>
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<tr>
<td>Day 2:</td>
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<tr>
<td>pre—paws handler, grunts, excited</td>
<td>Small struggle into sling</td>
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<tr>
<td>during—resistant</td>
<td>during session—barks a few times, chews sling, urinates in sling</td>
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<td>post—jumps on handler</td>
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<td>Day 3:</td>
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<tr>
<td>pre—excited, grunting, urinates, jumps on table, pawing handler</td>
<td>Small struggle while harnessing</td>
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<tr>
<td>post—same as pre</td>
<td>during session—barking, whining, chewing sling</td>
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<tr>
<td>Day 4:</td>
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<tr>
<td>pre—licks handler, whining, jumps on table</td>
<td>Small struggle while being harnessed</td>
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<tr>
<td>during—resistant</td>
<td>during session—barking</td>
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<tr>
<td>post—tries to jump on table, whining</td>
<td>whining, chewing sling</td>
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<td>Day 5:</td>
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<tr>
<td>pre—scratches self, whining, explorative</td>
<td>Small struggle while being harnessed</td>
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<tr>
<td>post—same</td>
<td>during session—urinates in sling, barking, whining, &amp; chewing sling</td>
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</table>

**Training Sessions:** Not Applicable
SIT TEST

Training Sessions:

Week 2:

Week 3:

Week 4:

Week 5:

POST TESTS

Post-test, Week A:
pre--whining, paws handler
post--whining, paws handler

Post-test, Week B:
pre--light whining, explorative, urinates
   (2 days)
post--light whining, explorative

Post-test, Week C:
pre--quiet exploration,
   sniffs handler
during--scratches, attentive
to outside noise
post--quiet exploration

LEASH CONTROL TEST:

PASSIVE HANDLER TEST:

ADDITIONAL COMMENTS:

PAVLOVIAN STAND

Week 2:

Week 3:

Week 4:

Week 5:

POST TESTS

Post-test, Week A:
No struggle while being
   harnessed
during session--whining,
biting sling

Post-test, Week B:
No struggle while being
   harnessed
during session--whining,
   chewing sling

Post-test, Week C:
No struggle while being
   harnessed
during session--whining and
   chewing sling
SUMMARY SHEET: ANECDOTAL RECORDINGS

SIT TEST

Pretests:

Day 1:
pre--goes to corner
during--runs to corner
post--stays in corner

Day 2:
Same as Day 1

Day 3:
Same as Day 1

Day 4:
pre--sniffs floor on way to corner
during & post--same as Day 1

Day 5:
Same as Day 1

Training Sessions:

Week 1

Day 1:
pre--exploratory, goes to corner
during--runs to corner
post--goes to corner

Day 2:
pre--exploratory, goes to corner
during--runs to corner
post--goes to corner

PAVLOVIAN STAND

Pretests:

Day 1:
Struggles while harnessed
during session--whines for
10 minutes, chews on leg restraints

Day 2:
Calm while harnessed
during session--quiet, head down

Day 3:
Intense struggle against being harnessed
during session--chews on restraints, quiet, leans head forward

Day 4:
No struggle while harnessed
during session--leans head forward, quiet

Day 5:
No struggle while harnessed
during session--quiet, leans head forward

Day 1:
Struggle while being harnessed
during session--whines, leans head forward

Day 2:
No struggle while being harnessed
during session--quiet, leans head forward
Day 3:
pre—exploratory, close to corner
during—goes to corner
post—walks around corner area
Day 4:
pre—sits in corner
during—playful avoidance
post—goes to corner
Day 5:

Week 2:
pre—exploratory
during—playful avoidance
post—sniffs floor around handler

Week 3:
pre—sniffs area around handler
during—licks hands, shoes & bites jeans
post—exploratory

Week 4:
pre—explores room
post—exploration, sniffs handler

Week 5:
pre—calm, explorative
post—calm, explorative

POST-TESTS
Post-test, Week A:
pre—calm exploration or sits by handler
during—romps across room (2 days)
post—calm, explorative

Post-test, Week B:
pre—calm, explorative, except one day whines & scratches near door
post—same as pre

Day 3:
No struggle while being harnessed
during session—quiet, leans head forward

Day 4:
Same as Day 3

Day 5:
Same as Day 3

Week 2:
No struggle while being harnessed
during session—watches door, quiet

Week 3:
No struggle while being harnessed
during session—quiet, watches door (except 1 day—barked)

Week 4:
No struggle while being harnessed
during session—quiet, head down

Week 5:
No struggle while being harnessed
during session—quiet, head down

POST-TESTS
Post-test, Week A:
Calm while being harnessed
during session—quiet, head down or watching door

Post-test, Week B:
Calm while being harnessed
during session—intermittent whining, head down
Post-test, Week C:
pre-quiet, explorative
during-playful
post-explorative

Post-test, Week C:
Calm while being harnessed
during session-quiet, head down (see additional comments)*

LEASH CONTROL TEST: walked all the way by 5th session

PASSIVE HANDLER TEST: first three days-sits in corner; last two days-explores room

ADDITIONAL COMMENTS: *except for 7/26 when one of another investigator's dogs was in heat, Dear ol' Sam went wild, we couldn't get him in the sling
SUMMARY SHEET: ANECDOTAL RECORDINGS

SIT TEST

Pretests:

Day 1:

- pre--stays where placed on floor, crouching
- during--sits where placed
- post--sits (frightened)

Day 2:

- pre--stays where placed
- during--briefly sniffs handler, remains in position, lets flies perch on nose
- post--slides into laying position

Day 3:

- pre--stays where placed
- during--slight whine at 2'3"
- post--sits

Day 4:

- pre--stays where placed
- during--sniffs around sit area, watches a fly
- post--sits

Day 5:

- pre--stays where placed
- during--sits still, looks around
- post--sits

Training Sessions:

Week 1

Day 1:

- pre--stays where placed
- during--sits, sniffs sit area, slight whining near end
- post--stays sitting

PAVLOVIAN STAND

Pretests:

Day 1:

- No struggle to harness
- during session--chews harness, whining, urinates

Day 2:

- No struggle to harness
- during session--chews harness, whining

Day 3:

- No struggle to harness
- during session--light whining, chewing

Day 4:

- No struggle to harness
- during session--barking, chewing

Day 5:

- No struggle to harness
- during session--watches door, chews sling

Day 1:

- No trouble harnessing
- during session--quiet, watches door
Day 2:
pre--stays where placed,
looks around
during--sniffs handler and
area around sit, trembling
post--sits
Day 3:
pre--sits by door
during--walks to door
post--stands by door, sniffs
area by handler
Day 4:
pre--timid exploration,
stands by door
during--
post--stands by door
Day 5:
pre--walks to door, tail be-
tween legs, timid explora-
tion
post--explorative sniffs pant
Leg
Week 2:
pre--calm, explorative, sniffs
handler
during--sniffs floor
post--calm, explorative
(day 9: defecates)
Week 3:
pre--defecates (2 days)
scampers around handler,
explorative
during--
post--calm, explorative
Week 4:
pre--scampers around handler,
explorative
during--
post--explorative, calm
Week 5:
Same as Week 4

Day 2:
Same as Day 1
Day 3:
Same as Day 1
Day 4:
No trouble harnessing
during session--loks
around, especially at
doors, whines approxi-
mately 10 min., chews
harness
Day 5:
No trouble harnessing
during session--whining,
barking

Week 2:
No trouble harnessing
during session--whining
and chewing sling
Week 3:
No trouble harnessing
during session--whining,
chewing sling, watches
doors
Week 4:
Same as Week 3
Week 5:
Same as Week 3
POST TESTS

Post-test, Week A:
pre--frisky, explorative
during--alert, chews chair, licks handler
post--playful, social

Post-test, Week B:
pre--playful, explorative
during--attentive to outside noise
post--explorative

Post-test, Week C:
pre--scampers (day 3-111)
during--3days: playfully resistant
post--explorative, playful

LEASH CONTROL TEST: never walks entire way

PASSIVE HANDLER TEST: first two sessions: doesn't leave handler
3rd and 4th session stands on boundary line and stares at handler, 5th session: walks around room, explorative

ADDITIONAL COMMENTS:
SUMMARY SHEET: ANECDOTAL RECORDINGS

**SIT TEST**

**Pretests:**

Day 1:
- **pre**—explores room, urinates  
  **during**—whines, scampers away  
  **post**—exploration  

Day 2:
- **pre**—urinates, exploratory, whining, sniffs handler  
  **during**—excited, playful  
  **post**—exploratory, sniffs handler  

Day 3:
- **pre**—wanders, paws handler  
  **during**—rolls over  

Day 4:
- **pre**—paws handler, whines  
  **during**—  
  **post**—paws handler, sniffs floor  

Day 5:
- **pre**—paws and licks handler  
  **during**—  
  **post**—exploratory

**Training Sessions:**

**Week 1**

Day 1:
- **pre**—sniffs, explorative  
  **during**—scratches  
  **post**—exploration  

Day 2:
- **pre**—paws handler  
  **during**—scratches, makes choking noises  
  **post**—exploratory

**PAVLOVIAN STAND**

**Pretests:**

Day 1:
- No trouble harnessing  
  **during session**—whines, chews, tips sling over 12 minutes  

Day 2:
- No trouble harnessing  
  **during session**—whines, panting, chewing  

Day 3:
- No trouble harnessing  
  **during**—whining  

Day 4:
- No trouble harnessing  
  **during session**—chewing harness, whining  

Day 5:
- No trouble harnessing  
  **during session**—whining

**Day 1:**
- No trouble harnessing  
  **during session**—began whining when door closed, looking around  

**Day 2:**
- No trouble harnessing  
  **during session**—soft whining, watches door
Training Sessions:

Day 3:
- pre--excited, jumps on handler's lap
- during--shakes head, scratches, sniffs shoe, lays on back

Day 4:
- pre--paws and sniffs handler
- during--rolls over, scratches, sniffs handler, makes choking noise
- post--exploration

Day 5:
- pre--explorative
- during--chewing, sniffs handler, makes choking noise

Week 2:
- pre--calm, explorative
- during--scratches, sniffs, paws handler, grooms
- post--calm, explorative near handler

Week 3:
- pre--explorative
- during--grooms, scratches, sniffs handler's shoe
- post--explorative, sniffs handler

Week 4:
- pre--explorative (one day jumps on handler's lap)
- during--lays down, scratches, grooms
- post--calm, explorative

Week 5:
- pre--explorative
- during--lays down, scratches, grooms
- post--calm, explorative
Francis #9 Continued

POST TESTS

Post-test, Week A:
pre-explorative
during-lays down, scratches, grooms
post-explorative

Post-test, Week B:
Same as A

Post-test, Week C:
Same as A

LEASH CONTROL TEST: Walks on leash by second day

PASSIVE HANDLER TEST: explores room licks handler, paws handler, sniffs handler

ADDITIONAL COMMENTS:
Group: Training Only
Dog: Kasha # 10
Handler: A. L.

SUMMARY SHEET: ANECDOTAL RECORDINGS

SIT TEST

Pretests:

Day 1:
pre--explorative, calm
during--avoidance behavior,
appeared as if going to
snap at handler. It took
10 minutes to catch him

Day 2:
pre--explorative, sniffs
handler's shoe
during--same as Day 1

Day 3:
pre--sniffs handler
during--handler tries to
approach dog, dog licks
hand until handler tries
to pickup

Day 4:
pre--sniffs around handler
during--resistive to sit but
allows self to be caught

Day 5:
pre--sniffs around handler
during--clasps handler's hand,
jumps on handler, attentive
to outside noise

Training Sessions:

Week 1
Day 1:
pre--climbs on handler, ex-
plorative
during--grooming, climbing
on handler, playful chews
chair leg
post--sits for 30", explorative

PAVLOVIAN STAND

Pretests:

Day 1:
Too irritable to handle

Day 2:
Struggle to harness
during session--chews on
sling when door closed,
then quiet with head
down for first 15 min.,
then chewing & whining

Day 3:
No problem harnessing
during session--loud whining
and barking

Day 4:
No struggle harnessing
during session--chewing
on sling, barking con-
sistently

Day 5:
No struggle harnessing
during session--barking
entire time
Day 2:
preh—climbs on handler, licking very active
during—same as above, and playful avoidance, lays down
post—calmer, explorative

Day 3:
preh—jumps on handler, explorative
during—collapses, climbs on handler, licks, chews chair leg
post—explorative, climbs on handler

Day 4:
preh—wild, jumps on observer during—grooming, struggles, runs away smells wall, jumps on handler
post—explorative

Day 5:
preh—excited yelping, jumping scratches
during—runs skidding on floor
post—skids on floor

Week 2:
preh—jumps on handler, explorative
during—scratches, lays down, rolls on back, licks handler "busy"
post—calmer, explorative, licks handler

Week 3:
preh—paws handler, explorative
during—chews on handler's clothes, licks handler, collapses, resistive, grooms scratches, reacts to small movements
post—stays near handler

Day 2:
Some trouble harnessing during session—barks as door closes, howls, chews sling, looks at door near end of session

Day 3:
Bites on restraints while being harnessed during session—whines, barks, howls

Day 4:
Urinates and struggles while being harnessed during session—continual barking, urinates

Day 5:

Week 2:
Some trouble harnessing during session—barking and chewing on sling

Week 3:
Struggle harnessing during session—begins biting restraints as placed in, barking, chewing
Week 4:
pre—climbs on handler, explorative
during—scratches, runs away, chews chair & lab coat
post—explorative

Week 5:
pre—paws handler and observer
during—scratches, lays down, licks handler, chews chair, grooms
post—explorative by handler

POST TESTS

Post-test, Week A:
pre—excited, climbs on handler and observer
during—grooms, chews on clothing, bites chair leg, licks handler, scratches

Post-test, Week B:
pre—paws handler and observer
during—scratches, sniffs, chews chair, pulls on lab coat

Post-test, Week C:
pre—smells handler
during—scratches, chews chair, licks handler
post—calmer, explorative

POST TESTS

Post-test, Week A:
Struggle to harness
during session—chews sling, barking

Post-test, Week B:
Little to alot of struggle to harness
during session—barking, chewing

Post-test, Week C:
Struggle to harness
during session—barking, chewing

LEASH CONTROL TEST: walks smoothly by second session
PASSIVE HANDLER TEST: very, very active, explorative, made many approaches to handler

ADDITIONAL COMMENTS:
SUMMARY SHEET: ANECDOTAL RECORDINGS

SIT TEST

Pretests:

Day 1:
pre--exploratory, urinates, sniffs handler
during--pivots around
post--exploratory

Day 2:
pre--sniffs handler, exploratory
during--grooms, resistive
post--exploratory

Day 3:
pre--stays near handler, sniffs handler
during--not as resistive as day 2
post--same as pre

Day 4:
pre--paws handler, sniffs floor
during--shakes head, grooms, jumps on handler

Day 5:
pre--licks handler, exploratory
during--resistive, shakes self, collapses on floor

Training Sessions:

Week 1
Day 1:
pre--sniffs handler, exploration
during--resistive, shakes self, collapses on floor
post--same as pre

PAVLOVIAN STAND

Pretests:

Day 1:
Struggle to harness
during session--bites
harness, pulls front feet free, no vocalizations

Day 2:
Struggle to harness
during session--bites
harness, knocks stand over 7'30"

Day 3:
Struggle to harness
during session--bites
harness, no vocalizations

Day 4:
No struggle to harness
during session--bites
harness, intermittent whining, alot of head movement

Day 5:
Slight struggle
during session--no vocalizations
Training Sessions:

Day 2:
- **pre**-explorative
- **during**-"wiggly," attentive
- **post**-same as pre

Day 3:
- **pre**-paws handler, explorative
- **during**-keeps laying down, attentive to outside noise
- **post**-same as pre

Day 4:
- **pre**-panting, circling handler's feet
- **during**-resistive, rolls over
- **post**-same as pre

Day 5:
- **pre**-explorative
- **during**-pivots, grooms, scratches
- **post**-same as pre

Week 2:
- **pre**-very active, sniffs handler
- **during**-grooms, jumps on handler, licks chair, lays down
- **post**-same as pre

Week 3:
- **pre**-very active, sniffs handler
- **during**-grooms, jumps on handler, licks and chews chair, lays down
- **post**-same as pre

Week 4:
- Same as above, calmer and some exploration during free time

Day 2:
- Same as above

Day 3:
- No struggle to harness
- **during session**-some whining and chewing

Day 4:
- No struggle to harness
- **during session**-watches door

Day 5:
- Slight struggle to harness
- **during session**-intermittent whining and chewing sling

Week 2:
- No struggle to harness
- **during session**-whining, biting harness

Week 3:
- No to light struggle
- **during session**-whining

Week 4:
- No struggle to harness
- **during session**-intermittent whining, watches door near end of session
Training Sessions:

Week 5:
   Same as above, calmer
   and some exploration
during free time

---

Lucy #11

Week 5:
   No struggle to harness
during session--by end of
week, biting harness

---

POST TESTS

Post-test, Week A:
   pre--exploratory, sniffs
   handler
during--jumps on handler,
   chews chair, scratches,
   attentive to outside
   noise
   post--same as pre

Post-test, Week B:
   Same as post-test A

Post-test, Week C:
   Same as post-test A

---

LEASH CONTROL TEST: carried entire time, when felt rope, rolled
   on back and squirmed

PASSIVE HANDLER TEST: paces, sniffs handler

ADDITIONAL COMMENTS:
SUMMARY SHEET: ANECDOTAL RECORDINGS

SIT TEST

Pretests:

Day 1:
pre—explores, paws handler
during—grooms, light whine
post—explorative

Day 2:
pre—explorative, sniffs handler
during—sniffs and bites at at handler's pants, licks hand
post—paws handler, exploratory

Day 3:
Pre—urinates, explores
during—smells shoes, licks hand
post—explores

Day 4:
pre—explores, licks hand
during—licks handler, grooms

Day 5:
pre—sits by handler, sniffs clothes, paws up on lap
during—grooms, avoids sit
smells shoes, licks handler

Training Sessions

Week 1
Day 1:
pre—exploratory, frisky,
licks handler
post—exploratory

PAVLOVIAN STAND

Pretests:

Day 1:
No struggle into the stand
during session—whines for short time after door closes, chewing on sling

Day 2:
No struggle into the stand
during session—whining
started 1 minute after door closed, lasted 15 minutes

Day 3:
No struggle into the stand
during session—whining
started 30 seconds after door closes, chews on harness, urinates in sling

Day 4:
Slight struggle into sling
during session—whining,
chewing, urinated in sling

Day 1:
No struggle into stand
during session—whining
when door closes, looks at door, urinates in stand
Training Sessions:

Day 2:
pre--climbs on handler, pacing
during--circles handler
post--climbs handler, pacing

Day 3:
pre--feet on handler
during--when gets up circles, very fidgety
post--paces

Day 4:
pre--stays sitting near handler
during--fidgety, darts eyes
post--paces, stays near handler (stereotypic behaviors)

Day 5:

Week 2:
pre--explorative, paces (not stereotypic)
during--on 3 days sits without misc. behaviors
post--calm, explorative

Week 3:
pre--stays near handler, light panting, pacing
during--sits fidgety, alert to outside noise
post--stays by handler, often sitting

Week 4:
pre--light panting, explorative
during--scratches
post--explorative

Week 5:
pre--sniffs handler
during--grooms, scratches, licks handler
post--stays near handler, explorative

Day 2:
No struggle into stand
during session--quiet, some head jerks

Day 3:
No struggle into stand

Day 4:
No struggle

Day 5:

Week 2:
No struggle harnessing
during session--whining (beginning of week), watches door

Week 3:
Light struggle into sling
during session--quiet looks at door

Week 4:
Light struggle harnessing
during session--watches door

Week 5:
Light to no struggle harnessing
during session--quiet, looks at door
**POST TESTS**

**Post-test, Week A:**
- **pre**—quiet, explorative
- **during**—scratches, grooms
- **post**—explorative

**Post-test, Week B:**
- **pre**—explorative
- **during**—scratches, grooms
  - handler's hand
- **post**—explorative

**Post-test, Week C:**
- **pre**—explorative, sniffs handler
- **during**—grooms, scratches,
  - licks handler
- **post**—explorative

**POST TESTS**

**Post-test, Week A:**
- Struggle harnessing
  - during session—quiet, looks at door

**Post-test, Week B:**
- No trouble harnessing
  - during session—quiet,
  - looks at door

**Post-test, Week C:**
- Light to no struggle harnessing
  - during session—watches door

---

**LEASH CONTROL TEST:** walked smoothly by the 4th session, occasional balks throughout training period

**PASSIVE HANDLER TEST:** mainly paced the boundary line, made intermittent contact with the handler

**ADDITIONAL COMMENTS:**
Group: Training & Medication
Dog: Bear #13
Handler: K. W.

SUMMARY SHEET: ANECDOTAL RECORDINGS

SIT TEST

Pretests:

Day 1:
pre--exploratory, urinates
during--urinates, attentive
outside noise
post--sits

Day 2:
pre--explorative
during--grooms, resistive
post--grooms

Day 3:
pre--howling, running a-round, grooms
during--playful, becomes resistive
post--goes to door, explorative

Day 4:
pre--explorative, panting
during--grooms, attentive
outside noise, resistive
post--explorative

Day 5:
pre--barks at observer, explorative
during--grooms, attentive
hall noise
post--explorative

Training Sessions:

Week 1

Day 1:
pre--runs around room in circles, panting
post--runs around in circles, panting

PAVLOVIAN STAND

Pretests:

Day 1:
No struggle into harness
during session--quiet,
chews sling a little,
mainly looks around

Day 2:
No struggle into harness
during session--no vocalizations, bit through sling 8'5"

Day 3:
Strong thrashing during harnessing
during session--chewing,
barking, whining

Day 4:
Struggle into sling
during session--whining,
chewing, sling bitten through at 11'7"

Day 5:
struggle harnessing
during session--thrashing,
chewing, whining

Day 1:
No trouble harnessing
during session--occasional
whine, looks around
Training Sessions:

Day 2:
  pre--exploratory
  during--runs away
  post--exploratory

Day 3:
  pre--paces
  during--resistive
  post--paces & circles

Day 4:
  pre--paces and circles,
    panting
  post--paces and circles

Day 5:
  pre--frisky, circles, howls
  during--howls, grooms, anti-
    cipates forces
  post--howls, circles

Week 2:
  pre--panting, pacing,
    climbing walls
  during--grooms
  post--explorative, then pants
    and paces

Week 3:
  pre--pants, paces, climbs walls
  during--panting, resistant to
    forces
  post--paces, pants

Week 4:
  Same as Week 3

Week 5:
  Same as Week 3

POST TESTS

Post-test, Week A:
  pre--panting, pacing
  during--grooms, pants
  post--pants, paces, climbs
    walls

POST TESTS

Post-test, Week A:
  No trouble harnessing
  during session--quiet,
    looking around

Day 2:
  No trouble harnessing
  during session--quiet,
    looking around

Day 3:
  Same as Day 2

Day 3:
  Same as Day 2

Day 5:
  Same as Day 2

Week 2:
  No trouble harnessing
  during session--occasional
    whine

Week 2:
  No trouble harnessing
  during session--occasional
    whine

Week 3:
  No trouble harnessing
  during session--cryng,
    quieter by end of week

Week 4:
  No trouble harnessing
  during session--whining,
    watches door

Week 5:
  Same as Week 4

Week 5:
  Same as Week 4
Post-test, Week B:

pre--excited, climbs on
handler and observer, pants
during--grooms, chews lab
coat, woofs, pants, chews
chair
post--jumps on walls

Post-test, Week C:

pre--excited, panting,
jumping
during--grooms, scratches,
bites lab coat
post--bites lab coat

LEASH CONTROL TEST: walked entire way by 2nd session, intermittent
balking throughout training period

PASSIVE HANDLER TEST: constantly paces (stereotypic)

ADDITIONAL COMMENTS:
Day 4--pretests: got foot caught in cage, hurt badly
Training sessions: was self-abusive, hitting head on cage bars,
making it bleed
Group: Training & Medication  
Dog: Barbara #14  
Handler: D. B.

SUMMARY SHEET: ANECDOTAL RECORDINGS

SIT TEST

Pretests:

Day 1:
- pre--pawing handler  
during--jumps on handler  
post--stays close to handler

Day 2:
- pre--pawing handler, explorative  
post--pawing handler, explorative

Day 3:
- Same as Day 2

Day 4:
- Same as Day 2

Day 5:
- pre--whining, licking and jumping on handler, sniffing floor  
during--sniffing handler's shoe  
post--explorative

Training sessions:

Week 1

Day 1:
- pre--explorative  
post--explorative

PAVLOVIAN STAND

Pretests:

Day 1:
- Struggled while being harnessed  
during session--whined for 3 minutes, then quiet and rested head on stand

Day 2:
- Chewing on sling while being harnessed  
during session--whining, biting sling

Day 3:
- Struggled while being harnessed  
during session--whining, chewing on sling

Day 4:
- Struggled while being harnessed  
during session--whining, chewing on sling

Day 5:
- Same as Day 4
Training sessions:

Day 2:
pre--whining, pacing
during--anticipates force
post--pacing

Day 3:
pre--jumps on handler, whining
post--pacing, panting, occasional jump on handler

Day 4:
pre--pacing, panting, jumps on handler
during--crouches
post--same as pre

Day 5:
pre--jumps on handler, pants during--tries to skid across floor
post--paces, jumps on handler

Week 2:
pre--occasional jump on handler, stays in proximity
during--tries to slide away
post--stays close to handler, sniffs handler

Week 3:
pre--exploratory by handler
during--tries to slide away
post--exploratory by handler

Week 4:
pre--exploratory around handler
post--same as pre

Week 5:
pre--exploratory around handler
during--scratches
post--exploratory around handler

Day 2:
Struggled while being harnessed
during session--quiet, leans head on sling, wild when released

Day 3:
Struggled while being harnessed
during session--quiet, head leaning forward

Day 4:
Calm while being harnessed
during session--whines, head leaning forward

Day 5:
Same as Day 4

Week 2:
Struggled against being harnessed
during session--whines first 10 minutes, watches door

Week 3:
No struggle while being harnessed
during session--few whines, head down or facing door

Week 4:
Little to no struggle while being harnessed
during session--whining, looking around

Week 5:
No struggle while being harnessed
during session--whining, head down
<table>
<thead>
<tr>
<th>POST TESTS</th>
<th>POST TESTS</th>
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</thead>
<tbody>
<tr>
<td><strong>Post-test, Week A:</strong></td>
<td><strong>Post-test, Week A:</strong></td>
</tr>
<tr>
<td>pre--calm, exploratory</td>
<td>No struggle while being</td>
</tr>
<tr>
<td>post--calm, exploratory</td>
<td>harnessed</td>
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<tr>
<td></td>
<td>during session--whines at</td>
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<tr>
<td></td>
<td>beginning of week, looks at</td>
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<td></td>
<td>door or head down</td>
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<tr>
<td><strong>Post-test, Week B:</strong></td>
<td><strong>Post-test, Week B:</strong></td>
</tr>
<tr>
<td>pre--exploratory, grooms</td>
<td>No struggle into sling</td>
</tr>
<tr>
<td>post--calm, exploratory</td>
<td>during session--bites leg</td>
</tr>
<tr>
<td></td>
<td>restraints, quiet, head down</td>
</tr>
<tr>
<td><strong>Post-test, Week C:</strong></td>
<td><strong>Post-test, Week C:</strong></td>
</tr>
<tr>
<td>pre--calm, exploratory</td>
<td>No struggle into sling except</td>
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<tr>
<td>post--same, last day</td>
<td>for last day</td>
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<tr>
<td>jumped on table</td>
<td>during session--quiet, head</td>
</tr>
<tr>
<td></td>
<td>down</td>
</tr>
</tbody>
</table>

**LEASH CONTROL TEST:** walks smoothly by 14th session

**PASSIVE HANDLER TEST:** stereotypic pacing on or near boundary line

**ADDITIONAL COMMENTS:**
SUMMARY SHEET: ANECDOTAL RECORDINGS

SIT TEST

Pretests:

Day 1:
pre--sniffs floor, trembling
during--whining, sniffs handler
post--climbs on handler, whines

Day 2:
pre--whines, paws handler, sniffs floor
during--whines, pants, very active
post--paws handler, panting

Day 3:
pre--jumps on handler's lap
during--resistive to sit, whines, pants
post--paws handler, panting

Day 4:
Same as Day 3

Day 5:
pre--explorative, paws handler
during--grooms, scratches, paws handler, attentive hall noise
post--explorative, paws handler

Training Sessions:

Week 1
Day 1:
pre--whining, pawing handler
during--resistive, keeps walking around handler's legs
post--pacing, paws up on handler

PAVLOVIAN STAND

Pretests:

Day 1:
Struggles very hard when harnessing
during session--crying, whining, thrashing, gets both front feet loose

Day 2:
Struggles while harnessing
during session--whining, crying, some moans

Day 3:
Trouble harnessing
during session--whining

Day 4:
Trouble harnessing
during session--whining

Day 5:
Trouble harnessing
during session--crying, whining, gets front feet loose
Training Sessions:

Day 2:
- **pre**-pacing, panting, pawing handler
- **during**-panting, pacing
- **post**-panting, pacing

Day 3:
- **pre**-shaking head, pacing, paws upon handler, panting
- **during**-resistive "spacey," sits for 1 min. at end
- **post**-pacing

Day 4:
- **pre**-climbs on handler, pacing, panting "spacey"
- **during**-resistive, head bobbing
- **post**-paces

Day 5:
- **pre**-somewhat more alert, shaking head
- **during**-shaking head, paws upon handler
- **post**-paws up on handler, sniffs door

Week 2:
- **pre**-panting, circling handler's feet, "spacey"
- jumps on handler
- **during**-resistive
- **post**-circles handler's feet

Week 3:
- **pre**-sniffs handler, panting, circles handler's feet
- **during**-grooms, paws up on handler
- **post**-circles handler's feet

Week 4:
- **pre**-circles handler's feet pants, paces, jumps on handler
- **during**
- **post**-circles handler's feet

Day 2:
- Trouble harnessing
  - **during session**-quiet, little movement except for head bobbing

Day 3:
- Trouble harnessing
  - **during session**-jerky head movements

Day 4:
- Trouble harnessing
  - **during session**-quiet, jerky head movements

Day 5:
- Trouble harnessing

Week 2:
- Trouble harnessing
  - **during session**-quiet first 2 days, head jerks

Week 3:
- Struggle during harnessing

Week 4:
- Struggle during harnessing
  - **during session**-looking around
Training Sessions:

Week 5:
pre--circles handler's feet
during--pants, paces, jumps
   on handler
post--circles handler's feet

POST TESTS

Post-test, Week A:
pre--first few days
circles handler's feet; last 2 days
   calmer
during--sniffs, scratches
post--circles handler's feet

Post-test, Week B:
pre--explorative, sniffs
   handler
during--grooms, scratches,
   alert
post--explorative

Post-test, Week C:
pre--calm, explorative
during--whines, scratches,
   grooms, attentive to
   hall noise
post--explorative

LEASH CONTROL TEST: walks on leash first day

PASSIVE HANDLER TEST: paces

ADDITIONAL COMMENTS:
SUMMARY SHEET: ANECDOTAL RECORDINGS

SIT TEST

**Pretests:**

Day 1:
- **pre**--urinates, stays near handler
- **during**--runs to corner, sensitive to handler's movements
- **post**--stays near handler

Day 2:
- **pre**--urinates, hesitantly explorative, sniffs handler
- **during**--sniffs sit area, sensitive to handler's movements
- **post**--explorative by handler

Day 3:
- **pre**--goes to handler and sits
- **post**--sits, cowers when picked up at end of session

Day 4:
- **pre**--stays near handler

Day 5:

Training Sessions:

**Week 1**

Day 1:
- **pre**--stays near handler, alert
- **post**--same as pre

Day 2:
- **pre**--drooling, stereotypic head movements, mouth clenching, "spacey"
- **during**--crouches when handler goes to get
- **post**--same as pre

Day 5:

**PAVLOVIAN STAND**

**Pretests:**

Day 1:
- No struggle to harness
- **during session**--one small period of struggle, slight head movements, no vocalizations

Day 2:
- No struggle to harness
- **during session**--head movements, no vocalizations

Day 3:
- No struggle to harness
- **during session**--head movements, bites on harness

Day 4:
- Same as day 3

Day 5:
Training Sessions:

Day 3:
pre--stereotypic head movements, seems more alert

Day 4:
pre--exploratory
post--sits

Day 5:
pre--stereotypic head movements, "spacey" doesn't orient to noise

Week 2:
pre--calm exploration
during--seems alert
post--sits

Week 3:
Same as Week 2

Week 4:
Same as Week 2

Week 5:
Same as Week 2

POST TESTS

Post-test, Week A:
pre--exploratory
during--grooms, lays down, walks away
post--exploratory

Post-test, Week B:
pre--exploratory, sniffs handler
during--grooms, scratches, attentive to outside noise
post--exploration

George #16 Continued

Day 3:
No struggle to harness
during session--stereotypic head movement, bites at harness

Day 4:
No struggle to harness

Day 5:

Week 2:
No struggle to harness
during session--whining & harness biting beginning of week, calmer near end of week

Week 3:
No struggle to harness
during session--no vocalizations

Week 4:
No struggle to harness
during session--stereotypic head movements

Week 5:
Same as Week 4

POST TESTS

Post-test, Week A:
No struggle to harness
during session--visually explorative, no vocalizations

Post-test, Week B:
Same as Week A

Post-test, Week B:
Same as Week A
Post-test, Week C:
Same as Week B
Post-test, Week C:
Same as Week A

LEASH CONTROL TEST: had to be carried entire time

PASSIVE HANDLER TEST: sits on boundary line

ADDITIONAL COMMENTS:

1) didn't eat day 3
2) George escaped from cage during post-test week C. A student tried to take George's dish from the cage. George bit the student and escaped. Reinforcements, in the form of two veterinarians, helped the student lasso George. It took them ½ hour. I then received a call to come get "vicious George." When George saw me he wagged his tail. I took the rope off his neck and carried him to his cage.
REFERENCE NOTES


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