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PENCIL PRESSURE IN PROJECTIVE DRAWINGS: AN INDICATOR OF ANXIETY

By

Sean Davis LaRoque

A Dissertation Submitted to the Faculty of the
DEPARTMENT OF SCHOOL PSYCHOLOGY
In Partial Fulfillment of the Requirements
For the Degree of
DOCTOR OF PHILOSOPHY
In the Graduate College
THE UNIVERSITY OF ARIZONA

2001
THE UNIVERSITY OF ARIZONA
GRADUATE COLLEGE

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ABSTRACT

There has been much debate in the literature regarding the use and abuse of projective drawings in clinical and school settings. The criticism has largely centered around interpretation and use of indicators within these drawings that have not achieved consensus in the research regarding their validity. This study attempts to bridge the gap between those opposed and those in support of projective drawings. It does this by illustrating that valid indicators can be found within projective drawings provided accurate, sensitive and reliable tools are available to measure these indicators. This research analyzed the relationship between pencil pressure used during drawing and State and Trait anxiety. A highly accurate and precise pressure sensitive palette was used to reliably and objectively measure the degree of pencil pressure used by the participants during three drawing tests, including the Draw a Person, Bender – Gestalt Visual Motor Integration Test, and the drawing of an automobile (n = 50). The State Trait Anxiety Inventory for Children assessed the participants’ levels of State and Trait anxiety. Results indicated that individuals with higher levels of Trait anxiety used significantly less pencil pressure on all three drawing measures than individuals with lower levels of Trait anxiety. Further, individuals with high and low levels of State anxiety used significantly more pencil pressure on all three drawing measures than individuals with medium levels of State anxiety. The implications of these findings, as well as considerations for future research are discussed.
CHAPTER 1
INTRODUCTION

Projective drawings are often seen as an important part of psychological evaluations and have been used for over 100 years to describe and assess human behavior (Harris, 1963). This practice continues with great frequency. In fact, Prout (1983) found that the most widely used methods of assessing the socio-emotional functioning of children and adolescents were figure drawings, interviews and classroom observations. Similarly, Goh and Fuller (1983), in a survey of 274 practicing school psychologists, found that projective techniques, especially human figure drawings and sentence completion tests, were the most often used instruments for personality assessment. Concurrently, and maybe because of the extensive use, a great battle has been waged over whether practitioners should use projective drawings in personality assessment. None have been more heated, and more representative of the divide, than the recent debate covered in School Psychology Quarterly, Vol. 8, No. 3, 1993. Amidst the veiled, and at times unveiled, disdain generated, important information can be drawn. The major issues from both sides of the debate will be covered because the intent of this study falls, not unlike most practitioners' beliefs, somewhere in the middle.

Projective techniques (e.g., human figure drawings) have been used extensively to assess anxiety in individuals (Cummings, 1986; Obrzut & Cummings, 1983) and there has been much criticism over their use, or as the opponents of projective techniques would say, abuse. In contrast to structured (i.e., objective) personality tests, projective techniques typically present respondents with an ambiguous stimulus (such as an inkblot
or general request such as “draw a person”), and ask them to make sense of the stimulus or disambiguate the stimulus. The rationale underlying most projective techniques is the projective hypothesis (Sundberg, 1977). According to the projective hypothesis, respondents project aspects of their personalities (e.g., needs, desires, and/or conflicts), both conscious and/or unconscious (intrapsychic), when imposing meaning or order on an ambiguous or unstructured stimulus (Obrzut & Boliek, 1986). The clinician is able to draw valuable information from this disambiguation. The principal advantages of most projective techniques relative to more objective personality tests are typically hypothesized to be their capacity to bypass or circumvent the conscious defenses of respondents and allow clinicians access to privileged, important psychological information (e.g., conflicts, impulses, needs, desires) (Lilienfeld, Wood & Garb, 2000). Some of the ambiguous or unstructured stimuli commonly used are inkblots (e.g., Rorschach test), incomplete sentences (e.g., sentence completion techniques), novel pictures or images, (e.g., thematic approaches), or of primary interest to this study, the drawing of a human figure (e.g., projective drawing techniques).

Support for Projective Drawings

Those that support the use of projective drawings assert that while limitations exist and some caution is warranted, the inherent advantages and clinical utility justify continued use. Those supportive of projective drawings concede that there are many abuses of human figure drawings, but when used within narrowly prescribed ways these tools offer many distinct advantages (Holtzman, 1993).
Proponents of projective drawings suggest that many of the conflicting validity studies critical of these techniques have missed the mark. Riethmiller & Handler (1997) suggest that empathic, phenomenological approaches skillfully employed by clinicians competent in evaluating both the striking and seemingly mundane aspects of drawings are necessary to understanding clients accurately. Waehler (1997) states that this observation goes a long way to explain some of the conflicting validity study results for drawing techniques. It is not necessarily that human figure drawings lack validity, it may be that the interpretive qualities Reithmiller and Handler suggest as necessary, are difficult to translate into reliable scoring systems.

It has also been suggested that conflicting validity studies have missed valuable information because of the "box score method" used by many researchers. For example, Kahill (1984) used a "box score" review of the published literature from 1967 to 1982, and found support for only 2 of 30 Machover indexes reviewed. Lilienfeld, Wood and Garb (2000) report that "it is possible, of course, that certain drawing signs possess slight validity for features of personality and psychopathology that were obscured by the box score method (pp. 49). Because they do not take statistical power into account, box score reviews tend to err toward mistakenly negative conclusions (Schmidt, 1992).

The ease and efficiency of administration of projective drawings is another advantage over more objective, structured personality measure. Waehler (1997) points out that "drawings are simple and quick to administer; are easy for most people to engage in; can be useful with clients who are evasive or guarded; can be a springboard for discussion of specific conflict areas; appear to create culture reduced data; have few age
limitations; and allow clients to express themselves in intensely personal ways” (p. 487).

Proponents point out that it would be a mistake to do away with these procedures because we need more, not fewer, performance-based measures in our test batteries to compare and contrast with self-report measures (Waehler, 1997). Bardos (1993) concedes that screening procedures are always expected to result in lower predictive accuracy. However, he suggests that the real question in the screening process is: “what resources should be allocated (e.g., personnel, instruments) when testing large groups of students and what is the return of this investment, in this case, the instrument’s screening efficiency” (p. 180)? Proponents of projective drawings assert that it is indeed a good return on the investment.

Meyer (1997) adds further support for projective drawings indicating that self-report measures miss essential information that are captured by projective measures. Projective drawings may reveal underlying personality structures, motives, conflicts, needs, values, and attitudes toward others and selves that are not conscious to the individual. Researchers like Machover (1949) and Koppitz (1968) suggest that there is much information to be gained from the symbolic and structural content of the drawings, which the subject may not be overtly aware of and, hence, not able to verbalize.

Projective drawings are also helpful in cases involving special populations. For example, projective drawings may be useful when working with a language impaired or verbally uncooperative individual. Further, Holtzman (1993) states that because projective drawings are truly universal they can be used with a wide range of children
with varied cultural backgrounds. Children everywhere have had experience in perceiving and differentiating human figures, regardless of culture.

It is clear that projective drawings have tremendous value when used appropriately. Drawing advocates unanimously admonish mental health practitioners to avoid overgeneralizations based on a drawing’s single sign or characteristic. Knoff (1993) states that when projective drawings are used, they should be one part of a hypothesis generating and testing approach. Hutt (1968) echoes this sentiment by advocating the use of the clinical intuitive method of analysis when using projective drawings. This method encourages the practitioner to examine all aspects of a child’s behavior, while remaining cognizant that graphic, verbal and nonverbal behaviors are the result of a constellation of events in the child’s history. Hutt suggests that a series of plausible hypotheses be formulated and then examined with data from other tests, life history and behavioral observations. Hutt points out that the clinical intuitive method “… is an intricate, complex and time consuming method – it requires considerable effort in generating appropriate hypotheses and testing them – and it has serious limitations since each analysis is like doing research with a single case” (1968, p.407).

Similarly, Cummings (1986) advocates an exploratory approach when using projective drawings. He asserts that data from drawings should be used to generate hypotheses, not provide conclusive evidence that a child is aggressive, emotionally disturbed, insecure, etc. Hypotheses are developed and tested with projective drawings, not confirmed.
Knoff (1993) suggests that a Cognitive-Behavioral Perspective is one acceptable way in which projective drawings can be used. In this context, “the HFD provides information that suggests hypotheses about children’s thoughts, beliefs, expectations, self statements, aspirations, attributions, needs, and perceptions. These hypotheses are most often generated through the inquiry (or semi- or unstructured interview) process that follows the child’s completion of the drawing” (p 193). Through this inquiry process, a child may reveal cognitions that are related (a) to past, present, or future issues or events; (b) to a specific person or to a myriad number of people or roles; (c) to a specific setting or to multiple settings or circumstances; and/or (d) to specific social-emotional state or trait processes.

Criticisms of Projective Drawings

One of the major objections to the use of projective drawings has to do with the validity of these techniques. Motta, Little & Tobin (1993a) assert that despite the long and extensive use of projective drawings, their predictive validity as assessment devices has yet to be satisfactorily demonstrated. Results from a number of surveys over the years support this.

For example, Swensen (1957) conducted a comprehensive survey and found that Machover’s (1949) hypotheses concerning human figure drawings and the projection of one’s own concerns onto the drawings was not supported by the available research at that time. Suinn & Oskamp (1969) conducted a somewhat smaller survey but their conclusions were similar. They concluded that the predictive validity of figure drawings as test instruments was “tenuous”. Similarly, after conducting another survey of the
research, Klopfer & Taulbee (1976) concluded that it was unfortunate that so much research effort is expended on the Draw A Person (DAP) test in view of the rather discouraging predictive validity results of this instrument. Finally, Kahill (1984) reviewed the empirical literature on the validity and reliability of human figure drawings, covering the years 1967 through 1982. Kahill reached a number of non-supportive conclusions with regard to the predictive validity of human figure drawings. The evidence for the hypothesis that one projects one’s own concerns when producing a drawing was nonexistent to mixed. Further, Kahill found that the evidence regarding both the content and structural aspects of the drawings failed to support the majority of Machover’s hypotheses, or were contradictory to them.

Critics of projective drawings also point to their lack of incremental validity. As Motta, Little and Tobin (1993b) explain, one cannot use a less valid measure to support the results obtained from a more valid measure. In other words, projective drawings have little if any incremental validity because they do not add a significant amount of variance in describing personality or predicting behavior. Lilienfeld, Woods and Garb (2000) state, “we are unaware of any studies demonstrating that human figure drawings offer psychologically useful information over and above the MMPI-2, psychiatric interviews, demographic data, or other information that is often readily available in clinical settings” (pp.51).

Despite continues research on the lack of validity for the interpretation of signs found within drawings, many clinicians continue to do exactly this. Gresham (1993) believes this occurs because of a phenomenon known as an illusory correlation. An
illusory correlation refers to the relationship between test responses and symptoms/behavior that are based on verbal associations rather than valid observations (Kurtz & Garfield, 1978). In other words, many clinicians may rely on figure drawing signs (e.g., large eyes) that bear a strong semantic or associative connection with psychopathology (e.g., paranoia). Research by Chapman & Chapman (1967) demonstrates that clinicians are often convinced of the validity of such figure drawing signs despite the pronounced lack of evidence for their validity.

Critics of human figure drawings suggest that the impossibility of disconfirmation is another reason why projective drawings continue to be used frequently. Gresham (1993) states, “given that one can never ‘prove’ the null hypothesis, many may take this as evidence for the validity of human figure drawing interpretations. For example, one cannot ‘prove’ that small human figure drawings are not indicative of a low self-concept. One can only reject or fail to reject the null hypothesis” (p. 184).

There is concern that the lack of reliability and validity found for projective drawings is contributing to tenuous and specious diagnoses and conclusions (Palmer, 1983). Motta, Little & Tobin (1983) conclude that there is ample evidence that figure drawings should not be used as personality test instruments, in that they do not provide valid descriptions of personality, behavior or socio-emotional functioning. Some researchers have concluded that drawings are nothing more than “useful rapport-building devices” (Joiner, Schmidt & Barnett, 1996, p. 139) or a springboard for verbalization and discussion (Kahill, 1984).
Those opposed to the use of projective drawings have also raised an ethical argument. Researchers, such as Martin (1983) have declared the use of projective drawings to be unethical and have called for a moratorium on their applications in clinical practice. Similarly, Motta et al. (1993b) assert that the continued use of these invalid assessment devices may represent a violation of the APA Code of Ethics. Specifically, article 2.02 (a) which states: “Psychologists who develop, administer, score, interpret, or use psychological assessment techniques…. do so in a manner and for purposes that are appropriate in light of the research on, or evidence of the usefulness and proper application of the techniques” (p. 1063).

Statement of the Problem

The debate between those supportive and those opposed to the use of projective drawings helps illuminate and simplify the reasons for the divide. There is little to no statistical evidence to support the use of human figure drawings as assessment tools that provide definitive answers regarding predictions of behavior and/or descriptions of personality. However, there is ample evidence to suggest that human figure drawings do offer clinical utility, by helping to generate hypotheses from information that may not be accessible through other more objective measures. Disagreement by the experts may very well center on how human figure drawings are used.

Purpose of the Study

Psychologists like Machover, Koppitz and Hammer have stated that drawings provide a vehicle for the expression of nonverbal, symbolic messages. What researchers have attempted to do over the last half century is decode these messages (e.g., Hammer,
1958; Machover, 1949; Koppitz, 1968; Goodenough, 1926; Naglieri, 1988). Based on a review of the research, it appears justifiable to state that there has only been partial success in breaking the code (Cummings, 1986).

This study attempts to add to the pool of knowledge in hopes that it will further our understanding of these symbolic messages within projective drawings; and is an attempt to quantify performance in a way that provides statistical validity.

As a result of the great divide between those opposed and those supportive of the use of projective drawings, it seems important to clearly delineate the position from which this research stands; namely (1) projective drawings offer distinct advantages over other personality assessment tools warranting continued use. (2) Projective drawings provide information and insight into the intrapsychic characteristics and tendencies of an individual that cannot be obtained through more objective personality measures. (3) Information from projective drawings can be gathered from the symbolic and structural content of the drawings, observations of the characteristics of the drawer as well as their approach to drawing, and through an unstructured interview regarding the drawer's cognitions. (4) There are a number of validity problems with projective drawings; (5) and that because of this, one should only use information gained from projective drawings to generate hypotheses. (6) The information gathered should never be used to confirm hypotheses or make any type of differential, or other, diagnosis. (7) Finally, through research we can improve our understanding of projective drawings, and the technique of interpreting drawings, so that psychologists can more effectively use this valuable approach to help children and adolescents.
Roback (1968) echoes this final sentiment when he stated, “applied clinicians have an obligation to their field and to their clients to determine the multitudinous variables influencing their interpretations of signs in figure drawings through sound experimental procedures, code these characteristics by scientifically based methods, and accumulate sufficient data from normal as well as abnormal groups which can be analyzed by appropriate statistical techniques” (p. 17).

The purpose of this study is to provide practitioners with more valid information regarding the structural content of projective drawings to help them with the development of hypotheses. More specifically, this study investigates the relationship between the degree of pencil pressure used by children in projective drawings and levels and types of anxiety.

Definitions of Terms Used

*Pencil Pressure*: The amount of force used when pressing pencil to paper during the act of drawing.

*Line Emphasis*: The repetitive strokes of the pencil on a line suggesting reinforcement.

*Line Heaviness*: The subjective visual determination of the amount of pencil pressure used during the act of drawing (e.g., heavy line vs. light line).

*Pressure Sensitive Pallet*: A 12 X 12 inch Wacom Intuos graphic tablet that simulates an artist’s pallet. This pallet allows for a paper overlay.

*Pressure Sensitive Pen*: An inking pen that sends pressure data to a computer. The pen is to be used with the pressure sensitive pallet.
**State Anxiety:** A temporal emotional and physical state consisting of subjective feelings of tension, apprehension, nervousness, and worry and activation of the autonomic nervous system. State anxiety varies in intensity and fluctuates over time as a function of the perceived threat.

**Trait Anxiety:** A personality characteristic that represents relatively stable individual differences between childrens’ tendency to experience anxiety states. This personality characteristic is relatively stable over time.
CHAPTER 2

REVIEW OF LITERATURE

This chapter will review the literature with regard to theories of anxiety, reasons why it is important to assess anxiety in individuals, various assessment techniques used to measure anxiety levels, a review of the research that looks at pencil pressure as an anxiety indicator in projective drawings, a discussion explaining why there exists such a discrepancy of findings in this research.

Theories of Anxiety

Anxiety has generally been defined as "an unpleasant emotional state or reaction that can be distinguished from others, such as anger or grief, by a unique combination of experiential qualities and physiological changes. An anxiety state consists of feelings of tension, apprehension, nervousness and worry and activation of the autonomic nervous system" (Speilberger & Rickman, 1990, p. 69). The physiological manifestations generally include increased blood pressure, rapid heart rate (e.g., palpitations, tachycardia), sweating, dryness of the mouth, nausea, vertigo, irregularities in breathing and muscular skeletal disturbances (e.g., restlessness, tremors, feelings of weakness). When is anxiety considered normal and when is it considered neurotic? It has been generally accepted that increased anxiety is "normal" in any situation in which an immediate danger might result in physical harm. Anxiety has also been accepted as a normal reaction to situations that are perceived as threats to one’s self esteem or psychological well being. However, the occurrence of anxiety in situations in which there is no immediate physical or psychological danger, or when the amount of anxiety is
disproportionate to the actual danger, generally indicates the presence of neurotic anxiety (Spielberger & Rickman, 1990). Because assessment methods typically follow conceptual models, a number of theories of anxiety as a scientific construct will be reviewed.

**Freudian theory.** The emergence of fear and anxiety as a scientific construct can be seen in the writings of Darwin (1872/1965), who considered these feelings to be an inherent and adaptive characteristic of both humans and animals that had evolved over countless generations through a process of natural selection. Darwin’s theory of anxiety directly influenced Freud’s later view of anxiety.

Freud was the first to identify anxiety neurosis as a discrete clinical syndrome to be differentiated from neurasthenia (Freud, 1953) and eventually came to regard anxiety as the fundamental problem in all neurotic symptom formation (Freud, 1936). Freud (1969) described anxiety as “something felt,” an unpleasant affective emotional state or condition characterized by subjective feelings of chronic apprehension, all that is covered by the word nervousness” (p. 341). Freud’s earliest theory (1894/1962a, 1895/1962b) defined anxiety as the discharge of a “quota of affect” (or “sum of excitation”). He theorized that the psyche was a kind of electrical system. When it receives a stimulus or input, it becomes charged with affect. When this occurs a need arises to discharge this affect so it can return to equilibrium. Normally, discharge occurs through motor activity and secretory processes. When an affect can not be satisfactorily discharged, it becomes built up or blocked and is automatically discharged as free floating anxiety. Freud hypothesized that affects, particularly anxiety, may be generated two different ways:
psychically or somatically. Freud (1926/1959) then modified this view in favor of a more general description of anxiety as a signal indicating the presence of danger (i.e., The Danger Signal Theory). The perceived presence of danger causes an unpleasant emotional state that functions to warn the individual that some form of adjustment is necessary. Thus, Freud’s Danger Signal Theory, which emphasized the adaptive qualities of anxiety in prompting an individual to avoid or cope with danger, was consistent with Darwin’s evolutionary perspective (Spielberger & Rickman, 1990). Freud distinguished between two forms of anxiety and linked these to his theory of instinctual drives. He believed that realistic (or objective) anxiety forms when an external danger threatens the self-preservation instinct. Neurotic anxiety forms when internal danger gives rise to ‘unpleasure’, thereby threatening the second major instinct, the pleasure principle (Trautman, 1986). Later, Freud dropped the distinction between realistic and neurotic anxiety. He stated that the experience of helplessness is the essence of danger and that anxiety is the response of the ego to the threat of helplessness. He cited five dangers that are liable to precipitate an experience of helplessness: birth, loss of the object (i.e., mother), loss of the object’s love, loss of penis, and loss of the superego’s love. For many years Freud argued that anxiety was a response to danger from outside or from within the organism. Anxiety with external causes was linked to the flight – fight reflex, the instinct of self-preservation, and the reality principle. These factors were considered to be wholly conscious, and part of the “ego drive”. In contrast, internal or neurotic anxiety was tied to the pleasure principle and “libinal drive”, which he believed was fully unconscious and concerned with the preservation of the species. Freud believed that the resourcefulness
and flexibility of a person’s ego largely determine whether the anxiety experienced in life will reach levels considered pathological or remain at tolerable, useful levels. “Despite his movement away from physiological models of explanation and toward a more ‘purely’ psychological one, Freud’s broadly organismic perspective has remained steeped in a conception of a man as a creature rooted in drive/defense conflicts” (Klein & Last, 1989, p. 18).

**Neo-Freudian theory.** After Freud, psychological theory tended away from biologically based views toward those that stressed the importance of social factors (Erikson, 1950). Neo-Freudian concepts of anxiety increasingly came to be seen as developing from and finding characteristic expression in a matrix of social relationships. Neo-Freudians attached the highest importance to environmental influences in human development, whether healthy or pathological. They differed from Freud in what they took to be the origins of anxiety and the nature of anxiety (Klein & Last, 1989). Sullivan (1956) discarded Freud’s libido theory and intrapsychic emphasis to stress the role of culture, where the individual is considered to develop a sense of identity through his or her interactions with other people. In this view, anxiety arises as a result of experienced maternal disapproval rather than internal conflict. Anxiety becomes an unavoidable consequence of social living.

**Learning theories.** Learning theories have also been used as theoretical explanations for anxiety. Although the two theoretical systems have many differences, they also bear some striking similarities. Both assign primary importance to the role of early traumatic experience, both refer to a mechanism whereby one specific fear becomes
the source of another (through displacement in the analytic and through stimulus
generalization in learning theory), and although both models clearly recognize that there
is normal and abnormal anxiety, neither can account for the difference in a way that is
likely to satisfy a contemporary clinician (Shaffer, 1986). In 1920 John Watson
conditioned an 11-month-old boy named Albert to fear a white rat by clanging two iron
bars together behind him each time he reached toward the animal. Watson was able to
create what looked like a rat phobia in Albert which persisted and, which also generalized
to other furry objects and animals (Watson & Raynor, 1920). After this experiment,
Watson and Rayner applied a Pavlovian paradigm to Albert’s acquisition of anxiety. The
loud noise was the unconditioned stimulus, which produced the unconditioned response,
fear. The paired exposure of the white rat and the loud noise had given the rat the
property of a conditioned stimulus and subsequent exposure to the conditioned stimulus
alone elicited a distress response as a conditioned response. Watson and Rayner (1920)
proposed that neurotic anxiety arises from experience in which a neutral stimulus has
been paired with an anxiety provoking stimulus.

A number of objections were raised to the classical conditioning model. First,
Shaffer (1986) has commented on how most phobias involve a somewhat narrow range
of stimuli (e.g., spiders, heights, snakes, etc.). This is not what one would expect if
abnormal fears were the result of serendipitous pairings of a neutral stimulus with fear,
anxiety or some other distressing affect. If this were the case one would expect a larger
number of phobias regarding automobiles or bicycles, objects more often encountered
and paired with unpleasant consequences. Second, according to classical conditioning
theory, an unreinforced conditioned response should extinguish rapidly if the conditioned stimulus is not followed by the unconditioned stimulus. This should be the case for most clinical patients with phobias, for rarely is the unconditioned stimulus followed by the troubling consequences patients fear. Yet, it is a common clinical experience that the fears of anxious patients, if anything, increase rather than decrease with time. Third, in classical conditioning, the acquisition of a conditioned response requires that the CS and the UCS be paired within a very narrow space of time, which is unlikely in real life situations (Shaffer, 1986). These objections led to various modifications of classical conditioning theory. Eysenck (1980) answers these objections by pointing to two variations, A and B, of the Pavlovian Conditioning model. He suggests that anxiety is the result of Pavlovian B conditioning, in which the appearance of the conditioned response does not require motivation or any willful act by the individual. Not only is the unconditioned stimulus (the experience of anxiety) independent of the person’s motivation, but there is a high degree of overlap between the conditioned response and the unconditioned response. This is why it is possible for anxiety to continue, and even increase, despite the pairing of the conditioned stimulus with the unconditioned stimulus. Because the conditioned response is the same as the unconditioned response, it is possible for the conditioned stimulus to be reinforced, even in the absence of the unconditioned stimulus – unconditioned response pairing. Eysenck (1980) also suggests that this process is most likely to occur after single trial learning of mild intensity.

Neurobiological theories. Prior to the availability of detailed neurobiological evidence, Eysenck hypothesized that the proneness to anxiety was mediated by the
reticular activating system. Gray (1988) revised and adapted this hypothesis, suggesting that a unified discrete subsystem in the cerebral nervous system exists which regulates human anxiety. Gray's highly complex and technical argument is based on psychopharmacologic, behavioral and genetic evidence. Based on Gray's theory, anxiety disorders would be defined as pathology resulting from a specific pattern of function in the subsystem regulating anxiety experiences. The pathology may have arisen "either as a result of trauma, infection, a major gene, and so on, or as the result of a cumulation of minor genes and/or environmental experiences" (Gray, 1988, p.11). Klein and Last (1989) point out that Gray's model does not provide an account of how this array of proposed causes leads to a common behavioral outcome.

**State vs. Trait anxiety.** Much research on anxiety as an emotional state has focused on delineating the particular properties of anxiety states, and identifying the specific conditions that evoke them. This research is integral to this study and will be given comprehensive coverage. Most definitions of anxiety states are comparable in many ways to objective anxiety as suggested by Darwin and Freud. Krause (1961) concluded that anxiety states are typically presumed from the following types of responses: introspective verbal reports, physiological signs, molar behavior (i.e., body posture, restlessness, distortions in speech), task performance, clinical intuition and the response to stress. Krause reports that introspective verbal reports provide the most useful and widely accepted basis for defining transitory or state anxiety. Stated somewhat differently, Martin (1961) viewed anxiety as a complex neurophysiological reaction. Martin differentiated between anxiety states and other emotional reactions on the basis of
the qualitative differences in these patterns. He also distinguished between anxiety reactions, the external or internal stimuli that incite these reactions, and defenses against anxiety that have been learned because they were effective at reducing the degree of anxiety. Spielberger and Rickman (1990) suggest that anxiety states can be most meaningfully and clearly defined and measured by some combination of introspective verbal reports and physiological-behavioral signs.

Cattell (1966) was integral in developing the application of multivariate techniques for defining and measuring anxiety. Cattell included both self-report and physiological measures of anxiety in a factor-analytic investigation of the covariation of different anxiety measures over time. Relatively independent “state” and “trait” anxiety factors were consistently identified in this research. Measures that showed greater fluctuations over time and covaried over occasions of measurement had high loadings on the state anxiety (S-anxiety) factor. Measures that showed relative stability over time and occasions of measurement had high loadings on the trait anxiety (T-anxiety) factor. The T-anxiety factor was defined in terms of individual differences in relatively permanent personality characteristics. While many of the same variables loaded on both the S-anxiety and T-anxiety factors, the pattern of loadings for each was quite distinct. Physiological variables, such as respiration rate and systolic blood pressure that fluctuated over time, loaded heavily on the S-anxiety factor but only slightly on the T-anxiety factor. Personality characteristics such as “ego weakness”, “guilt proneness”, and a “tendency to embarrassment”, loaded heavily on the relatively stable T-anxiety factor. Malmo (1957) examined trait anxiety in both anxiety neurotics and normal controls. This
study found that patients characterized by high levels of chronic (trait) anxiety presented greater reactivity and wider variability on many different physiological and behavioral measures. These findings suggest that measures of trait anxiety reflect one’s proneness to anxiety. In other words, individuals high in trait anxiety are more likely to manifest anxiety states under circumstances involving varying degrees of stress. “As an acquired behavioral disposition or motive, T-anxiety measures seem to reflect individual differences in the tendency to perceive a wide range of stimulus situations as dangerous or threatening, and to respond to such threats with S-anxiety reactions” (Spielberger & Krasner, 1988, p.36). Whether children who differ in T-anxiety will show parallel differences in S-anxiety depends upon the extent to which an individual perceives a specific situation as dangerous or threatening, and this is greatly influenced by the child’s past experience (Spielberger, 1973). Or in other words, S-anxiety fluctuates as a function of the perceived threat associated with various stressors, whereas T-anxiety measures are relatively impervious to stress and remain stable over time irrespective of the circumstances under which the measures are taken (Spielberger & Rickman, 1990).

To better understand the nature of state and trait anxiety, it is important to clarify the relationship of these constructs to stress and threat. In the physical sciences, stress has generally been defined as external forces or pressures that act on an object or person. Severe, chronic and frequent stress imposes strains that may permanently alter the structure of an object or that may result in mental or physical disorders in a person (Spielberger & Krasner, 1988). Lazarus and Folkman (1984) have proposed a more detailed conception of stress. They suggest that stress is a special kind of transaction
between a person and his or her environment. They make a distinction between stress and threat as two distinct constructs that are part of a sequence of events that end in the evocation of an emotional state. While this is occurring, physiological and biochemical changes activate a "fight or flight" reaction. Since one must first perceive or interpret a particular situation or setting as potentially threatening, one's perception and evaluation of the threat lies between the stressors and the emotional states. In Lazarus and Folkman's theory, stressors refer to situations or events that are characterized by some degree of objective physical or psychological danger. A person's subjective appraisal or evaluation of a particular stressor as potentially harmful characterizes the term threat. While threat reactions are based on one's subjective evaluation, some situations are likely to be more inherently stressful than others (e.g., speaking in front of a crowd, taking a college preparatory exam, etc.). According to Lazarus and Folkman's theory, the experience of threat has two main characteristics. First, the concept of threat is oriented to the future, meaning it involves the anticipation of a potentially harmful event that has not yet happened. Second, threat experiences involve a combination of mental processes, including memory, perception, thought, and judgement. One's memory of previous events encountered, judgements and decisions made under similar circumstances, one's thoughts about the success of these decisions, and coping skills may all influence the extent to which an event or situation is evaluated or appraised as threatening. Following this pattern of logic, when an individual encounters a stressor, and interprets this as a threat indicating impending danger, regardless of the accuracy of appraisal (i.e., whether the danger is real or imagined), the sense of threat will evoke a state of anxiety. As stated
earlier, these anxiety states involve a combination of behavioral manifestations, physiological changes and psychological states of worry. While situations that involve the risk of physical danger are generally appraised as threatening by most people, those circumstances in which personal adequacy is evaluated are likely to be perceived as more threatening by individuals who are high in T-anxiety than by those low in T-anxiety. Spielberger (1988) suggests that the origins of trait anxiety stem from childhood experiences and early parent-child relationships involving withdrawal of love and negative evaluations by parents, teachers or peers. It follows then that those individuals high in T-anxiety are generally more sensitive and susceptible to the evaluation of others, because they tend to be low in self-esteem and lack confidence in themselves. "High levels of S-anxiety, which are experienced as unpleasant and painful, stimulate coping behavior designed to avoid or minimize a perceived danger (threat). To the extent that a coping response is successful, the stressful situation will be avoided or reappraised as less threatening, and there will be a corresponding reduction in the intensity of S-anxiety. If an anxiety state persists, however, the individual may resort to psychological defense mechanisms to reduce the intensity of S-anxiety. Such mechanisms modify, distort, or render unconscious the feelings, thoughts, and memories previously associated with a perceived danger that would otherwise evoke a S-anxiety reaction" (Spielberger & Rickman, 1990, pp. 73). Two of the most widely used defense mechanisms are repression and denial. Because those individuals high in T-anxiety are more likely to experience high levels of S-anxiety, they are more likely to use repression and denial as well as other psychological defenses.
Importance of Measuring Anxiety

Why is it important to assess the levels of T-anxiety and S-anxiety in individuals? First, anxiety gone unchecked and untreated in individuals tends to increase rather than decrease over time (Shaffer, 1986). This in turn can lead to neurotic anxiety, extreme use of denial, repression and other defense mechanisms and a host of debilitating physiological and psychological symptoms and disorders, including alcoholism and drug addiction, cardiovascular dysfunction, eating disorders, sleep disorders and even suicide and death.

Alcoholism & drug addiction. Studies of prevalence of anxiety disorders among alcoholics have generally shown that alcoholics suffer from anxiety symptoms at a greater rate than non-alcoholics (Weiss, 1988). Wanburg (1969) found that over 90% of the patients admitted for treatment for alcoholism reported that they drank to relax, and the same number reported feeling guilt or shame because of their drinking. More than 80% reported having vague fears and anxiety following a bout of heavy drinking. The issue of anxiety disorders as primary or secondary to alcoholism was touched on by Hesselbrock, Meyer & Keener (1985). They found that although an etiological relationship between anxiety and drinking was not found in their study, the age of onset of drinking among the pure alcoholics was later then that for those subjects with additional psychopathology (i.e., anxiety disorders), suggesting that in many cases anxiety disorders precede alcoholism. Drug addiction also appears to have an interaction with anxiety disorders in that many drugs are used as neurotic coping mechanisms. Milkman & Frosch (1973), point to the addict's drug of choice being syntonic with his or
her mode of adaptation. For example, heroin is said to reduce anxiety through repression and withdrawal, two coping mechanisms fostered by the drugs effects.

**Cardiovascular dysfunction.** Dager, Roy-Byrne & Dunner (1988) state that evidence exists which supports a relationship between emotional factors, stress and the onset of cardiovascular dysfunction. Because anxiety has distinct cardiovascular-related symptoms (e.g., increased blood pressure, increase heart rate, palpitation, etc.), a similar relationship is expected. In fact, the authors assert that stress and anxiety have been implicated as possible risk factors in all clinically significant types of cardiovascular disorders. Retrospective interviews with surviving spouses of persons dying suddenly of coronary artery disease have revealed a pattern of significantly increased stress due to life changes during the six months preceding death as compared to other time periods (Trichopolulos, Zanitsanos & Katsouyann, 1983).

**Eating disorders.** It is commonly understood that moods such as sadness, elation, fear, excitement and anxiety sometimes affect the eating behavior of normal people, either increasing or decreasing food intake. This truism has led to research concerning the role of emotional states in the development of certain eating disorders. Abraham and Beumont (1982) reported that individual bulimic episodes were often precipitated by negative feelings of tension, boredom or loneliness. All of their patients said they felt anxious before binge eating, and 8% described physical symptoms such as palpitations and tremors. Relief of tension occurred once the binge started, or more commonly after the patient had engaged in a compensatory behavior, such as self induced vomiting.
Disordered sleep. "It is well known from clinical experience that sleep disturbances are commonly found among patients with anxiety disorders" (Vela-Bueno, Soldatos & Kales, 1988, pp. 509). Support for this statement comes from a study that showed that restless sleep was the only vegetative symptom consistently related to anxiety (Matthew, R. J., Swihart, A. A. & Weinman, M. L., 1982). Further, anxiety has been indited as one of the most common symptoms in patients with chronic insomnia (Kales & Kales, 1984, as cited in Vela-Bueno, Soldatos & Kales, 1988). Finally, the pharmacologic treatments of anxiety and sleep difficulty are quite similar; benzodiazepines are widely used to treat either disorder (Smith & Wesson, 1985, as cited in Vela-Bueno, Soldatos & Kales, 1988).

Suicide & death. Coryell (1988) conducted a follow up study of patients with anxiety neurosis or panic disorder and found that 17% of all the deaths that had occurred in the interim were the result of suicide. This becomes even more of a concern when we consider the fact that panic disorder is eventually complicated by major depression in over 40% of cases and, among males, by alcoholism in approximately 25% of cases (Noyes, Clancy, Hoenk & Slymen, 1980). Both of these psychiatric syndromes significantly increase the risk of suicide. Given the apparently substantial risk for suicide among these patients, prediction becomes an important clinical issue, as it is among other patient groups prone to suicide.

Assessment Techniques for Measuring Anxiety

A number of assessment techniques have been used to measure levels of anxiety, which have given rise to a multitude of anxiety instruments. A brief overview of the
varying techniques used to assess anxiety will be provided, including specific instruments used by clinicians and researchers. Virtually all of the instruments for assessing the motor aspects of children’s anxiety are observational; those for assessing the physiological aspects are mechanical; and those for assessing the subjective aspects are self-report and projective.

Observational instruments. Nearly all of the instruments for assessing the motor aspects of children’s anxieties use direct observation as their method of measurement. This direct observation generally takes one of four general forms: behavioral tests, observational rating systems, checklists and global ratings (Barrios & Hartman, 1988). Behavioral avoidance tests (BAT), are somewhat self explanatory, in that they entail placing a child in a setting that contains the anxiety producing stimulus, then having the child perform a series of graduated tasks that call for approach to an interaction with the feared stimulus. Some passive variants of the procedure have the child remain stationary and bring the anxiety producing stimulus in a graduated fashion closer to the child. The hallmark of this type of assessment tool is tight control over stimulus conditions. Some examples of behavioral avoidance tests include BATs for blood and heights (Van Hasselt et al., 1979); medical procedures, school events, strangers and water.

Observational rating systems are used to assess children’s motor reactions to events in the natural environment. Children’s reactions are observed directly, and the observations are recorded with some immediacy. Observational rating systems have been developed for the assessment of children’s motor reactions to darkness, medical procedures, public speaking, separation, social contact and test taking (Barrios &
Hartmann, 1988). Some specific rating scales include the Observer Rating Scale of Anxiety (Melamed & Siegel, 1975); the Preschool Observational Scale of Anxiety (Glennon & Weisz, 1978); and the Observation of Classroom Behavior (Wine, 1979).

A third type of observation instrument for the assessment of anxiety in children is the checklist. Like the observational rating system, the checklist is composed of multiple responses that are monitored for their occurrence in the naturalistic setting. A major difference is that the checklist provides retrospective data, as there may be a considerable delay between the monitoring of the checklist items and the recording of these observations. The checklists vary not only in the relevant situations where observations take place, but also in the number of, and nature of, their response items and the timetable for their observations and recordings. Some examples of these instruments include the Parent Anxiety Rating Scale — Separation (Doris, McIntyre, Kelsey & Lehman, 1971, as cited in Barrios & Hartmann, 1988); and the Direct Home Observation (Graziano & Mooney, 1980).

**Physiological measures.** Physiological measures of anxiety are fewer in number. This is due to a number of problems associated with the nature of these instruments and the complexities involved with measuring physiological variables. The first mitigating problem is the fact that there are no universal simple responses or combination of responses that signify anxiety across persons and stimuli. Research indicates that there are different patterns of physiologic response to different anxiety producing stimuli, and that for any given stressor there are differences in how individual express these responses (Lacey & Lacey, 1967). Hence, adequate measures of the physiological aspects of
anxiety must include multiple physiological responses. Another difficulty encountered when using many of the physiologic measurement devices is the reduction of artifact (e.g., room temperature, child movement, electrical current, etc.). With children, measurement artifacts are always a concern, in that they may find it difficult to remain still during physiological recording. Despite the complexity of physiologic assessment, measures of heart rate, finger pulse volume, respiration and skin conductance have been reliably collected (Barrios & Hartmann, 1988).

**Self-report.** Self-report is the third type of assessment method for anxiety. Self-report methods take into account the inner child and his or her thoughts, feelings and experiences. These are vital in the assessment of childhood anxieties. There are two main types of self-report measures: global self ratings and objective rating scales/questionnaires.

Global self ratings are similar to their counterparts with one main exception, the child becomes the evaluator and the evaluated. Using a multipoint scale, the child rates his or her overall reaction to a stressor or anxiety producing situation. There is no uniformly accepted format for these ratings. Some ratings ask the child to rate his or her level of fear on a 12 point scale (e.g., The Target Complaint Scales, Van Hasselt et al., 1979). Others ask the child to rate themselves on a 5 point scale (e.g., Fear Thermometer, Kelley, 1976); while still others employ the use of drawn faces or figures from which the child rates him or herself (e.g., The Faces Test of Anxiety, LeBaron & Zeltzer, 1984).

The second type of self report measure is the objective rating scales / questionnaires. These differ from the global self ratings in that the global self ratings
have a single response item. Objective rating scales employ the use of multiple response items that are either continuous or categorical in nature. These self-report measures are either very specific, assessing the individual's level of anxiety regarding a specific stressor or situation (e.g., snakes, hospital visits, test taking etc.) or more general, assessing the child's subjective reactions to his or her overall life situation. These objective rating scales are relevant to this study. Two of the most frequently used instruments that assess a wide range of children's subjective responses to their overall life situation are the Revised Children's Manifest Anxiety Scale (Reynolds & Richmond, 1978) and the State – Trait Anxiety Inventory for Children (Spielberger, 1973). These instruments have become more widely used as the notion of generalized fear and anxiety has become more widely accepted among child behavior therapists (Barrio & Hartmann, 1988).

The Revised Children's Manifest Anxiety Scale (RCMAS) (Reynolds & Richmond, 1985) is a 37-item scale that assesses general anxiety. Internal consistency coefficients average in the .80s (Paget & Reynolds, 1984). Regarding validity, Reynolds and Richmond (1985) reported a series of supportive factor analytic and convergent / discriminant validity studies (e.g., Reynolds, 1982). The RCMAS contains a Lie scale (nine items; e.g. I am always kind, I never get angry). Like similar devices (e.g., MMPI validity indicators), the items were devised such that their purpose is relatively non-obvious to respondents.

The State Trait Anxiety Inventory for children (STAIC) (Spielberger, 1983) has been used extensively over the past two decades to assess state and trait anxiety in normal
and disturbed children (Spielberger & Rickman, 1990). The STAIC consists of two 20
item scales: a State Scale, which measures transitory anxiety reactions to particular
situations; and a Trait Scale, which measures a more stable personality characteristic, or
predisposition, to act more anxiously. Evidence of the concurrent validity of the STAIC
T-Anxiety Scale is reflected in correlations of .75 and .63, respectively, with the
Children's Manifest Anxiety Scale (Castaneda, McCandless & Palermo, 1956) and the
General Anxiety Scale for Children (Sarason, Davidson, Lighthall, Waite, & Rulbush,
1960), two of the more widely used trait anxiety measures for children. The alpha
reliability for the STAIC S-Anxiety Scale in the normative sample was .82 for males and
.87 for females; the alpha coefficients for the STAIC T-Anxiety Scale were .79 for males
and .81 for females (Spielberger, 1973). Initially developed as a research tool to measure
anxiety in 9 to 12 year old elementary school children, the STAIC has also proven useful
in assessing state and trait anxiety in younger children (Papay, Costello, Hedl &
Spielberger, 1975).

**Projective assessment techniques.** Projective assessment techniques are another
way to evaluate children's anxiety. Projective assessments all share one general
hypothesis: that an individual will 'project' his or her needs, desires, and/or conflicts,
both conscious and unconscious (intrapsychic), when asked to impose meaning or order
on an ambiguous or unstructured stimulus (Obrzut & Boliek, 1986). This intrapsychic
information cannot always be obtained through more objective personality measures,
because many times the individual is not aware of these feelings / pulls / tendencies.
Lindzey (1959) developed a taxonomy of five broad and partly overlapping categories of
projective techniques. These include association techniques (e.g., Rorschach, word association techniques), construction techniques (e.g., human figure drawings, story creation methods such as the TAT), completion techniques (e.g., sentence completion), arrangement or selection techniques (e.g., Szondi Test, Luscher Color Test) and expression techniques (e.g., doll play, puppetry and handwriting techniques). Association techniques (i.e., Rorschach Test), completion techniques (i.e., sentence completion), construction techniques (i.e., and thematic story creation methods and human figure drawings) will be covered in greater detail because they are the most frequently used projective techniques in clinical practice (Watkins et al., 1995).

The Rorschach method is one of the most common association techniques. This method was originally developed and still operates primarily as a perceptual-cognitive task. "Subjects are presented with 10 inkblots and asked, 'what might this be?'. As subjects respond during this Free Association phase of the test, the examiner records all of their responses verbatim. After completing all 10 blots, the examiner goes back through each of the cards, reading each response, and asks the individual to identify the part of the blot used and what particular aspects of the blot suggested the response. This information is used to help score the subjects responses. While there are a number of scoring procedures, the most commonly used and accepted is the Comprehensive System, developed by Exner (1974) which includes 90 possible scores organized into seven major categories: location, determinants, form quality, organizational activity, popularity, content(s), and special scores. Rorschach interpretation is guided by two major assumptions: One assumption is that the manner in which the individual articulates his or
her impression of the inkblots provides a representative sample of how they structure other kinds of perceptual—cognitive experience. Second, if one is able to identify the psychological corollaries involved in structuring the Rorschach task in certain ways, conclusions can be drawn from subjects’ responses concerning their characteristic nature and current emotional and attitudinal states (Weiner, 1986). Specific scores are interpreted as reflective of states of tension and anxiety (e.g., when ep exceeds EA by a substantial degree). Scores indicating a reluctance to engage in emotional interchange with others, hesitancy to initiate social interactions, loss of interest in being with or thinking about others, depressed mood, and negative self attitudes are suggestive of a pattern of anxiety—withdrawal (Weiner, 1986).

Sentence completion techniques are some of the most commonly used completion techniques. The sentence completion method consists of a number of incomplete sentence stems which are completed either orally or in writing. Responses to the sentence stems are unforced and are confined only to the range of attitudes and feelings they evoke within the individual. The evaluator then analyzes the responses to ascertain attitudes, personality styles and dynamics and overall psychological adjustment (Goldberg, 1965). Responses on sentence completion tests are analyzed and interpreted using any one, or a combination, of the following four systems. “1. The interpretation of each item of a test resulting in clinical impressions of the psychodynamics of personality. 2. The interpretation of items which are clustered into predetermined content areas resulting in focused perceptions of attitudes and needs. 3. The rating of each item or group of items according to a simple scale, usually negative to positive. 4. The comparison of items or
clusters of items to establish criteria based on the similarities of response contents” (Hart, 1986, pp. 255). Some of the more commonly used sentence completion tests include the Rotter Incomplete Sentence Blanks (Rotter & Rafferty, 1950), the Rohde Sentence Completion Method (Rohde, 1957), and the Hart Sentence Completion Test for Children (Hart, 1986).

Thematic story telling and projective drawings (i.e., human figure drawings) are the two most commonly used construction techniques. Thematic story telling approaches tap personality structure and the dynamics of interpersonal relationships through verbal means. “These techniques elicit basic data on individuals’ relationships to male and female authority figures, and they frequently provide insight into family relationships. In addition, projective thematic techniques may reveal underlying personality structures, motives, conflicts, needs, values, and attitudes toward others and selves. Indeed, the intensity of a child or adolescents’ attitudes or needs is often directly or symbolically evident in themes of generated stories. Finally, picture techniques analyze individuals’ perceptions of their environments and differences in these perceptions across people in the same environment” (Obrzut & Boliek, 1986, pp. 186). Some of the more commonly used Thematic approaches are the Thematic Apperception Test (Murray, 1971), the Roberts Apperception Test for Children (McArthur & Roberts, 1982) and the Children’s Apperception Test (Bellak & Bellak, 1949). There are three primary assumptions associated with thematic approaches. First, the storyteller identifies himself with the central figure in the story, or actually is the central figure in the story, as he or she conceives it. Second, the story is an example of situational behavior or a series of events
as the storyteller would like them to be. Finally, there is an assumed relationship between the expressed fantasy, inherent in the story, and past, present and/or future behavior (Obrzut, 1997).

Anxiety in thematic stories is often inferred from the central figure’s main motivational state or states and the material the motivational state refers to. These motivational states are defined in terms of behavior sequences and emotions as expressed by the storyteller in the story. Anxiety, as interpreted in thematic stories, is generally conceived as either physical anxiety and/or social anxiety. The former involves content aimed at avoiding pain, physical injury, illness and/or death; to escape from a dangerous situation; or to take precautionary measures. Social anxiety is conceived as content aimed at avoiding blame, ostracism, or punishment by inhibiting asocial or unconventional impulses; and/or to be well behaved and obey the law (Obrzut, 1997). Obrzut & Boliek (1986) point out that it is important to evaluate both the child and his or her projective responses from both a developmental and normative perspective.

Projective drawings (i.e., human figure drawings), are one of the most commonly used construction techniques for assessing the socio-emotional functioning of children and adolescents (Prout, 1983). There are a variety of projective drawing techniques including the House-Tree-Person technique (Buck, 1948), the Kinetic Family Drawing (Burns & Kaufman, 1972), the Kinetic School Drawing (Prout & Phillips, 1974) and, relevant for this study, the Draw-A-Person Technique (Goodenough, 1926).

Machover (1949) and Koppitz (1968) are the two researchers most influential in the development of human figure drawing interpretation. Machover (1949) was really the
pioneer on the interpretation of human figure drawings. The hypotheses developed by Machover have not only provided the groundwork for the clinical use of drawings, but also have sparked several decades of empirical investigations. Overall, Machover suggested that the interpretation of human figure drawings should be based on a gathering of indicators, not on an analysis of single signs or characteristics. Cummings (1986) suggests that "this is comparable to assembling a jigsaw puzzle; the pieces must be juxtaposed to form a comprehensive picture of the child or adolescent" (pp. 203).

Machover's most significant contribution was to identify the pieces of the puzzle and to offer interpretive hypotheses organized by several features or components of a drawing. Machover separated the features into three main categories: social features, represented in the parts of a drawing's head; contact features, which reveal a child's interactions with the environment (e.g., fingers, hands, feet, legs, etc.); and the structural variables of the drawing itself. It is beyond the scope of this paper to provide a comprehensive review of all of these components; however, the components related to anxiety will be given cursory coverage later in the paper.

Koppitz (1968) was another influential researcher who contributed greatly to the interpretation of human figure drawings. Koppitz's interpretations distinguish between signs or drawing characteristic which reflect a child's age or level of maturation and those which suggest anxiety, social-emotional concerns and intrapersonal and interpersonal adjustment. Koppitz labeled the former developmental items and the latter, emotional indicators. Koppitz developed a list of 38 signs, taken from a review of Machover (1948) and E. G. Hammer's (1958) works, which she believed met her criteria
to be an emotional indicator. This criteria is that the indicator must have clinical utility and differentiate between drawings of healthy and emotionally disturbed children; they should occur in less than 6% of the drawings of normal children and their frequency of occurrence should be independent of age and maturational level.

Evidence of anxiety in figure drawings has been the subject of a great deal of consideration and discussion and a large number of empirical investigations (Sims, Dana, & Bolton, 1983). These empirical investigations have sought to identify indicators of anxiety in drawings, while others have attempted to validate or invalidate anxiety indicators that have already been identified. Handler and Reyher (1965) compiled a comprehensive list of 21 anxiety indices (See Table 1) drawn from a review of 51 studies investigating anxiety in human figure drawings.

Table 1

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<th>Hypothesized Anxiety Indicators in Human Figure Drawings</th>
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Many of these anxiety indices have been drawn from the work of Buck (1948) and Machover (1949). The majority of the research that has been conducted regarding
anxiety in human figure drawings includes at least one, or a combination, of the following indicators.

Many of the paper and pencil measures of anxiety reviewed leave much to be desired; whether it be the subjectivity involved with analyzing drawing indices or the inability of most objective measures to uncover those feelings and thoughts unconscious to the individual. Most of the measures lack the ability to provide direct evidence of both conscious and unconscious anxiety. In the search for direct evidence, it is important to take a closer look at pencil pressure, a physiological indicator that holds the potential to be a valid way of assessing anxiety levels, both conscious and unconscious. A number of studies that have investigated this relationship will be reviewed in the following section.

**Pencil Pressure and Anxiety**

The focus of this research study is on pencil pressure as an indicator of anxiety. There are a number of reasons why this dependent variable was chosen. First, there is considerable disagreement among the research investigating pencil pressure as an indicator of anxiety. However, an on-line measure of pencil pressure is thought to be a more objective measure of anxiety and will be employed in this study. Pressure levels of up to 1024 will be measured. Prior to this, pencil pressure had been measured on a 0 to 5 subjective likert scale, at best. Second, by using this on-line measure, valid and reliable data may be obtained, free from examiner bias. Last, physiological responses to anxiety are considered universal. Because of this, pencil pressure may be one of the only true anxiety indicators in projective drawings which is expressed in a relatively consistent way across individuals.
Pencil pressure is defined as the amount of force used when pressing pencil to paper while drawing. This variable covers the categories of line pressure increase, light line and heavy line. Light line and heavy line are conceptually included with pencil pressure, because the amount of pencil pressure applied is directly responsible for the degree of lightness or heaviness of line.

Research regarding pencil pressure in HFDs has been far from consistent and confirmatory. Handler and Reyher (1965) indicate that of the 27 studies reviewed which investigated pencil pressure (i.e., light line, heavy line, line pressure increase), 18 were in agreement, 2 found opposite results, and 7 were nonsignificant. Further, two studies done more recently, and reviewed in greater detail later, (Joiner, Schmidt & Barnett, 1996; Vanderark & Mostardi, 1997) also split on the validity of pencil pressure as an indicator of anxiety, with the former finding nonsignificance and the latter finding significance. Similarly, Swensen (1968) in a review of studies on drawing indices of anxiety found that such indicators as line heaviness and line pressure were unsupported as correlates of anxiety in an average of 43% of the studies that examined them (the range was from 25% to 78.6%).

An analysis of why these results are mixed requires closer scrutiny of those studies investigating line pressure as an indicator of anxiety. These studies are summarized in Appendix a. The following information will be examined: how each study was conducted, whether multiple coders were used, inter-rater reliability results if reported, how the researchers operationalized and measured pencil pressure, how the
researchers operationalized and measured anxiety, whether the studies were double blind, and the researchers' findings of (non) significance.

Research not supportive of pencil pressure as an indicator of anxiety. Holzberg and Wexler (1950) attempted to validate human form drawings as a personality instrument and secondarily to provide some basis for an objective analysis of drawings. The population used in this study consisted of a control group composed of 78 student nurses and a pathological group composed of 38 women diagnosed with schizophrenia. The pathological group was further broken down during analysis into Schizophrenic total group, Hebephrenic Schizophrenics and Paranoid Schizophrenics. The researchers analyzed each human figure drawing completed by each participant and scored them for the presence or absence of 174 items. Included in this list was "the de-emphasis of line in the whole drawing: use of very light line throughout the entire drawing" and "the deemphasis of line in part of the drawing: contrasting pressure of lines, e.g., light line for head and heavy line for legs, etc." (pp. 349). Each of the researchers coded each drawing independently. The two judgements were then compared and where there was disagreement, discussion was used to reconcile the difference. Inter-rater reliability scores were not reported. Further, the researchers do not report if this was a double blind study. Neither item was found to differentiate significantly between any of the groups. While this study was cited in Handler and Reyner's (1965) review of the literature as non-supportive of pencil pressure as a variable of anxiety, a closer look may suggest quite the opposite. Even though heavy line / heavy pressure is directly related to the above variables, the researchers did not determine the degree to which they were
evidenced in each drawing. However, the researchers did look at line emphasis, a variable somewhat related to line pressure. Line emphasis was defined as the repetitive strokes of the pencil suggesting reinforcement of line. This variable was found to differentiate significantly between Paranoid Schizophrenics and normals. This is consistent with Reznikoff and Nicholas' (1958) findings which found that heavy line / heavy pressure differentiated significantly between Paranoid Schizophrenics and Undifferentiated Schizophrenics. This suggests that heavy line / heavy pressure and line emphasis are related and may be representative of the same internal state. Further research is needed in this area.

Hoyt and Baron (1959) looked at anxiety indices in same sex drawings of psychiatric patients with high and low Manifest Anxiety Scale (MAS) Scores. Their subjects consisted of 112 institutionalized neurotic and psychotic women. The researchers divided their subjects into three groups according to their MAS score. The researchers used the high and low anxiety score groups in this study. The researchers asked each participant to draw a picture of a person. These drawings were then scored by two examiners for the presence of a number of indexes drawn from the work of Buck (1948) and Machover (1949). Included in this list was “type of line (faint)” and was rated on a scale of 0-3 for degree. The researchers were blind to whether the drawings were completed by high or low anxious participants. Reliability for this scoring procedure was determined by computing for each index the mean absolute difference between the scores of each of the raters. The researchers report small differences (only two larger than .111).
The researchers concluded that the type of line did not differentiate significantly between high and low MAS groups.

Mogar (1962) replicated this double blind study using a male psychiatric sample. The same scoring system was used, and scoring reliabilities for this study ranged from .84 to 1.00. Mogar reports that there was substantial agreement between his study and Hoyt and Baron’s (1959) study in that little relationship was found between the DAP anxiety indices and the Manifest Anxiety Scale.

Engle and Suppes (1970) assessed the validity of Human Figure Drawings as a measure of test anxiety. 27 HFD scoring indices commonly associated with anxiety were rated in each drawing. Included in this list of 27 was line pressure which was rated on a scale of 0 to 4 (0 = normal to 4 = very heavy or very light). Two judges scored each drawing for the presence of the scoring indices. Indices which could not be scored with greater than 75% agreement were discarded. The participants were blind to the study’s intent, but it is not noted whether the judges were blind to the participants’ level of anxiety. 57 girls and 76 boys from grades five and six each completed four HFD tests, a test anxiety and defensiveness questionnaire, and a problem-solving task that yielded four behavioral measures. The correlation of line pressure with the other measures of test anxiety was found to be insignificant.

Joiner, Schmidt and Barnett (1996) conducted a study that examined the reliability and validity of three commonly used indicators of emotional distress (anxiety) in children’s projective drawings (size, detail, and line heaviness) and assessed their relation to established objective and projective measures of childhood depression and
anxiety. Their participants included 80 child and adolescent psychiatric inpatients, ages 6 to 16. Line heaviness was rated on a scale ranging from 1 (very light lines) to 5 (very heavy lines). Each participant was administered the Kinetic-House-Tree-Person test, the Draw-A-Family Test and the Draw-A-Person Test. The participants were also asked to complete a Children’s Depression Inventory (CDI), the Revised Children’s Manifest Anxiety Scale (RCMAS) and the Positive and Negative Affect Schedule, the Roberts Apperception Test for Children, the Roberts Depression Scale and the Roberts Anxiety Scale. Two raters, one blind to the study’s intent and both blind to participant’s level of anxiety, were used to score each of the drawings. Inter-rater reliability coefficients of .92 were reported for line heaviness. The researchers concluded that none of the three drawing indicators were significantly related to CDI Depression, Roberts Depression or RCMAS Anxiety. The researchers also evaluated the possibility that drawings are a less useful assessment technique among older children who have “outgrown” drawing. Interestingly, when age was taken into account in a regression equation line pressure achieved statistical significance (RCMAS Anxiety x Age predicted Line Heaviness, \( t[51] = 1.98, p<.05 \)). The researchers “shrugged” this off stating that when the p value was corrected for number of analyses (i.e., Bonferoni adjustment) it did not achieve significance.

Research supportive of pencil pressure as an indicator of anxiety. Berman, Klein & Lippman (1951) studied the drawings of 100 psychoneurotic veterans at the Rehabilitation Clinic of the Jewish Hospital of Brooklyn. Both a psychologist and psychiatrist interpreted each drawing using a list of differential or variable factors, of
which “pressure intensity: 1. Great, 2. Lightness of line… 3. Darkly drawn line” (pp. 59-60) were included. When there were areas of disagreement “the psychologist re-evaluated the interpretation of the Human Figure Drawing Test; and conversely the psychiatrist cooperated by re-examining the patient in the light of the points of differences” (pp. 59).

Inter-rater reliability scores were not reported. Further, the raters were not blind to the study’s intent. In this instance clinical intuition and subjective interpretation was used to establish whether there was “great” pressure or “lightness of line”. In this study it appears that the degree of pressure was ignored. The researchers simply measured these variables as either present or absent. The researchers in this study reported lightness of line and darkly drawn lines to be significantly related to anxiety.

Exner (1962) hypothesized that “anxiety associated with a psychogenic disturbance, such as that found in the psychoneurotic and character disorder, would manifest itself in the line qualities of human figure drawings in such a way as to be significantly different from the drawing of essentially normal subjects” (pp. 392). Data were collected from four groups of 20 subjects each. All participants were blind to the study’s intent. Each group contained 14 females and 6 males between the ages of 18-20. All subjects from the first two groups were self referrals to the university clinic. These subjects complained of chronic and intense anxiety. What differentiated group one from group two is that the former group also complained of intense depression. Group three and four were control groups which did not exhibit high levels of anxiety. In this study the researcher quantified line pressure on a scoring gradient in which a number of 1 was assigned to “light type of line” and the number 5 was assigned to the “heaviest type of
line". The author, alone, scored each of the drawings and was blind to which group the
drawing was taken from. A statistical comparison using the technique of unmatched t-test
was conducted. The findings suggest that those individuals experiencing chronic and
intense anxiety alone (group 2) consistently used lighter lines in their figure drawings
more so than any of the other subjects from the other three groups.

Royal (1949) sought to determine whether the drawings of a man and woman by a
group of anxious neurotic patients may be significantly differentiated from a group of
relatively symptom free subjects on the basis of drawing characteristics associated with
anxiety. Two groups were asked to draw a picture of a man and a woman. The first group
consisted of 80 anxious neurotic white male patients from a mental hygiene clinic and
Veterans Administration Hospital. The control group consisted of 100 subjects from a
dental clinic, who volunteered to participate and were free from overt anxiety and
nervousness. Pencil pressure was included in the drawing checklist and was broken down
into firm lines, faint lines, heavy lines, combination of firm and light lines, combination
of firm and heavy lines and combination of firm, light, and heavy lines. These drawing
characteristics were coded as either present or absent in the drawing. The authors did not
state whether they used multiple coders, nor if this was a double blind study. The findings
suggest that the absence of heavy lines was displayed with significantly greater frequency
in the drawings done by the anxious neurotic patients.

Handler and Reyher (1964) manipulated anxiety levels in their subjects. The
researchers manipulated the external stress level by attaching each subject to a large six
channel polygraph, in a sound proofed room in the presence of the experimenters. Their
subjects consisted of fifty seven male students, from an introductory psychology class. Each subject was asked to draw a picture of a man, woman and automobile. Each subject was tested under stress and non-stress conditions. The automobile was included as a control figure. Reyher (1959) found that the drawing of an automobile is a relatively neutral task of approximately equal difficulty and is less subject to projection than either the male or female drawing. The researchers hypothesized that externally induced anxiety increases manifestations of anxiety on human figure drawings; and that there are two sources of these manifestations of anxiety: (a) the laboratory stress situation and (b) anxiety producing intrapsychic processes activated by drawing the human figure. 21 anxiety indexes were analyzed on each of the drawings. Light line, heavy line and line pressure increases, were included in this list. These three variables were given a range from zero to three depending on degree. Inter-rater reliability scores ranged from .67 to 1.0, with a modal score of .87. The researchers did not state if this was a double blind study. Their findings support their hypotheses suggesting that line pressure differentiated significantly between stress and non-stress drawings and that the automobile drawing showed far less change under externally induced stress than did the drawings of the male and female. Importantly, Handler and Reyher also found that while light and heavy line quality may indicate anxiety, different processes underlie their presence. “Heavy line may reflect feelings of external stress, or presence from without, while light line may represent a feeling of stress from within” (pp. 263). The researchers cite Reznikoff and Nicholas (1958) as support for this hypothesis. These researchers found that heavy line significantly differentiated drawings of paranoid schizophrenics from undifferentiated
schizophrenics. Handler and Reyher (1964) state, "a paranoid views the world about him as the source of his fears. This is consistent with the widely shared clinical observation that patients who experience anxiety about themselves improve more quickly than those who see their problems as emanating from outside sources" (pp. 263). They also cite findings from Gutman (1952) who reported that patients who did not improve in therapy tended to draw continuous and reinforced lines, but those who improved tended to draw light sketchy lines. This is consistent with the widely shared view among therapists that patients who experience anxiety about themselves improve more quickly than those who see their problems as emanating from an outside source.

Handler and Reyher (1966) conducted a similar study to their 1964 design. In this study 96 male college students drew a man, a woman and an automobile while continuous galvanic skin repsonses (GSR’s) were obtained. Each drawing was scored by two judges, one blind to the study’s intent, for the same 23 anxiety indexes as in the previous study. Inter-rater reliability scores were reported to range from .67 to .97. A significant difference was found in the degree of anxiety for the three drawings. The drawing of the automobile produced the lowest level of anxiety, followed by the male and female. The finding that more anxiety is associated with the man and woman drawings than with the automobile drawing is in agreement with Handler and Reyher’s (1964) findings. "The differential anxiety producing characteristics of these three drawings is again interpreted to be a function of differences in their potential for stimulating intrapsychic conflict and/or anxiety. In the present study the automobile had the lowest anxiety scores for all but two of the significant indexes appropriate to all three
drawings (heave pressure and heavy line). The researchers interpret this to mean that heavy line and heavy pressure reflect external stress to a greater degree than they reflect intrapsychic stress. On the other hand, light line and light pressure differentiated between the three drawings, presenting themselves in the human figure drawings significantly more than in the automobile drawing. The researchers conclude that a differential response to stress is evident; light line and light pressure reflecting intrapsychic stress, while heavy line and heavy pressure reflect external stress.

Vanderark and Mostardi (1997) investigated the differences between drawings completed during rock music and silence. Their sample consisted of three groups including 17 boys and 18 girls in the first grade, 23 undergraduate women and 17 undergraduate men and 17 graduate women and 18 graduate men. Each group was asked to complete the Draw A Person Test. Each group was asked to complete two drawings one during three minutes of silence and one during three minutes of exposure to “heavy metal” rock music (i.e., “The Shortest Straw” by Metallica). The drawings were rated on a scale of 1 (low) to 10 (high) for amount of detail, pressure of pencil and completion of picture. Three raters were used, but inter-rater reliability scores were not reported. Further it is not clear if this was a double blind study. Three paired t-tests on the groups’ drawing scores yielded significant differences between silence and rock music. Significantly more pencil pressure was found in the drawings completed while listening to rock music as opposed to silence. These findings are supportive of Handler and Reyher’s (1964, 1966) findings suggesting that heavy line / heavy pressure are reflective of external stress, in this case “heavy metal” rock music.
Discrepancies in Findings

There are a number of possibilities why the reported findings are so contradictory. Among these are demographics, fine motor coordination, measurement of pencil pressure, and the source of the anxiety.

Demographics. The demographics of each study are incredibly diverse. The samples used in each of the studies differed greatly in their age range. There is the distinct possibility that developmental effects may cause differences in how individuals express anxiety in human figure drawings. As stated earlier in the Joiner, Schmidt, and Barnett (1996) study, the relation of age with objective anxiety levels (RCMAS) predicted line heaviness at statistically significant levels. When age was not factored in, line heaviness was not predictive of anxiety. The studies cited in Handler and Reyher’s (1965) and Swensen’s (1966) reviews used samples that varied in age from first grade to WWII veterans. Without taking into account the developmental levels of each sample it is like comparing apples with oranges. It is important to note the paucity of research on anxiety as seen in children’s human figure drawings. Of the thirteen studies reviewed eleven used adults as participants and only two used children as participants. This is even more disturbing when one considers that figure drawings are one of the most common assessment tools of school psychologists used with children (Motta, Little & Tobin, 1993). If in fact anxiety, as expressed in figure drawings, varies by age, then many child psychologists may be interpreting figure drawings based on research conducted with an adult sample. This is comparable to ignoring the age of the client when administering and
interpreting an objective personality measure like the Minnesota Multiphasic Personality Inventory. This would be considered unethical and less than best practice.

**Fine motor coordination.** Conceptually related to developmental levels is an individual’s fine motor coordination ability. This may be another reason why there is such diversity in the results of studies investigating line pressure and anxiety in human figure drawings. None of the studies reviewed controlled for individual visual-motor-integration ability. This is problematic in that there is a significant relationship between fine motor control and point pressure (equivalent to line pressure / pencil pressure). More specifically, Harris and Rarick (1959) found that individuals with poor fine motor control tended to exert more point pressure during writing. Further, Clawson (1999) concluded that young children grasp a pencil more firmly and exert more pressure than do children of pre-adolescent years. This suggests a developmental factor influenced by learning to coordinate gross and fine musculature while attending to a perceptual task. If fine motor control is not accounted for, it could potentially become a confounding variable leading to erroneous and misleading findings.

**Measurement of pencil pressure.** The way many of the researchers decided to measure pencil pressure may have also contributed to the contradictory findings. Out of the twelve studies reviewed, five of the studies did not use multiple coders and / or report inter-rater reliability estimates, when measuring pencil pressure. Further, four of the studies measured pencil pressure / line heaviness in drawings dichotomously, either 0 (light) or 1 (heavy); four studies utilized a scale ranging from 0 to 3, one study extended the scale from 0 to 4; two studies utilized a scale from 0 to 5; and one study rated pencil
pressure on a scale from 1 to 10. The differences in the amount of pressure used in drawings as a function of anxiety may be too sensitive and minute to measure on limited, subjective likert scales. The more sensitive and accurate the measurement of the variable, pencil pressure, the more reliable and valid the results.

Source of anxiety. Of all of the studies reviewed only Handler and Reyher (1964, 1966) took into account the source of anxiety for each individual (i.e., external vs. internal / intrapsychic). This is significant given their hypothesis that the source of the anxiety produces directly opposite levels of pressure in human figure drawings (i.e., external source of anxiety = heavy line pressure, internal source of anxiety = light line pressure). With this in mind, it is important to once again review Cattell’s (1966) work on anxiety factors. Cattell found two distinct and independent anxiety factors, which he defined as State Anxiety (S-anxiety) and Trait Anxiety (T-anxiety). S-anxiety fluctuates as a function of the perceived threat associated with various stressors, whereas T-anxiety measures are relatively impervious to stress and remain stable over time irrespective of the circumstances under which the measures are taken (Spielberger & Rickman, 1990). In other words, State Anxiety is more sensitive to external stressors like an experimental setting or the testing situation itself; whereas trait anxiety is more sensitive to intrapsychic stress. When comparing Handler and Reyher’s hypothesis regarding the source of anxiety with Cattell’s anxiety factors, State anxiety appears to be directly related to external stress and Trait anxiety directly related to internal or intrapsychic stress. Because of the classic concept of “stimulus pull” (Murstein & Easter, 1965), human figure drawings are more likely to elicit certain needs and or conflictst and are
likely to have a greater potential for stimulating intrapsychic stress (T-anxiety), whereas the testing situation itself has the potential to stimulate external stress (S-anxiety). If Handler and Reyher’s hypothesis is correct, pencil pressure becomes dependent on the degree to which an individual possesses either State and/or Trait Anxiety.

With the limitations of these studies in mind; this study intends to illustrate that given a valid and reliable measure of pencil pressure produced during the drawing of a human figure, in conjunction with a valid and reliable objective anxiety scale that identifies levels of both State and Trait Anxiety, pencil pressure will be shown to be directly related to the level of State and/or Trait anxiety. To avoid the problems of earlier studies (e.g., inter-rater reliability problems, lack of double blind design, limited pencil pressure ratings, etc.) an on-line method (i.e., pressure sensitive palette) with the capability of measuring up to 1024 levels of pressure will be utilized. This will allow for an analysis of pencil pressure free from examiner bias. Further, to help confirm the validity of this method, the highly valid State Trait Anxiety Inventory for Children will be used to determine types and levels of anxiety.
CHAPTER 3

METHODS

This chapter will discuss the participants used in the study, the measurements employed, procedures followed, and the specific hypotheses tested. The statistical analysis used in this study will also be provided.

Participants

The participants for this study were fifty, four to eleven year old male and female normally achieving children from an elementary school in a predominantly middle to upper class, white Midwestern School District. The population of the school is approximately 500 students. Ten children from each of grades, one through five, were randomly selected using the Lavarand random number generator to participate in this study. The students’ handedness, gender and age were recorded in order to control for each during statistical analyses. Consent was obtained from each participant’s parents prior to their involvement in the study. These participants were chosen for a number of reasons. First, as stated earlier, few studies on anxiety indicators in projective drawings have included children as subjects; yet, projective drawings are one of the most commonly used tools in a school psychologist’s assessment battery. Second, by randomly selecting children, ranging in age from four to eleven (grades 1 to 5), developmental implications can be investigated. Third, these participants were chosen for convenience. The school district and school were willing to participate in this study.
Instruments

A number of instruments were used to assess the following: the child’s anxiety level, the degree of pencil pressure and the child’s visual-motor-integration ability.

Pencil pressure. The amount of pressure used during the drawing of the Bender Visual Motor Gestalt Test for Children (B-G Test), Draw-A-Person (DAP), and automobile, were measured using a Wacom - Intuos Tablet (see Figure 1). This is a pressure sensitive 12 x 12 pallet, generally used by graphic artists. This Wacom Tablet was designed to take into account the amount of stylus pressure (i.e., pencil pressure) exerted by the user in order to more accurately reflect the actual act of drawing on a piece of paper. The harder one pushes, the darker the line appears on the computer screen. The Wacom Tablet quantified pencil pressure on an ordinal scale ranging form 1 to 1024 levels ($1024 = 2^{10}$ – chosen because of hardware considerations). The pressure sensitive pallet allows for a paper overlay and the use of an inking pen.

Figure 1. The Wacom – Intuos Tablet used for measuring pencil pressure.
Each participant was asked to produce the previously mentioned drawings (DAP, automobile, B-G Test), on a piece of paper which was overlaid on the pallet. The tablet is engineered and designed to simulate a natural and realistic drawing setting. This study was able to avoid a number of problems inherent in previous research studies that attempted to measure pencil pressure as an indicator of anxiety by using the Wacom pressure sensitive pallet. First, much of the previous research analyzing pencil pressure (reviewed earlier), measured this variable on a subjective five-point scale, at best. Some of the researchers simply determined whether heavy or light lines were present or absent. The Wacom — Intuos Tablet (i.e., pressure sensitive palette) has the capacity to accurately and reliably measure up to 1024 levels of pressure used during the act of drawing, allowing for a much more detailed, sensitive and comprehensive measure of pencil pressure. A software program, created for this study, was able to record pressure data 10 times per second during the act of drawing. This allowed for the determination of a total mean pencil pressure for each drawing not available in previous studies. Second, this tablet allowed for the objective gathering of pencil pressure data while the participant engaged in the act of drawing, as opposed to a more problematic post drawing determination.

**Rating of anxiety levels.** Each participant’s State and Trait Anxiety level was assessed using the highly valid State Trait Anxiety Inventory for Children (STAIC) (Spielberger, 1983). The STAIC is an objective measure of anxiety, which allows for a better understanding of the relationship between anxiety types and pencil pressure. This inventory was used for a couple of reasons. First, by using the STAIC, found to be high
in construct and discriminant validity, it was possible to better validate the pencil pressure method being employed. Second, this assessment instrument allowed the researcher to determine and discriminate between an individual’s level of both State and Trait anxiety. This is paramount because the presence or absence of each, as well as the degree to which each is present, has direct implications on the amount of pressure used during drawing (Handler & Reyher, 1966). Initially developed as a research tool to measure anxiety in children between the ages of nine and twelve (Spielberger, 1973), the STAIC has also been proven useful in assessing State and Trait Anxiety in younger children (Papay, Costello, Hedl & Spielberger, 1975; Papay & Spielberger, 1986). The internal consistency of the STAIC was found to be satisfactory for kindergarten, first and second grade children when administered individually (Spielberger & Rickman, 1990), as was done in this study. These findings extend the effective range of the applicability of the STAIC from kindergarten to the sixth grade level.

The Draw-A-Person test (DAP) was also administered to each participant. The degree of pencil pressure used during the DAP test was measured through the use of the Wacom pressure sensitive pallet discussed earlier. This instrument measured the degree to which pencil pressure, used during the drawing of a human figure, is an indicator of anxiety. The drawing of a human figure has been hypothesized to stimulate a certain degree of intrapsychic conflict and/or anxiety (Handler & Reyher, 1966). This intrapsychic conflict and/or anxiety may be reflected in both the STAIC (as Trait anxiety) and, hypothetically, in the degree of pencil pressure used during the act of drawing (i.e., light pencil pressure). The testing session itself may also produce
heightened levels of State anxiety, which could also be reflected in both the STAIC (as State anxiety) and, possibly, in the degree of pencil pressure used during the drawing (i.e., heavy pencil pressure).

Each participant was also asked to draw a picture of an automobile. This allowed the investigator to determine whether the DAP test actually stimulates intrapsychic anxiety (Trait anxiety), as reflected in the degree of pencil pressure used. Handler and Reyher (1964) determined that because the automobile poses less intrapsychic stress than either the drawing of a male or female, “the automobile may be used as a control base or base line from which to evaluate the relative contributions of psychodynamic factors, drawing style and quality. A control is especially important in analyzing the DAP since clinicians often make inferences on the basis of artistic quality” (pp. 263).

**Visual-motor-integration ability.** Each participant’s visual-motor-integration ability was assessed using the Bender Visual-Motor Gestalt Test for Children (B-G Test) (Bender, 1938). The purpose for using this instrument was to control for each child’s visual-motor-integration ability. Research suggests that a child’s fine motor coordination and / or visual-motor-integration ability is directly related to the amount of pencil pressure used during drawings (Harris & Rarick, 1959). By controlling for visual motor integration ability, pencil pressure as an anxiety indicator can be more accurately assessed. The participant’s drawings were scored using the Developmental Bender Scoring System for Young Children (Koppitz, 1964). Both scorer reliability and test – retest reliability were found to be sufficient for this scoring system (Miller, Loewenfeld, Lindner, & Turner, 1962; Koppitz, 1964).
Procedures

Each participant was read the following instructions. The instructions were intended to provide the participant with just enough information, so as to be neither distressing nor comforting. This was an attempt to avoid affecting the participant's State anxiety level in either direction.

"Hello, my name is Mr. LaRoque and I'm a school psychologist working in this school district. Your parents have given me permission to ask you down here to help me out with a research study I am conducting. I am very interested in how kids draw different things, so today I am going to ask you to help me out by doing some drawing. This won't take very long. Will you help me out?"

Each participant was then asked to complete one of the following sequences of tests which included the DAP, automobile, STAIC, or the B-G Test. The order in which each individual completes these tests was counterbalanced, resulting in four different sequences. These sequences were: (1) DAP – STAIC – Automobile – B-G Test, (2) STAIC – Automobile – B-G Test – DAP, (3) Automobile – B-G Test – DAP – STAIC, or (4) B-G Test – DAP – STAIC – Automobile.

The instructions given for the DAP were as follows: "Draw a picture of a whole person. It can be any kind of person you want to draw. Just make sure that it is a whole person and not a stick figure or a cartoon figure" (Koppitz, 1968, pp. 6). Most questions raised by the participants regarding what and how to draw were answered by the investigator in a neutral manner such as, "That is up to you, you may do as you like, I only ask that you draw a picture of a whole person, not a stick figure or a cartoon figure".
Participants were not allowed to move the piece of paper attached to the pressure sensitive tablet.

The instructions given for the automobile were as follows: “Draw a picture of a car. It can be any kind of car you want to draw” Most questions raised by the participants regarding what to draw were answered with the phrase, “That is up to you, you may do as you like”.

The instructions given for the Bender Visual Motor Gestalt Test for Children (B-G Test) were as follows: “I have nine cards here with designs on them for you to copy. Here is the first one. Now go ahead and make one just like it” (Koppitz, 1964, pp. 15). The card was placed at the top of the blank paper in front of the participant. No comments were made to the participant during the test. When the participant finished drawing the figure, the card with the stimulus design was removed and the next card was put in its place. All nine cards were presented in this fashion to each participant.

The instructions given for the State – Trait Anxiety Inventory for Children were as follows: (in order to control for reading ability level, the examiner orally read the items on the inventory to all participants). Each participant was told, “I am going to read you a series of questions, and I want you to answer them as truthfully as possible. What you say will be confidential, which means that only you and I will know how you answered each of the questions. No one else will know”.

The examiner scored all of the instruments in order to eliminate interscorer reliability problems.
Hypotheses of the Study

H₀₁: There will be no main effect of State anxiety levels on pencil pressure: such that an individual having a higher degree of State anxiety will not use a greater degree of pencil pressure on the Draw a Person Test, the B-G Test and the drawing of an automobile.

H₀₂: There will be no main effect of Trait anxiety levels on pencil pressure: such that an individual having a higher degree of Trait anxiety will not use a lesser degree of pencil pressure on the Draw a Person Test, the B-G Test and the drawing of an automobile.

H₀₃: There will be no two way interaction effect of Trait anxiety and test type on levels of pencil pressure: such that an individual having a higher degree of Trait anxiety will not use less pencil pressure during the drawing of a human figure, than during the drawing of the B-G Test or automobile.

These null hypotheses were accepted or rejected at the .05 level of significance.

Because all of the participants in the study completed all three drawing assessments (i.e., human figure drawing, automobile and B-G Test), and there was a need to control for a number of static variables, a repeated measures ANCOVA model was used in the analysis of the data (See Appendix E).

Four variables served as covariates including handedness, gender, visual motor integration ability and age of the participants. Step one controlled for gender, age and
handedness. Step two controlled for each participant's visual-motor-integration ability. Order was found to have no significant effect on pencil pressure and was discarded as a controlling variable in the analysis. There were two between-subjects independent variables, State anxiety and Trait anxiety. Both of these variables were trichotomized based on the subjects raw score (i.e., low, medium and high). Test type was the one within-subjects variable which involved three measures, corresponding to the three test types (i.e., DAP, Auto, and B-G Test). Test type was used as an independent variable in the analysis. The dependent variable in the study was mean pencil pressure. This was a continuous variable measured on an ordinal scale with pressure levels ranging from a low of 1 to a high of 1024. The repeated measures ANCOVA model used allowed for all hypotheses to be tested at the same time (see Appendix E).
CHAPTER 4

RESULTS OF THE STUDY

This chapter will discuss the findings for each hypothesis, the data that support these findings and a number of secondary conclusions that could be drawn from the results.

**Hypotheses Tested**

All three hypotheses were tested using one 3 X 3 X 3 (State anxiety levels: low, medium, high X Trait anxiety levels: low, medium, high X test type: DAP, B-G Test, Auto) ANCOVA model with repeated measures of test type (see Appendix E). Test type was used as an independent variable in this model. Specific analyses for each hypothesis were drawn from this model. This model tested the main effects of State and Trait anxiety on the degree of pencil pressure used in all three drawing measures and the two way interaction effect of Trait anxiety and test type on pencil pressure. The variables controlled for in the study included gender, handedness, visual motor integration ability and age.

**Variables controlled.** As can be seen in table 2, all of the variables controlled in this study, with the exception of age, were found to have no significant influence on the dependent variable, (see Table 2). This indicates that these variables do not influence pencil pressure and can be excluded from consideration when interpreting pencil pressure within drawings.
Hypothesis 1. It was hypothesized that Individuals having a higher degree of State anxiety would use a greater degree of pencil pressure during the Draw a Person Test, the B-G Test and the drawing of an automobile. Table 3 shows the mean level of pencil pressure as a function of State anxiety levels. The repeated measures ANCOVA model used indicated a significant main effect ($F(2, 37) = 4.64; p = .016$). As hypothesized, individuals with a higher degree of State anxiety used a significantly greater amount of pencil pressure on all three drawing tests, than did individuals with medium levels of State anxiety (see Table 3). This hypothesis can only be partially accepted, however, because the results suggest a curvilinear relationship (see Appendix B) between State anxiety and pencil pressure. More specifically, individuals with a lower degree of State anxiety also used a significantly greater degree of pencil pressure on all three drawing tests, than did individuals with medium levels of State anxiety.
Table 3

Mean Level of Pencil Pressure as a Function of State Anxiety Levels (N=50)

<table>
<thead>
<tr>
<th>State Anxiety Levels</th>
<th>Mean Pencil Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>High State Anxiety</td>
<td>684.73</td>
</tr>
<tr>
<td>Medium State Anxiety</td>
<td>546.76a</td>
</tr>
<tr>
<td>Low State Anxiety</td>
<td>634.21a</td>
</tr>
</tbody>
</table>

a = significant differences between these anxiety levels at p<.05

Hypothesis 2. It was hypothesized that individuals having a higher degree of Trait anxiety would use a lesser degree of pencil pressure during the Draw a Person Test, B-G Test and the drawing of an automobile. Table 4 shows the mean level of pencil pressure as a function of Trait anxiety. The repeated measures ANCOVA model used indicated a significant main effect (F(2, 37) = 2.82; p = .073). As hypothesized, individuals with a higher degree of Trait anxiety used a significantly lesser degree of pencil pressure on all three drawing tests, than did individuals with average and low levels of Trait anxiety (see Table 3). These findings suggest a linear relationship between Trait anxiety levels and pencil pressure (See appendix C).
Table 4

**Mean Level of Pencil Pressure as a Function of Trait Anxiety Levels (N=50)**

<table>
<thead>
<tr>
<th>Trait Anxiety Levels</th>
<th>Mean Pencil Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Trait Anxiety</td>
<td>552.19a</td>
</tr>
<tr>
<td>Medium Trait Anxiety</td>
<td>657.98a</td>
</tr>
<tr>
<td>Low Trait Anxiety</td>
<td>655.52</td>
</tr>
</tbody>
</table>

* a = significant differences between these anxiety levels at p<.05

**Hypothesis 3.** It was hypothesized that Individuals having a higher degree of Trait anxiety would use less pencil pressure during the drawing of a human figure, than during the drawing of the B-G Test and automobile. Table 5 shows the mean level of pencil pressure as a function of test type and Trait anxiety levels. No significant interaction effect was found (F(4, 72) .916; p = .46) using the Wilks’ Lamda Test within the repeated measures ANCOVA model. Contrary to the hypothesis, individuals with higher levels of trait anxiety did not use less pencil pressure on the Draw a Person Test than on the B-G Test or the drawing of an automobile (see Table 5).
Table 5

Mean Level of Pencil Pressure as a Function of Trait Anxiety Levels on Drawings (N=50)

<table>
<thead>
<tr>
<th>Trait Anxiety Levels</th>
<th>Mean Pencil Pressure on Drawing Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DAP Test</td>
</tr>
<tr>
<td>High</td>
<td>548.728</td>
</tr>
<tr>
<td>Medium</td>
<td>670.856</td>
</tr>
<tr>
<td>Low</td>
<td>666.966</td>
</tr>
</tbody>
</table>

Interaction of State and Trait Anxiety Levels on Pencil Pressure

The relationship of State and Trait anxiety and their possible combined effect on pencil pressure was examined. Consistent with previous research (i.e., Papay & Spielberger, 1986), both State and Trait anxiety were found to be correlated in this study \( r = .533; p < .0001 \). Because both State and Trait anxiety have a differential effect on pencil pressure, the possibility of an interaction effect was examined. The repeated measures ANCOVA model used indicated that there was no interaction between State and Trait anxiety on pencil pressure \( F (4, 37) = .266; p = .898 \). Both variables interacted independently with pencil pressure. In other words, both State and Trait anxiety affected pencil pressure in distinct and separate ways.

Interaction of Gender and Test Type on Pencil Pressure

The relationship of gender and test type on pencil pressure was analyzed in order to rule out any effects on pencil pressure due to possible socialization effects and possible
familiarity with the different drawings, specifically the Draw a Person and the automobile drawing. The results of the Wilks' Lamda test within the repeated measures ANCOVA model indicated no interaction between gender and drawing type on pencil pressure (F(2, 36) = 2.404; p = .105). Boys and girls, as a whole, press equally hard or soft when drawing an automobile as when drawing a person.

**Relationship of Trait Anxiety T-scores on Pencil Pressure**

This study utilized “normal” elementary school children, with varying levels of State and Trait anxiety. Few of these participants had clinically significant levels of either anxiety type. Because the data indicate a linear relationship between Trait anxiety and pencil pressure, and a curvilinear relationship between State anxiety and pencil pressure, we can assume that as anxiety (State or Trait) increases, a greater (or lesser) degree of pencil pressure will be exerted. It is expected that this relationship should become even more evident as both anxiety types increase to clinically significant levels. This is in fact what is seen when Trait anxiety is categorized somewhat differently in the repeated measures ANCOVA model. Table 6 presents the mean levels of pencil pressure as a function of Trait anxiety levels. The repeated measures ANCOVA model used indicated a significant main effect (F(2, 43) 5.218; p = .009). The data suggest that when the anxiety scores are grouped according to T-scores and distance from the mean (i.e., high = one SD above the mean; low = one SD below the mean; average = everything in-between) the linear relationship becomes even more evident (see Appendix D) and the results more significant (see Table 6).
Table 6

Mean Level of Pencil Pressure as a Function of Trait Anxiety Levels (Regrouped by T-score) (N=50)

<table>
<thead>
<tr>
<th>Trait Anxiety Levels</th>
<th>Mean Pencil Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Trait Anxiety</td>
<td>544.13ab</td>
</tr>
<tr>
<td>Medium Trait Anxiety</td>
<td>649.19b</td>
</tr>
<tr>
<td>Low Trait Anxiety</td>
<td>717.71a</td>
</tr>
</tbody>
</table>

a = significant differences in these anxiety levels at p<.05
b = significant differences in these anxiety levels at p<.05

State anxiety could not be regrouped in this way because of a limited number of individuals with T-scores falling one standard deviation above the mean.
CHAPTER 5

DISCUSSION

This chapter will present a review of the purpose of the study, a summary and analysis of the findings, differences and/or similarities with existing literature, the practical and theoretical implications of the findings, limitations of the study and considerations for future research.

Purpose of the Study

Psychologists like Machover, Koppitz and Hammer have stated that drawings provide a vehicle for the expression of nonverbal, symbolic messages. What researchers have attempted to do over the last half century is decode these messages (e.g., Hammer, 1958; Machover, 1949; Koppitz, 1968; Goodenough, 1926; Naglieri, 1988). Based on a review of the research, it appears justifiable to state that there has only been partial success in breaking the code (Cummings, 1986). This study attempted to add to the pool of knowledge in hopes that it would further our understanding of these symbolic messages within projective drawings; and was an attempt to quantify performance in a way that provided statistical validity. The study achieved this by illustrating that given a valid and reliable measure of pencil pressure produced during drawing, in conjunction with a valid and reliable objective anxiety scale that identified both State and Trait anxiety levels, pencil pressure was significantly and differentially related to State and Trait anxiety levels.
Relationship of State Anxiety Levels and Pencil Pressure

The results of this study indicated that participants with higher levels of State anxiety used more pencil pressure on all three drawing tests than did individuals with medium levels of State anxiety. Similarly, participants with lower levels of State anxiety also used more pencil pressure on all three drawing tests than did individuals with medium levels of State anxiety. In other words, individuals with higher and lower levels of State anxiety use more pencil pressure when drawing, than do individuals with medium levels of State anxiety. It is not clear why this curvilinear relationship exists. However, Handler and Reyher (1964) suggested that differences between drawings could be a result of the source of the stressor (i.e., internal vs. external), as well as how the individual responded to the stressor. In the present study, state anxiety was viewed as externally driven because this type of anxiety fluctuates as a function of the perceived threat associated with various stressors, or in this case the testing situation (Spielberger & Rickman, 1990). This is why the STAIC asked individuals to rate themselves based on how they were feeling “right now”. The explanation for the identified curvilinear relationship may be found in how the individual responded to the testing situation. Each individual had the potential to respond to the testing situation with high, medium or low levels of State anxiety. This differential response of State anxiety may have affected the degree of pencil pressure used in two ways. If the characteristics of the task or testing situation created high levels of State anxiety, the individual most likely responded with a strong desire to finish the drawings quickly, with minimal effort or involvement, in order to escape the stressor causing the State anxiety. Riethmiller and Handler (1997) have
described this as an avoidant response in that the individual is attempting to avoid or escape the anxiety provoking situation. This line of reasoning may also be extended to those individuals that responded to the testing situation with lower levels of State anxiety. More specifically, if the individual did not view the task at hand as something relevant or important, his or her State anxiety levels were likely low, causing them to respond with minimal effort and a desire to finish the task quickly and carelessly. These “avoidant” or “flight” responses to the testing situation, by individuals with both higher and lower levels of State anxiety, likely impacted the awareness or care the participant used during drawing. If the individual was not concerned about his or her performance (low State anxiety), or the individual was exceedingly nervous about the testing situation (high State anxiety), he or she may have been less concerned about completing the drawings with care, simply wanting to be done with the testing situation. If finishing the task at hand is paramount, either because they perceive it to be a waste of time or they want to flee or avoid the stressor (the testing situation or task), they are less concerned about making mistakes. This lack of concern may have contributed to the use of more pencil pressure. If an individual was concerned about making mistakes and completing the drawings with care, they would likely take a more cautious approach to the task, using less pressure during drawing, to avoid making mistakes. Prior to this research, Handler and Reyher (1966) conducted the only study taking into account the source of anxiety. The current results are somewhat different from the findings reported by Handler and Reyher (1966). They found a linear relationship between external anxiety (i.e., State anxiety) and pencil pressure. More specifically, individuals having high external stress tended to use heavy
pressure when drawing. Perhaps the differences in methodology used in the two studies may have accounted for the discrepant results. Specifically, Handler and Reyher scored pencil pressure on a scale from one to three, and it is possible that their more simplistic scoring method reduced their statistical power and concealed the curvilinear relationship.

Relationship of Trait Anxiety Levels and Pencil Pressure

The current findings also indicate that participants with higher levels of Trait anxiety used less pencil pressure when drawing. This appears to be a linear relationship; as Trait anxiety increases, pencil pressure decreases. These results are consistent with Handler and Reyher's (1964) study. It is possible that this finding is a result of the approach individuals high in trait anxiety take when engaged in certain tasks. It is important to note that Trait anxiety refers to relatively stable differences in the disposition to perceive certain situations as threatening and environmental stressors do not impact its measurement. Trait anxiety tends to be more inherent and ongoing, and is likely an indicator of insecurity. Cattell and Scheier (1958), in their factor analytic study of anxiety, found a number of personality characteristics that loaded heavily on the factor called Trait anxiety. They found Trait anxiety to be associated with a desire to achieve, a lack of confidence and self-assurance, timidity, and a high ratio of self criticism to self approval. This suggests that individuals high in trait anxiety when confronted with a test (e.g., drawing), will likely want to perform well, yet will lack the self confidence and self assurance that they can. In the case of the drawing tests, they likely approached the test with caution, drawing lightly because they lacked the confidence that what they were
drawing was correct or acceptable. The higher their trait anxiety the more they desired to achieve, yet the more they lacked the self assurance and confidence that their responses would meet expectations. They approached the drawing task cautiously, and drew lightly. Interestingly, Cattell and Scheier (1958) also found that the concept of trait anxiety as dysfunction leads to the expectation that a variety of performances should be impaired by it. "This impairment is not visible in high level intellectual performances, or in memory, or in accuracy tests, but there are significant relations to a group of variables almost at the physical performance level, showing themselves in slower tempo, reduced muscular pressure in writing, etc." (pp. 371).

Reasons for Discrepant Findings from Previous Research

It is apparent from the review of the literature noted earlier that the discrepant findings in the anxiety / pencil pressure research could be the result of several factors. First, none of these studies, with the exception of Handler and Reyher (1966), accounted for type or source of anxiety. It is clear from the current results that the type of anxiety has a differential effect on pencil pressure. Because each type of anxiety has an opposite effect on pencil pressure (high Trait anxiety = light line pressure and high/low State anxiety = heavy line pressure), a significant relationship was concealed by research designs that failed to control for this. Second, all of the studies used an unreliable, subjective scoring method to assess levels of pencil pressure. Each study had a scorer "eyeball" the line to determine if the participant used heavy or light pressure. This study utilized a pressure sensitive tablet free from rater reliability problems. Third, all of the
previous studies used an overly simplistic and imprecise scoring scale to measure pencil pressure in drawings. Imprecise likert scales, ranging anywhere from 1 – 2 to 1 – 10, limited the range and precision available to each scorer when analyzing pencil pressure. It is possible that the differences expressed in pencil pressure, as a function of anxiety levels, are too minute to measure by using such gross, simplistic and primitive scales. The approach used in this study measured pencil pressure with precision and accuracy, by recording ten pressure data points every second during the act of drawing with a measurable range of 1 to 1024 levels of pressure.

Possible Interaction of Trait Anxiety and Test Type on Pencil Pressure

The third hypothesis was largely based on findings from work done by Handler and Reyher (1964). These researchers believed that human figure drawings had the capability of activating certain intrapsychic processes with the potential of generating anxiety, more so than other types of drawings (i.e., automobile). They hypothesized that the automobile drawing posed less intrapsychic stress because it is less subject to projection of anxiety than either the drawing of a male or female figure. This internal stress or anxiety, generated by the drawing of a human figure, is conceptually similar to trait anxiety. The findings of Handler and Reyher led this researcher to hypothesize that the act of drawing a human figure would generate higher levels of trait anxiety, contributing to the use of less pencil pressure on that drawing. Because the drawing of an automobile or the B-G test possesses less potential to generate intrapsychic stress or trait anxiety, an individual’s use of pencil pressure should not be affected. Therefore, this
examiner hypothesized that individuals would use less pencil pressure on the DAP test, than on the automobile drawing or on drawing of the B-G test. The findings of this study, however, indicated that individuals did not use any less pencil pressure on this test than on either of the other two tests. This may have occurred for a number of reasons. It is possible that the drawing of a person does not inherently generate intrapsychic stress within an individual as originally hypothesized. Or, if it does, it may either not generate enough trait anxiety to impact pencil pressure, or it may differentially affect a person depending on their age and maturity. Handler and Reyher’s study utilized college age students, as opposed to the elementary age students used in this study. It may be that elementary age children are not developmentally ready to connect or associate something abstract (i.e., drawing of a person) with their conscious and unconscious feelings of self. They may see the act of drawing a person as simply that, the act of drawing a person. The conscious and unconscious associations may not occur until one is more cognitively developed. Further study is needed to determine this possible interaction.

Possible Interaction of State and Trait Anxiety on Pencil Pressure

The relationship of State and Trait anxiety and their possible combined effect on pencil pressure was examined. Consistent with previous research (i.e., Papay & Spielberger, 1986), both State and Trait anxiety were found to be correlated in this study. This was expected because Trait anxiety can be looked at as individual differences in anxiety proneness (i.e., relatively stable differences in the disposition to perceive certain situations as threatening and to respond to these threats with elevations in State anxiety).
Because both State and Trait anxiety have a differential effect on pencil pressure, the possibility of an interaction effect was examined. The results indicated that there was no interaction between State and Trait anxiety on pencil pressure. Both variables interacted independently with pencil pressure (e.g., High State anxiety = high pencil pressure, and high Trait anxiety = low pencil pressure). This is consistent with Cattell and Scheier's (1958) findings that both State and Trait anxiety are distinct entities, the former reflecting anxiety as an emotional state and the latter reflecting anxiety as a personality trait. This finding makes the degree of interpretation needed when analyzing pencil pressure in drawings potentially much less complex. For example, when an examiner analyzes a drawing and finds a low degree of pencil pressure, he or she can assume the low pencil pressure is related to higher levels of Trait anxiety and not some combination of high Trait and low State anxiety or high Trait and high State anxiety. The interpretation has the potential of being more direct and simple. Manipulation of the independent variables, Trait and State anxiety, is needed to investigate this further.

**Issues Related to the Sample Utilized**

This study utilized "normal" elementary school children, with varying levels of State and Trait anxiety. Few of these participants had clinically significant levels of either anxiety type. This sample choice was important for two reasons. First, projective drawings are one of the most commonly administered assessment tools by school psychologists (Prout, 1983). Because of this, it was important to establish this relationship on a population type that are often administered these tests. Second, it was
necessary to establish the relationship between anxiety and pencil pressure based on less clinically significant children. If this study only included those diagnosed with an anxiety disorder of some type, or those with clinically significant levels of anxiety, it would be hard to generalize the findings to a more "normal" school age population. One may assume that the pencil pressure / anxiety relationship "kicks in" only after anxiety levels reach a certain point. Because the data indicated a linear relationship existed between Trait anxiety and pencil pressure, and a curvilinear relationship existed between State anxiety and pencil pressure, it can be assumed that as anxiety (State or Trait) increases, a greater (or lesser) degree of pencil pressure will be exerted. One would expect that this relationship should become even more evident as both anxiety types increase to clinically significant levels. This was precisely what was found in this study. When the Anxiety scores were grouped according to t-scores and distance from the mean (i.e., high = one SD above the mean; low = one SD below the mean; average = everything in-between) the linear relationship became even more evident and significant (see Appendix D).

**Age and Visual Motor Integration as Controls**

All of the variables controlled in this study, with the exception of age, were found to have no significant influence on the dependent variable. It is assumed that the reason age had a significant effect on pencil pressure is simply because as an individual ages, he or she gains body size and muscle mass. The differences in physical stature of a first grader and fifth grader are significant. The increased muscle mass and body size contribute to one using a greater degree of pencil pressure when drawing. Further study is
needed to determine the exact relationship between these two variables. Interestingly, visual motor integration was not found to have a significant influence on pencil pressure despite the previous findings of Harris and Rarick (1957) who reported a significant relationship between their measures of pencil pressure and fine motor control. These differences in findings may have been found for two reasons. First, it is possible that this discrepancy in findings is a result of differences in how pencil pressure / point pressure was measured. Harris and Rarick used an elaborate and technically advanced pressure measure for the time (i.e., mechanical plate system). However, their ability to accurately measure pencil pressure and the amount of pressure data they were able to collect (approximately 12 data points per individual) was inferior to the current pressure data collection system used and open to problems of reliability. Second, this discrepancy in findings may also be due to differences in the variables: fine motor control versus visual motor integration. Harris and Rarick used the Straight Line Motor Control Test to measure the participant’s fine motor control. This study used the Bender Visual-Motor Gestalt Test to measure visual motor integration ability. Visual motor integration describes one’s ability to integrate a visual image with fine motor output. Because drawing involves the integration of what one sees in one’s mind with fine motor output, this variable was thought to be a better control than simply fine motor control. This difference in the complexity of the variables may have caused the discrepancy between the findings of both studies.
Familiarity Effects on Drawing

It was suspected that the participants’ familiarity with the item being drawn, may in some way have affected the amount of pencil pressure used. This is logical, and in line with prior reasoning, in that if one is unsure of what they are drawing, they may approach the task with a certain degree of caution. It is possible that this cautious, more hesitant approach would foster a lighter line being drawn. It is also possible that when the participants were asked to draw an object that they were more familiar with, they may have pressed more firmly, more sure of themselves and what they were drawing. If this suspicion is true, one might expect to see (based on the differences in socialization of boys and girls) an interaction between gender and the drawing of an automobile and person, such that a boy may be more comfortable drawing a picture of an automobile, and a girl more comfortable drawing a person. While this reasoning may be logical, the findings did not support this. The results indicated no significant interaction between gender and drawing type. Boys and girls, as a whole, pressed equally hard or soft when drawing an automobile as when drawing a person.

Limitations of the Research

There are three potential limitations of this study. First, the population used for this study comes from a predominantly middle to upper class, white school district. This limits the generalizability of results to those children matching this demographic population. It is this examiner’s opinion that anxiety and pencil pressure are non-discriminatory towards race, ethnicity or socio-economic status, making generalization to
most children acceptable. However, until further study is done generalizability of the findings is limited to the demographics of the current sample used.

Another possible limitation of this research has to do with the manner in which pencil pressure was measured. This study used a Wacom pressure sensitive tablet and a pressure pen to gather data on pencil pressure. Because the Wacom tablet was engineered to be used by graphic artists, the device was thought to eliminate any confounding variables that may interfere with the natural act of drawing. The surface space and angle of the tablet are identical to that of a small desk and the pen is similar to any drawing instrument commonly used by students. It is possible, however, that the participants were affected in some way by the device itself, finding it different from a natural drawing setting. Further, while it was assumed that an individual would use a similar amount of pressure whether the drawing instrument they were using was a pencil or pen, it is possible that an individual may use different amounts of pressure depending on the drawing utensil. Possible reasons for this could be individuals’ perceptions of the finality of ink, even though they were instructed that it was alright to simply cross out the drawing and start over if a mistake was made, or the difference in the feel of a pencil on paper as opposed to a pen on paper.

Another possible limitation of this research is the use of a single item (i.e., pencil pressure) for assessing anxiety. Other researchers have criticized this approach by pointing out that a single item or variable has little discriminative power when compared to an entire test or scale (Riethmiller & Handler, 1997). Similarly, the use of single
drawing indices have been criticized in relation to the Kinetic Family Drawing Technique (Handler & Habenicht, 1994). The authors reported that, “it is not surprising that no significant differences were found [using this research procedure], because we cannot expect that all children…will reflect their feelings in the same way graphically. The analysis of single signs or variables is to be discouraged” (p. 447). However, other researchers have supported the use of single indicators in drawings. Joiner & Schmidt (1997) state that one would expect a single item from a test to correlate with the results of distinct but conceptually related tests, as long as the single item, although of (probably) low reliability, is a valid indicator of the underlying construct in question. Waehler (1997) expresses very clearly the view of this author when he states that, “room needs to be made in both scientific and practitioner activity for holistic and atomistic considerations. Clearly, individual drawing characteristics need to be examined, but efforts to see them contextually must be undertaken. We need to keep in mind that personality assessment science is not only interested in ascertaining diagnostic precision, but also makes a contribution when it assists the clinician in generating both convergent and divergent hypotheses about individual clients, and helps communicate results to clients (emphasis added).” (p. 487). Pencil pressure in projective drawings should help the clinician by providing one more piece of evidence to aid them in generating and confirming both their convergent and divergent hypotheses.
Considerations for Future Research

While it is believed that drawing is a universal medium for all children, and pencil pressure is believed to be free of cultural or ethnic effects, the sample used for this study was predominantly white, from middle to upper class mid-western families. It will be important to determine if the relationship between pencil pressure and anxiety is present in children from other cultures and ethnicities.

Reithmiller and Handler (1997) point out that the use of single drawing indices in research is unlikely to produce consistently significant findings, because these indices have limited stability over time. In other words, their test - retest reliability tends to be low. This statement is most likely true for the indicators associated with State anxiety, in that State anxiety has been described as a *transitory* emotional condition that consists of feelings of tension, apprehension, nervousness and worry and heightened activity of the autonomic nervous system (Spielberger, 1972). This would not apply to the same degree for Trait anxiety, which refers to relatively *stable* individual differences in anxiety proneness, that are relatively free from situational effects. Further research is needed to determine the test - retest reliability of pencil pressure as an anxiety indicator.

While this study validated a single anxiety indicator within projective drawings, in order to aid the clinician with hypothesis development and analysis, future research could be used to develop a multi-item anxiety indicator scale for projective drawings. By finding and validating other anxiety indicators within projective drawings (i.e., size of the drawing, detail, sketching, etc.), a multi-item scale could be constructed which would
have greater discriminative power than a single indicator. If items are combined, then error tends to average out, thus yielding a more accurate estimate of the true relation between variables. In other words, a multi-item scale would essentially allow for repeated measures of the same phenomenon, increasing the reliability (a decrease in the amount of variance attributable to error).

While this study determined that there is a significant relationship between anxiety type and pencil pressure, it did not determine if the differences in pencil pressure related to anxiety type are visible to the eye of the examiner. For example, while we know that an individual with a high level of Trait anxiety uses significantly less pencil pressure than an individual with a low level of Trait anxiety, we do not know if the examiner can visibly interpret these differences. Further, normative data is not currently available to indicate what should be considered heavy, medium or light pressure, making comparisons across individuals inappropriate. For example, while we know that individuals high in Trait anxiety use less pencil pressure when drawing, we do not know if less pencil pressure equates to a visually interpretable light line. Further, what may be heavy pressure for one individual may be medium or light pressure for another. The current exploratory study established a relationship between pencil pressure and anxiety levels; now further study is needed to normalize pencil pressure in order to allow for specificity in interpretation and comparison across individuals.

Related to this is the need to further analyze and detail the relationship between anxiety type and pencil pressure. The current results indicated that pencil pressure and
State / Trait anxiety are related, and the nature of this relationship has been determined. These results, however, do not allow for specificity of interpretation. For example, the findings indicated that light pencil pressure is related to high levels of Trait anxiety, however the exact meaning of these high levels is not known. Is the level of Trait anxiety clinically significant, borderline, high but in the average range, etc.? A much larger, more diverse sample will be needed to further develop this relationship. If this is done, one would be able to develop corresponding T-scores for anxiety types as a function of pencil pressure. This will allow for comparison between subjects and greater specificity in interpretation. These T-scores would only be available for clinicians using a system sensitive enough to measure minute levels or changes in the degree of pencil pressure used.

Another consideration for future research would be to extend the practical applications of pencil pressure in projective drawings as it relates to anxiety. One way this could be done is by examining the differential degree of pencil pressure used in the drawings of family members in the Kinetic Family Drawing. The software created for this study has the potential to analyze any area in the drawing highlighted by the clinician. It is possible to isolate drawings of individual family members, in order to determine the amount of pressure used. For example, if a child uses significantly less pressure when drawing his or her father than when drawing his or her mother, this could be interpreted to mean that for whatever reason, the father is contributing in some way to elevated levels of Trait anxiety in the child. This may provide the clinician with more information regarding treatment development, hypothesis development, and / or a focal
point for the clinical interview. At the very least, it would provide the clinician with a better understanding of the relationship between the drawer and his or her family members. This may be especially important when the clinician suspects that family dynamics may be contributing to or causing certain problems for their client. It would also be helpful in those situations where the type of problematic family dynamic makes confession or open discussion unlikely (e.g., child abuse).

Lastly, it is this examiner's belief that there are many more indicators within projective drawings that are valid descriptors of personality and emotional trauma. Researchers have simply not found effective ways to measure these indicators with precision and sensitivity. Technology, like the Wacom Pressure Sensitive Tablet used in this study, is now available which will allow clinicians to measure those indicators, which have escaped valid measurement in the past. The size of certain aspects of drawings (e.g., eyes, head, torso, shoulders, entire person), placement of the drawing on the page, inconsistent use of line pressure, shading, etc. are all conducive to more sensitive and technologically advanced forms of measurement. No longer is it acceptable to subjectively measure these types of indicators on crude likert scales, fraught with interrater reliability problems. If these indicators are measured with greater sensitivity, it is possible that a whole host of indicators could be available for valid interpretation by the examiner.
Conclusions

What this study offers is one more piece of evidence to help clinicians identify anxiety in children. It is important to restate earlier warnings about overly relying on single signs when interpreting projective drawings. Pencil pressure simply provides one more piece of evidence to use when formulating and analyzing hypotheses about a particular child. This being said, pencil pressure in drawings has a number of advantages as an anxiety indicator. First, drawings are quick and easy to administer, providing a large amount of pencil pressure information. Second, pencil pressure can help to identify various amounts and types of anxiety in an individual that he or she may not be aware of, and therefore not available to self-report measures or interviews (Meyer, 1997). Third, pencil pressure avoids some of the problems faced when individuals try to conceal or lie about their anxiety. The indirect nature of pencil pressure avoids the problems of an evasive and uncooperative child. Fourth, many rating scales and interviews assume a certain level of intrapersonal understanding by children. It is expected that if a child is chronically anxious, he or she will be able to express these feelings in words or through answers on a questionnaire. This assumption may be problematic with younger children who are not as self-aware, or do not have the capacity to understand and describe their feelings, states or personality traits (Papay & Spielberger, 1986). Pencil pressure is a universal medium that does not require any degree of self-awareness and drawing is an activity that children have a tremendous amount of experience with. Last, pencil pressure is sensitive to the source of anxiety. It is important to be able to differentiate between fleeting, transitory states of anxiety (which may be caused by the examiner or evaluation
setting), and the more stable differences in anxiety as a disposition or personality trait. Many measures confuse the two; pencil pressure is able to differentiate between these, quickly and efficiently.

What does this add to the debate about the use of projective drawings? First and foremost, it appears that researchers and practitioners should not be so quick to throw the baby out with the bathwater. It is important not to condemn projective drawings in their entirety, simply because researchers have not been able to validate certain indicators within these drawings. Part of what has fueled this debate has been problems with what researchers have been trying to measure, and even more importantly, how they have measured it. If pencil pressure is a valid indicator of anxiety, it is likely that there are other valid indicators within projective drawings that can be used. Those researchers (Motta, Little & Tobin, 1993b; Lilienfeld, Woods & Garb, 2000; Martin, 1983, Motta et al., 1993) that have so forcefully stated that projective drawings are invalid and have strongly discouraged their use may have drawn too hasty a conclusion. It appears likely that up to this point they have simply not been able to find ways to accurately measure the indicators within drawings. For example, if a researcher measures pencil pressure in a drawing on a three point likert scale (e.g., heavy, medium and light pressure), and does not find a significant relationship between pencil pressure and anxiety, does this mean we should ignore pencil pressure, or even more, throw out projective drawings altogether? Or could it be that the changes within indicators like pencil pressure, or head size, or eye size or placement on page, are simply too minute to be measured on such crude, subjective scales? Demonstrating interrater reliability in a study, does not demonstrate
validity. Two raters can certainly reliably measure a variable, but that does not mean the way they have chosen to measure the variable is accurate and valid. Some opponents of projective drawings (Martin, 1983; Motta et al., 1993) are ready to dismiss projective drawings altogether calling their use unethical. This is not only premature, it is poor science. This debate has been waged over the wrong question. Instead of “are projective drawings valid assessment tools?”, the question should be “what signs within projective drawings are valid indicators of emotional troubles or personality and can be used in assessment?”. This question changes the debate entirely. It is certainly irresponsible and unethical to interpret signs within projective drawings that have not been validated by good science; but it is even more irresponsible from a scientific perspective to write off projective drawings altogether, simply because we have not found accurate ways to measure many of the signs within these drawings. Because projective drawings are only as good as the interpretable signs found within them, researchers must continue to attempt to find ways to accurately and objectively measure these signs. Projective drawings provide a vehicle for the expression of nonverbal, symbolic messages. Researchers must continue to attempt to find ways to decode these messages, because ignoring the message is not an option.
APPENDIX A

Summary of Research Investigating the Relationship Between Pencil Pressure and Anxiety in Projective Drawings.

<table>
<thead>
<tr>
<th>Study</th>
<th># of Coders</th>
<th>Inter-rater Reliability</th>
<th>Double Blind Study</th>
<th>Levels of Pencil Pressure Measured</th>
<th>Significance Found</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reznikoff &amp; Nichols (1958)</td>
<td>2</td>
<td>.93</td>
<td>Yes</td>
<td>0-1</td>
<td>Yes</td>
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<tr>
<td>Royal (1949)</td>
<td>1</td>
<td>Not stated</td>
<td>Not stated</td>
<td>0-1</td>
<td>Yes</td>
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<tr>
<td>Vanderark &amp; Mostardi (1997)</td>
<td>3</td>
<td>Not stated</td>
<td>Not stated</td>
<td>1-10</td>
<td>Yes</td>
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<tr>
<td>Berman, Klein, &amp; Lippman (1951)</td>
<td>Not stated</td>
<td>Not stated</td>
<td>No</td>
<td>0-1</td>
<td>Yes</td>
</tr>
<tr>
<td>Exner (1962)</td>
<td>1</td>
<td>No</td>
<td>No</td>
<td>1-5</td>
<td>Yes</td>
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<tr>
<td>Handler &amp; Reyher (1964)</td>
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<td>Modal Score .87</td>
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<td>0-3</td>
<td>Yes</td>
</tr>
<tr>
<td>Handler &amp; Reyher (1966)</td>
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<td>.67-.97</td>
<td>Yes</td>
<td>0-3</td>
<td>Yes</td>
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<tr>
<td>Holzberg &amp; Wexler (1950)</td>
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<td>Not stated</td>
<td>Not stated</td>
<td>0-1</td>
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<tr>
<td>Hoyt &amp; Baron (1959)</td>
<td>2</td>
<td>Mean diff. .111</td>
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<td>0-3</td>
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<tr>
<td>Mogar (1962)</td>
<td>2</td>
<td>.84-1.0</td>
<td>Yes</td>
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<td>No</td>
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<tr>
<td>Engle &amp; Suppe (1970)</td>
<td>2</td>
<td>.75-1.0</td>
<td>Not stated</td>
<td>0-4</td>
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<tr>
<td>Joiner, Schmidt, &amp; Barnett (1996)</td>
<td>2</td>
<td>.92</td>
<td>Yes</td>
<td>1-5</td>
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</tbody>
</table>
APPENDIX B

Estimated Marginal Means of Pencil Pressure as a Function of State Anxiety.
APPENDIX C

Estimated Marginal Means of Pencil Pressure as a Function of Trait Anxiety.
APPENDIX D

Estimated Marginal Means of Pencil Pressure as a Function of T-Score Generated Trait Anxiety Levels.
APPENDIX E

3 X 3 X 3 Repeated Measures ANCOVA Table Summarizing Mean Pencil Pressure.

<table>
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<tr>
<th></th>
<th>DAP</th>
<th>Auto</th>
<th>B-G Test</th>
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<tr>
<td>Low TA</td>
<td>678.28</td>
<td>737.84</td>
<td>668.84</td>
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<tr>
<td>Med TA</td>
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<td>678.75</td>
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<td>High TA</td>
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<td>672.35</td>
<td>533.22</td>
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<tr>
<td>Med SA</td>
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<td></td>
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<tr>
<td>Low TA</td>
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<td>590.19</td>
<td>615.21</td>
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<tr>
<td>Med TA</td>
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<td>630.45</td>
<td>554.10</td>
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<tr>
<td>High SA</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Low TA</td>
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<td>788.43</td>
<td>670.00</td>
</tr>
<tr>
<td>Med TA</td>
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<td>663.22</td>
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<tr>
<td>High TA</td>
<td>584.12</td>
<td>576.15</td>
<td>575.22</td>
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</tbody>
</table>

SA = State anxiety
TA = Trait anxiety
REFERENCES


