

THE RELATIONSHIP OF LEARNING STYLE TO
INATTENTION AND HYPERACTIVITY

By

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CHAPTER 1

INTRODUCTION

Zach (not his real name) is a funny, spirited sixteen-year-old with an IQ over 130 whose creative talents have awed parents and teachers alike. He has tremendous powers of concentration for creative pursuits in the areas of music, writing and performing original compositions. Raw artistic ability enables him to design posters and web pages for his rock band, while his gift for conversation and negotiation make him the perfect band manager. But Zach has experienced a lot of academic variability throughout his school career. He was identified gifted at age seven, but was also diagnosed ADHD the same year. Zach has always had a high energy level, experiencing difficulty organizing his time and keeping track of his assignments. His tendency to blurt out responses and questions (however relevant) during class instruction has provoked the wrath of numerous teachers. By the time he reached middle school, his parents had come to expect that his academic progress was going to require close supervision. Considering that his grade point average is only a 2.5, he would be considered an underachiever. Every year he makes "As" in a few classes, while struggling to keep a "D" in others. Interestingly, no subject is consistently his best.

What differentiates between the classes in which Zach is successful and those in which he is not? His parents have determined that the primary difference seems to be the teacher's perception of Zach's active, creative style. When confronted with a highly sequential teacher who favors conformity over creativity, Zach's grades plummet. These teachers tend to perceive him to be highly distractible, disruptive, and irresponsible. Irresponsibility is punished with zeroes, which wreaks havoc with grade averages. If Zach gets the rare opportunity to be taught by a teacher who appreciates his way of looking at the

world, he tends to find the course to be intellectually stimulating and experiences academic success. It seems that some teachers view Zach as a child riddled with faults, while others see him as a child blessed with tremendous potential. While his parents wonder if there is anything wrong with him at all, they continue to medicate his ADHD during school hours to keep his grades in a passing range. Zach protests the medication. He says he does not like the way he feels when taking it. He says he has no personality while on it. However, he knows it helps get the work completed during class.

In the practice of school psychology, where behavioral analysis often leads to diagnosis, and diagnosis to treatment, the behavioral analysis should be contextually driven. From an educational perspective, it is important to differentiate between *disordered* behavior and issues of learning styles. Failure to honor a student's non-sequential, creative learning style, as with Zach, may increase the risk of both behavior problems and underachievement (Zentall, 1983).

Attention Deficit Hyperactivity Disorder - Inattentive, Hyperactive/Impulsive, or Combined type (ADHD) is a commonly diagnosed behavior disorder, thought to involve in varying combinations the inability to sustain attention, inability to efficiently divide attention, inability to selectively attend, hyperactivity, inability to inhibit response, and poor self-regulation. It is usually identified in childhood through academic and behavioral problems arising in school settings (Brown, Coles, Smith, Platzman, Silverstein, Erickson, Falek, 1990). ADHD is considered a neurological disorder related to a chemical deficiency in the brain. Despite some gains in the understanding of the neural mechanisms contributing to ADHD, the method of identification still rests primarily with behavior rating scales completed by teachers and parents. Most of these scales are in the process of being revised to reflect the DSM-IV criteria. The DSM-IV diagnostic criteria for Attention-Deficit/Hyperactivity Disorder, is based on the following symptoms:

A. Either (1) or (2).

(1) six (or more) of the following symptoms of inattention have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level.

Inattention

- (a) often fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities
- (b) often has difficulty sustaining attention in tasks or play activities
- (c) often does not seem to listen when spoken to directly
- (d) often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace (not due to oppositional behavior or failure to understand instructions)
- (e) often has difficulty organizing tasks and activities
- (f) often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (such as schoolwork or homework)
- (g) often loses things necessary for tasks or activities (e.g. toys, school assignments, pencils, books, or tools)
- (h) is often easily distracted by extraneous stimuli
- (i) is often forgetful in daily activities

(2) six (or more) of the following symptoms of hyperactivity-impulsivity have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

Hyperactivity

- (a) often fidgets with hands or feet or squirms in seat
- (b) often leaves seat in classroom or in other situations in which remaining seated is expected
- (c) often runs about or climbs excessively in situations in which it is inappropriate (in adolescents or adults, may be limited to subjective feelings of restlessness)
- (d) Often has difficulty playing or engaging in leisure activities quietly
- (e) is often "on the go" or often acts as if "driven by a motor"
- (f) often talks excessively

Impulsivity

- (g) often blurts out answers before questions have been completed
- (h) often has difficulty awaiting turn
- (I) often interrupts or intrudes on others (e.g. butts into conversations or games)

(DSM-IV, 1994, pp.83-84)

Inattention is considered predominant if six or more of the first set of symptoms have persisted for more than six months, even if hyperactivity or impulsivity are not serious problems (DSM-IV, 1994). ADHD - predominantly Hyperactive-Impulsive Type is diagnosed if criterion A2 is met but not A1 for the past six months. Even with the criteria outlined in the DSM-IV, diagnosis can be difficult to make. Distractibility, for example, often is task and situation specific. The diagnostic criteria itself continually refers to schoolwork or homework. Wender (1987) points out that some children who are very distractible at school are able to concentrate quite well on activities they choose themselves and may even be "undetachable" from such tasks. He goes on to relate that this phenomenon is as yet rather unexplainable to parents (p.8). When this is the case, is the problem one of disordered neurological function or one of learning style?

Zentall (1993) states that some ADHD students cannot accurately be described as having an attention deficit, because saying that implies an inability to sustain attention or a lack of attention. Many of these children are actually quite capable of sustaining attention for certain kinds of tasks, time periods, and under specific conditions. He describes the phenomenon as an "attentional bias" (p. 143) that is often specific to the educational environment and can result in educational deficits. The deficits associated with ADHD often bring about school failure. Thirty to fifty percent of these students will fail at least one grade by adolescent, and over one third will not finish high school, (Barkley, R. A., 1995).

Background of the Problem

Thomas Armstrong (1987) has suggested that students diagnosed with learning disabilities are actually "worksheet disabled" or "curriculum dysfunctional" (p. 40). Armstrong maintains that while some students avoid showing overt signs of educational distress, others clearly fall through the cracks, being labeled with a disability of one kind or another by school professionals. The attention disordered student may be an example of such a student. It may be that inattention represents a incompatibility of student learning style with typical classroom practice. Armstrong (1997) not only believes this is the case, he further asserts that very few studies even consider the positive attributes exemplified by ADHD children. The behavior rating scales used by physicians and psychologists to establish the presence of ADHD may be measuring teacher or parent intolerance of normal child behaviors rather than a disability inherent in the child (Patterson, 1996). A study by Eddowes, Aldridge, and Culpepper (1994) examined the classroom practices of primary grade teachers and compared the identified teaching styles to the teachers' perceptions of student attention problems. They concluded that teachers with a more structured teaching philosophy tended to rate more of their students as hyperactive and distractible than teachers with a less structured philosophy. It may be easier for parents and teachers to accept disorder in the child than face the responsibility of changing the environment in which the child is placed. Classroom environments can be challenging, interesting places that allow students choice in their learning. However classroom environments are often stifling and boring, places that would give the most controlled adult a serious case of inattention and fidgetiness.

The task of identifying influences of style and motivation when evaluating attention difficulties is troublesome. In fact, many instruments currently used to evaluate attention abnormalities fail to produce a scale that is factor pure. Items associated with

motivation, conduct problems, or oppositionality frequently find their way into these scales so that separating the influence of various components, for the purpose of intervention development, becomes even more difficult (Oehler-Stinnett, 1994).

Researchers have hypothesized several potential mechanisms thought to be deficit among the group of children diagnosed ADHD. Deficits have been suspected in the areas of information processing, divided attention, selective attention, sustained attention, and perceptual processing. However, there have been substantial difficulties in establishing a strong relationship between these deficits which are considered the measurable, underlying components of attention and the diagnosis of ADHD. Douglas (1988) cites studies demonstrating intact information processing abilities in ADHD children. She lists a wide variety of verbal and non-verbal memory tasks for which researchers have failed to find differences between ADHD students and controls. Further, Swanson (1988) states that some of the studies claiming to improve impairments in information processing with stimulant medications are, in fact, statistically flawed. The inconclusive nature of the ADHD research and the inadequacy of the diagnostic criteria is expressed openly among some of the experts in the field (Swanson, Shea, McBurnett, Potkin, Fiore, & Crinella, 1990). This professed uncertainty is often unsettling to physicians and psychologists involved in the diagnosis of this disorder.

In addition to difficulties establishing a firm theoretical basis for attentional problems, questions also exist about the influence of gender and ethnic variables on perception of attention or hyperactivity. McGuiness (1989) cited two studies, one by Satin, Winsberg, Monetti, Sverd, and Foss (1985) and the other by Goldstein (1987), demonstrating that the use of the Conner's Rating Scales led to 33 % incidence rates for ADD, hyperactivity, or conduct problems among elementary aged boys. Are responsible diagnosticians to accept and use criteria for a disorder that labels one-third of the nation's male children deviant? The Goldstein study (1987), collecting data on 7,119 children, found

only 15 % of the girls to score high on dimensions of attentiveness, hyperactivity, and aggressiveness while 33% of the boys met criteria for diagnosis. The data, generated by teachers, produced a normal distribution for girls but not for boys. A fact which McGuinness (1989) regards as evidence that teachers lacked objectivity in their ratings of male students.

The severity of attentional problems can be significantly affected by situational and contextual factors, with ADHD children displaying incredible concentration for preferred tasks, while being highly inattentive to school tasks (Barkley, 1997). Therefore, school-based assessment and referral efforts should examine closely other factors that may be relevant to the attention of a child such as learning style and preferences for movement and interaction. It may be that such attentional differences represent socially and culturally different views of the world, learning, time, and cognition. Understanding the influence of variables such as learning style upon teacher's perception of attention or hyperactivity in children may provide valuable information that would allow these children to experience greater success within the regular education environment.

Statement of the Problem

There are several specific problems that are associated with the disorder known as Attention Deficit Hyperactivity Disorder that would lend themselves to educational research. First, this is a disorder that is seen most often within the school environment or related to school tasks. Difficulty sitting still, completing class work, turning in homework, speaking out without permission are all tasks that are classroom specific. Secondly, since the defining characteristics are so educationally oriented, it would seem prudent to look for cognitive deficits that are causing the behavioral difficulties. However, research aimed at identifying deficits in information processing, divided and selective attention, sustained

attention, and perceptual processing have failed to provide conclusive evidence that such a cognitive foundation for the disorder exists. Third, the diagnosis of this disorder is heavily dependent upon the subjective opinion of parents and teachers, via behavior rating scales based upon the diagnostic criteria described in the DSM-IV. Rarely are the expectations of the adults questioned, or other aspects of the home/school environment. Fourth, many gender and ethnic influences which may impact both the child's expressiveness, activity level, and general style of learning. Yet, little research has been undertaken to determine how these influences affect a child's attention, despite the fact that 80% of the students diagnosed with ADHD are boys (Breggin, 1998). Educational research is well suited to examine the relationships learning style may have with the symptoms of ADHD.

Purpose of the Study

The purpose of this study is to determine the relationship of learning style and gender to teacher ratings of students on subscales of attention and hyperactivity that frequently result in a diagnosis of Attention Deficit Hyperactivity Disorder. Style variables, as measured by the Learning Style Profile (Keefe, Monk, 1988), which are expected to relate to classroom attention and activity levels include 1) sequential processing skill, 2) verbal-spatial preference, 3) willingness to risk verbally, 4) preference for manipulative or kinesthetic instruction, 5) grouping preferences, and 6) mobility preferences. These style variables will be correlated to teacher ratings of student behavior on the attention subscale and the hyperactivity subscale. Gender differences will be examined through separate analyses. The ACTeRS Attention subscale consists of six items that solicit teacher ratings about the child's ability to

- | | |
|--------------------------------------|-----------------------------------|
| 1) work well independently | 2) persist with a task |
| 3) complete tasks unassisted | 4) follow simple directions |
| 5) follow a sequence of instructions | 6) function well in the classroom |

The ACTeRS Hyperactivity subscales consists of five items asking teachers to rate the student on the following activity level traits:

- 1) extreme overactivity
 - 2) overreaction
 - 3) fidgetiness
 - 4) impulsivity
 - 5) restlessness
- (Used with Permission of Metritech, Inc.,
Ullmann, Sleator, and Sprague, 1986) .

Significance of the Study

This study was designed to examine learning style/teacher perception relationships because of existing evidence of diagnostic difficulties related to this common disorder. Since teacher perception of inattention often results in diagnosis, more research is needed to determine whether the perceived inattention is the result of learning style differences. The results are expected to have theoretical and practical implications for the practice of school psychology related to the identification of students with attention problems and the development of interventions. Problems that have been identified include inadequate instruments, overlap in diagnostic criteria, confounding teaching/learning style variables, confounding intellectual variables, and cultural differences in attention and activity. The relationship of gender as it relates to style patterns associated with attentional problems will also be examined.

Research Questions

The following variables will be studied: gender as identified by demographic description; learning style variables of sequential processing skill, verbal-spatial preference, willingness to risk verbally, preference for manipulative/kinesthetic instruction, grouping preference, and mobility preference as identified by the Learning Style Profile; and teacher perception of Attention and Hyperactivity, using the ACTeRS scale.

The research questions for the present study were as follows:

Research Question #1:

Are there interrelations among student learning style, teacher rating of attention, and teacher perception of hyperactivity?

Research Question #2:

Are learning style to teacher perceptions relations similar for boys and girls?

Research Question #3:

Does student learning style (as measured by sequential processing skill, verbal-spatial preference, willingness to risk verbally, preference for manipulative instruction, grouping preference, and mobility preference) significantly predict teacher rating of attention?

Research Question #4:

Does student learning style (as measured by sequential processing skill, verbal-spatial preference, willingness to risk verbally, preference for manipulative instruction, grouping preference, and mobility preference) significantly predict teacher perception of hyperactivity?

Research Question #5:

Are predictions of teacher perceptions (attention and hyperactivity) based on the six student learning style variables similar for boys and girls?

CHAPTER II

REVIEW OF THE LITERATURE

While the diagnosis of ADHD remains popular with many educators, physicians, and parents, a few lone voices are beginning to question the validity of this disorder. This review examines Attention Deficit Hyperactivity Disorder and its relationship to students' learning style and gender influences. The review presents evidence of symptom overlap that may lead to etiological confusion and misdiagnosis.

Attention Deficit Disorder

History

The condition known today as ADHD (Inattentive or Hyperactive/Impulsive) has undergone numerous name changes throughout the years since it was first described. The name Minimal Brain Dysfunction was first used in the 1960's and 1970's to describe children who exhibited symptoms of hyperactivity, hypoactivity, distractibility, impulsivity, perseveration, and disorganization (Faas, 1980). Various causes were hypothesized at that time such as food colorings and flavorings (Feingold, 1975), allergies and sugar (Wunderlich, 1973), and fluorescent light bulbs (Ott, 1973). Ott suggested that these children may have chemical imbalances in their bodies, which he believed to be due to the filtering of life-giving rays of sunlight by windshield, eyeglasses, and window glass. Some of these ideas seem ridiculous today as knowledge about attentional disorders have increased. Many researchers during the last century speculated that ADHD had an underlying neurological basis. In reviewing the medical research on ADHD, researchers at the University of Georgia have concluded that while significant differences have been found in electrophysiological measures such as cerebral blood flow, positron emissions, and magnetic

resonance imaging, little progress has been made in definitively describing the exact location and nature of the disturbance (Riccio, Hynd, Gohen, & Gonzalez, 1993). Some studies implicate the frontal lobe (Zametkin et al., 1990), others the basal ganglia (Lou et al., 1989), and others even identify hemispheric size differences, with the right caudate being smaller in ADHD children (Hynd, Hem, et al. 1994). Clark, Geffen, & Geffen (1987) suggest that the neurochemical makeup of these children may be quite different from those of unaffected children.

Symptoms and Diagnosis

While the medical community searches for structural or biochemical evidence that disorder exists, the field of school psychology is charged with the task of improving educational decisions and interventions regarding these children. According to many experts the child with ADHD is often a difficult child to parent or teach. He or she displays inattention, impulsivity, and difficulty in maintaining "rule-governed behavior" (Kauffman, 1993, p. 291). There are problems with motivation. For example, they will often fail to do things asked of them even though the acts are clearly within their abilities (Barkley, 1990). These children may move constantly, argue with peers and siblings, use loud voices, talk rapidly and incessantly, make noises of self-stimulation, destroy their own things and those of others, lack predictability, require supervision until an older age, and exhibit flightiness and disorganization (Wender, 1987). The symptoms of true ADHD are not mild or subtle. Kauffman (1993) describes them as abrasive behaviors that may make other adults and children alike exclude this youngster from their presence. They sometimes have coexisting learning disabilities (Kauffman, 1993).

While some extreme cases of ADHD are diagnosed prior to school entrance, the vast majority are identified during the early years of formal education. The teacher, counselor, or school psychologist may play a role in making referrals based on classroom

observations of behaviors felt to hinder academic progress. The official diagnosis and management of ADHD is generally handled by a physician, often the child's pediatrician. In addition to the pediatrician, the child may sometimes be seen by a child neurologist, a child psychiatrist, or a developmental pediatrician. Frequently the treatment includes the introduction of stimulant drugs such as ritalin even though the use of these medications have been shown to have no short-term or long-term benefit to the child's learning (Breggin, 1998).

Prevalence of ADHD

The estimated prevalence of diagnosed ADHD is set at about 3 to 5% of the school-age population (DuPaul, Guevremont, & Barkley, 1991). Boys are about three times more likely to exhibit symptoms of ADHD (Wender, 1987). Few studies have examined sociological factors related to the diagnosis of ADHD. Barkley (1995) lists the following risk factors associated with ADHD: 1) less education of the mother, 2) lower social class of the parents, 3) single parenthood, 4) abandonment of the family by the father. He points out that these factors produce a slight elevation in risk but do not cause ADHD. A study by Offord, Boyle, & Racine (1989) found that the following factors had significant relationships (from lowest to highest): low income, family dysfunction and chronic illness (tied for second), gender (male), and age (12-16). Research on the relationship of ADHD to socio-economic level, however, has been contradicted in a study by Shekim, et al. (1985). Based on evidence that an overrepresentation of minority children in special education classes has been found to exist as a result of differences in socio-economic status (SES), the potential exists for such overrepresentation of minorities referred for ADHD problems (McKinney, 1993). Research in this area is lacking, so more study is needed to fully ascertain the impact of SES on the prevalence of ADHD. Despite the fact that ADHD symptoms may be more common among lower SES populations, ADHD has been termed a middle class condition,

due to the fact that the middle and upper class youngster is more likely to be taken to a physician, diagnosed, and thus, receive pharmacological intervention (Evans, 1994).

Learning Characteristics of ADHD Children

In terms of what children diagnosed with ADHD may expect during their school careers, research shows that they experience more grade retentions, receive lower grades for school work, are more likely to be identified for special education classes, and to receive more tutoring (Biederman, Newcorn, & Sprich, 1991). They are more likely to be suspended or expelled from school (Barkley, 1990).

While learning style research is sparse, several studies have shown children with ADHD to have characteristics that differentiate them from the average learner. Zentall and Smith (1992) found that ADHD students were more likely to be social and kinesthetic learners. ADHD students are more likely to have mixed laterality and allergies. They were found to use more diverse nonverbal information and poorly focused information (Shaw, Brown, 1991). Gifted children have been found to be at risk of overidentification due to an overlap in symptoms with ADHD (Webb & Latimer, 1993). The restlessness, impulsivity, inattention, high activity level, and daydreaming that is often associated with ADHD may occur in gifted students, should they find themselves in educational environments where boredom or mismatches of learning style and teaching style exist (Webb & Latimer, 1993). Like the gifted child, the ADHD student may have many learning strengths that are going unnoticed while the nation focuses obsessively on what these students cannot do. Armstrong (1997) found that few studies researched the learning strengths of ADHD students. Those that exist suggest that children with ADHD often display tremendous creative energy, global thinking, flexibility, and visual memory strengths. He maintains that these children are underaroused, appearing to require more environmental stimulation than the average child. It is worth remembering that these students were highly successful learners for five years prior to their public school entrance. Many were so successful, that

they arrive on the school scene both gifted and ADHD. Yet their weaknesses are the overriding focus, not their strengths.

ADHD and Perceptual Deficits

Researchers have been diligently investigating the possibility of perceptual deficits, cognitive deficits, and deficits of sustained attention for the last ten years in hopes of finding the differentiating characteristic that will allow for a more objective diagnosis of students with attentional difficulties. For example, Leung and Connolly (1994) found that hyperactive students had significantly more target errors in a visual search task than controls or students with a dual diagnosis of hyperactivity and conduct disorder. In this experiment, the students had to wait without responding until the target was presented. The researcher, however, suggested the possibility that poor subject performance may have been related more to their vulnerability to underactivation during these wait periods than inadequate processing ability.

Other attempts to document visual processing difficulties for ADHD children have failed to find significant differences in ability or performance. The Continuous Performance Task has been used in attempts to document deficits in sustained attention. These research attempts were reviewed by Corkum and Siegel (1993) who found that while there were consistent indications of arousal deficits in ADHD children, they concluded that there was no compelling evidence of sustained attention deficit. There is evidence that these students' performance is poorer than controls. The authors admitted, however, that three different psychological resources are tapped when a child is completing the Continuous Performance Task (CPT): arousal, activation, and effort. One of these variables may in fact be deficit, and it may be useful to use the CPT as a research tool to determine the effects of each of these contributing variables. But until the precise mechanism can be identified, the CPT cannot be used to identify a single concept of sustained attention. Swanson, Shea, McBurnett,

Potkin, Fiore, & Crinella (1990) also concluded that defective information processing mechanisms cannot be found in ADHD children.

A study designed to investigate the theory that the low latency/high error response pattern of ADHD students is an attempt by the student to finish the visual search task quickly, found that the number of errors remained unchanged whether the students rate of response led to quicker test completion or not (Sonuga-Barke, Houlberg, & Hall, 1994). This led the researchers to conclude that some other variable, perhaps a motivational variable, was responsible for the lack of effort toward reducing errors. Again the hypothesis seems to point to the possibility that the student is motivated to maximize his levels of stimulation rather than concentrate on the correctness of response.

In terms of auditory processing abilities and preferences, students with ADHD have been found to have more difficulty with selective listening when initial instructions were very detailed or descriptive (Zentall, 1993). When such is the case, does this tendency reflect inattention or problems with short-term auditory memory?

Other Influences on Attention and Activity

Culture is also proving to be an important consideration when examining the classroom attentional difficulties of children. Examining the environmental variables of class presentation, classroom management, and teacher style may be as important as the intrachild variables currently assessed. As one of the most culturally diverse nations in the world, assessment practices should be ever mindful of how differences related to culture can be misinterpreted by the dominant culture. Learning styles and behavior patterns that are considered problematic in a typical classroom, may represent strengths within a given child's culture. The holistic, cooperative, and abstract learning styles that have been found to characterize the Native American learner, for example, may represent strengths that have been important to the survival of their people for thousands of years. Consider the work of

Tucker and Williamson (1984) who theoretically propose two systems at work in the human brain, an activation system and a vigilance system. The latter may be involved in the ADHD and the culturally different child's inappropriate attention to novel stimuli. It may be important to examine the reasons for this from a cultural standpoint.

Pontius (1993) tested the spatial abilities of a hunter-gatherer group from Indonesia known as the Dani. In assessing the Dani, it was found that they displayed intense curiosity and attention. Though they made errors on the Kohs Block Design, the errors were not considered random errors. The errors made sense within the environmental context of these people. Pontius suggested that the errors reflected the need to quickly assess overall configuration, much as they would need to do in the native environment in which they lived. She referred to these as preattentive features that need to be assessed as strengths within a population before diagnosis of disorder is appropriate.

ADHD- Diagnostic Problems

Comorbidity of ADHD and Other Disorders

The amount of medical research in this area is overwhelming, much of it involving examining the effectiveness of various medications, cognitive/behavioral therapeutic techniques, and neurochemical evidence of disorder. However, it is important to note that, while the research suggests the presence of a neurological basis for ADHD, the findings have not yet been able to provide the practitioner with a medically sound way to obtain a differential diagnosis. Without medical tests (blood, urine, brain scan, etc.) that can be used to definitively identify the presence of attention disorders, psychologists and physicians are forced to diagnose this condition on the basis of behavioral manifestations.

The issue of differential diagnosis is important one, due to fact that symptoms associated with ADHD are also associated with a host of other psychiatric and medical disorders, such as depression, fetal alcohol syndrome, and attachment disorders,

oppositional defiant disorder, conduct disorder, etc. (DSM-IV (1994), Brown, et. al., (1991), Abel (1984). One of the nagging difficulties associated the diagnosis of attention problems is that, despite decades of effort by medical researchers, the biological etiology for ADHD remains inconclusive and contradictory (Jacobvitz, Sroufe, Stewart, and Leffert, 1990). Sabatino and Vance (1994) examined 75 children who had a previous diagnosis of ADHD (based on DSM-III diagnostic criteria). Upon reexamination, one-third of the children had been reclassified with other mental disorders, leading these researchers to conclude that 8 of the 14 ADHD symptoms were diagnostically useless due to comorbidity tendencies.

Children diagnosed with ADHD (combined) are more likely to be diagnosed with Oppositional Defiant Disorder and Conduct Disorder than children diagnosed with ADHD (inattentive) or controls. Furthermore, ADHD (inattentive) groups have been shown to have significantly higher ratings on internalizing problems than ADHD (combined) or controls (Eiraldi, Power, & Nezu, 1997). Genetic studies, looking at familial and psychosocial risk factors associated with ADHD, have found that ADHD and mood disorders share many common familial vulnerabilities, leading some researchers to suggest that the disorder known as ADHD may, in fact, be a group of closely related conditions, rather than one single condition (Biederman, Faraone, Keenan, Benjamin, et.al., 1992).

Others have suggested that the ambiguous nature of the diagnostic criteria is felt to result from the current state of neurological science and the limited understanding that exists regarding the etiologies of the attention mechanisms. This overall lack of understanding further confuses the identification of ADHD by impacting the ability of researchers to develop diagnostic instruments with adequate construct validity. This combination of poor instruments, based on poor understanding, leads to diagnostic problems (Lyytinen, 1995).

Responsible practitioners attempt to counteract diagnostic difficulties by using measures of continuous task performance, neurological soft-signs, and evidence of learning

disabilities, in an effort to find some empirical evidence of disorder, beyond the opinion of some adult in the child's life. However, many physicians continue to make an inferential diagnosis on the basis of parent reports, teacher reports, and rating scales. Not only is the possibility of rater bias extremely high, the limitations of the behavior rating scales used for this purpose are many. In addition to the symptom confusion already mentioned, many of the rating scales used for the purpose of diagnosing problems of attention are not construct pure, resulting in the confusion of attention/motivation and hyperactivity/ conduct disorder (Oehler-Stinnett, 1995). This fact alone has caused ADHD to be overidentified among students with behaviors associated with Oppositional Defiant Disorder, even though the conduct problems were correctly identified. Research indicates that when the child's oppositional tendencies are directed toward the teacher, the teacher may inappropriately attribute the misbehavior to motor excesses (Abikoff, Courtney, Pelham, & Koplewicz, 1993).

Secondly, these rating scales are sometimes producing prevalence rates of 15% to 30% among the school-aged population (Taylor et al, 1990, & Shaywitz & Shaywitz, 1988). When the DSM III criteria was first established, the authors expected rates of approximately 3%, which would place it in line with other disorders. The high prevalence rates suggest that the criteria is so vague and subjective that normal children are frequently identified (Swanson, Shea, McBurnett, Potkin, Fiore, and Crinella, 1990). The task of the diagnostician is to identify the child whose behavior is truly outside normal limits, so that appropriate interventions (whether environmental or pharmacological) may be instituted.

ADHD Diagnosis Across Cultures

It has been noted that when ADHD scales, developed in the United States, have been applied across cultures worldwide, ADHD referrals have mushroomed. In examining the use of such instruments in Costa Rica, DeBoard (1996) found that classroom and teacher variables may confound the interpretations when used with students in other

minimally trained teacher. The typical Costa Rican classroom utilizes rote learning of specific knowledge which students are then expected to copy into notebooks for memorization and regurgitation. Classroom rules are quite strict and there is little opportunity for interaction, creativity, or mobility. In this educational environment, any child who wiggles or twiddles his thumbs is often viewed as hyperactive. Using rating scales developed in the United States, many children are being identified ADHD. High referrals rates to psychologists, neurologists, and physicians are causing concern. It warrants reconsideration of Reid and Maag's (1994) thought-provoking title "How Many Fidgets in a Pretty Much?" While it is clear that the answer is exacerbated when culture is a factor, these considerations are just as relevant within United States borders, as the cultural diversity of this country increases.

In a study of 2680 children designed to identify racial and ethnic distributions of disturbed child behavior patterns in the United States, Edelbrock and Achenbach (1980) found that Black males, ages six to eleven were more likely to be diagnosed hyperactive. Teachers, in particular, rated Black children considerably higher in terms of hyperactivity compared to other ethnic groups (Lambert et al. 1978). Eaves (1975) also found that white teachers consistently and significantly rated the behavior of Black and White children differently, with Black children's behavior being rated more abnormal.

Though these studies are beginning to age, newer studies have shown similar results. It seems that Puerto Rican children are also at risk of being diagnosed with ADHD at alarming rates (Bauermeister, Berrios, Jimenez, Acevedo, and Gordon, 1990). According to these researchers, this is due, in part, to cultural behavioral patterns that manifest more body movements, gestures, and facial expression. For example, Hispanics tend to have closer interpersonal space, touch more, move their eyes more, and focus less on their listener's face. The Bauermeister study also used a Spanish scale based on the criteria symptoms of

ADHD, and the Gordon Diagnostic System, a computerized test of inhibited response. Results indicated significant differences in performance for 6 to 9 year old children when compared to U.S. children of the same age. These researchers believe that biased assessments could occur due to the questionable validity of the diagnostic criteria for anyone whose cultural background differs from the one in which the criteria was established.

Learning Styles

Learning Style History

As early as 1878, Kussmaul identified individuals who exhibited word deafness or word blindness, primitive terms for auditory or visual processing problems. The emphasis at this time was not on learning styles or teaching techniques, but merely on the description of learning problems. James Hinshelwood, 1917, further clarified this definition as congenital word blindness and noted that those afflicted had otherwise normal and undamaged brains. Samuel Orton, an American neurologist during the 1930's began to study this phenomenon in greater detail, noting the reversals of letters or words in the reading process by some individuals. He investigated laterality issues related to handedness and eye dominance and noted a family history for such learning problems. Orton, along with Anna Gillingham pioneered a method of instruction for such children that centered on the use of auditory, visual, and kinesthetic elements to form a language triangle, thereby allowing the acquisition of sound - symbol relationships (Miles & Miles, 1990).

With this recognition that children learn differently and that they should be taught differently, began the field of learning disabilities. However, as the years progressed, it was also recognized that each of us possesses an individual learning style or set of preferences whether disorder exists or not. Learning style considerations are extremely important when seeking to improve academic performance and promotion rates.

In this section perceptual and cultural style variables associated with learning will be examined. Empirical evidence will be provided demonstrating the influence of biological and environmental factors on a child's learning style. Potential effects on inattention and hyperactivity will be discussed.

Factors Associated with Style

Some feel that inattention cannot easily be divorced from the literature on information processing. Letteri (1982) suggests a theoretical model for information processing that demonstrates how learning might occur through a six phase process. Phase One is the Perception Mode which involves the sensory input being received and the way it is translated into neural codes for further processing. Phase Two is Perceptual Memory which describes the perceptual memory trace which prepares the input for quick decisions about the nature of the information and storage options. Phase Three is the filter system which determines whether the information is cognitive or affective in nature and prepares a course of action. It might reject the message, memorize the message, transform the message, or learn the message. Phase Four place the input in short-term memory (a brief and limited storage capacity). Phase Five incorporates maintenance rehearsal and elaborative rehearsal to establish a working memory which will produce a changed cognitive structure for the individual. This is genuine learning in that new information is added to the memory store, existing memory has been clarified in some way and differentiated from other similar concepts. Phase Six places the information in long-term memory, a type of hierarchical storage system that undergoes constant change through the addition of new data. The deficits of attention that serve as criteria for Attention Deficit Hyperactivity Disorder suggest that the cognitive trace is somehow disturbed so that the student cannot focus long enough, or divide attention efficiently enough to operate effectively across multiple situations.

Using this model as a basis for understanding learning, learning style is then described by Keefe (1979) as a combination of cognitive, affective, and physiological variables that are indicative of how individual students perceive, interact, and respond to their learning environment. In his model, learning is divided into cognitive, affective, and physiological styles. Cognitive style factors represent the information processing variables. Affective styles represent motivational processes, such as attention, expectancy, and incentive. Physiological factors are related to environmental learning preferences that may be biologically based.

Possible Multicultural Influences

Children's first learning experiences occur within context of the family, home, and cultural community in which they live. Because of this, it is not unexpected that educators would hypothesize that learning style might have a cultural component. Numerous studies have investigated the effect of learning style upon the educational success of students who grew up in non-dominant cultures. Backes (1993) examined the learning styles of two groups of American Indian students, those who successfully graduated and those who dropped out of school and the styles of non-American Indian students who graduated or dropped out of school. Using the Gregorc Style Delineator (Gregorc, 1982), the dominant learning style of American Indian students, both graduates and dropouts, was Abstract Random. The dominant learning style of both groups of non-American Indians was Concrete Sequential. No significant differences were found between Indian dropouts or Indian graduates. The Abstract Random learning style found to dominate among this group is related to deductive, holistic learning, most responsive to teaching that is indirect. This style is contrary to the typical teacher dominated classroom and the sequential presentation of material. One limitation of interpretation of the results of this study relates to the fact that significant differences were not found between graduates and non-graduates, indicating that some other factor contributed to the drop out decision.

A 1986 study conducted by Hale (formerly Hale-Benson) suggests that cognitive traits derived from the African culture place the African American child at risk in classrooms that embrace the dominant culture. The researcher described the learning styles of African American children as being Person-Centered, Affective, Expressive, and Movement-Oriented. Person-Centered learners (similar in definition to field-dependent learners) are more deeply affected by criticism, need more structure in the learning environment, and look to the teacher for direct instruction, getting fewer clues from spoken and written language. Affective style refers to the tendency of these children to be more feeling oriented than white children. They place greater importance on personal and culturally induced belief systems than they do logic. They tend to prefer working cooperatively over competitive learning. They prefer and work better for teachers who give them a lot of positive feedback, attention, and extra help with their schoolwork. The Expressive style of these children describes their preference for uniqueness. Dressing and behaving in a style that is uniquely their own is highly valued in the African American culture. The dominant culture is often specifically opposed to the expressive nature of black children. Finally, these children are reported to be Movement-Oriented. The homes of these children tolerate much more movement than do the homes of white children. Continual movement is even encouraged in these homes as a means of developing the expressiveness described above. Conversations within African American homes are continuous and overlapping. These homes are full of stimuli. Hale advises that teachers who allow free movement and conversation in the classrooms will develop a better relationship with black students and contribute positively to their feeling of competence in the classroom.

ADHD and Learning Style

Examination of Letterri's theory suggests that factors related to attention and hyperactivity (which would include students diagnosed with ADHD) may relate to variables of learning style, an area frequently overlooked in the process of evaluating children for attentional problems. While style variables could provide an important basis for educational interventions, it was not examined in any of the ADHD studies reviewed. Anecdotal evidence of learning style differences in ADHD students is sometimes presented, primarily in publications that target parents and teachers. However, empirical evidence appears to be lacking. Since this study is examining the relationship of learning style variables to ADHD criteria, the Learning Style Profile (National Association of Secondary School Principals - NASSP) by Keefe and Monk (1988) is being selected. This instrument, as well as information regarding its development, will be described in this section.

The Learning Style Profile (Keefe & Monk, 1988) includes learning style variables that are expected to fluctuate in relation to attention and hyperactivity problems, based on diagnostic criteria for Attention Deficit Hyperactivity Disorder, case-study information, and previous research in perceptual and processing differences in ADHD children. This second generation learning style instrument developed by National Association of Secondary School Principals Task Force (Keefe, 1988) is designed to measure style variables in secondary students. The Task Force sought to develop an instrument that went beyond those available at the time by describing the substrates of learning styles in a format that was performance based, by examining a variety of components from a multidisciplinary perspective. Based on the previously described information processing model of Letterri (1982) and the generative process model of Osbourne and Wittrock (1983), the task force developed a set of items designed to describe individual differences in information processing, storage, and analysis across cognitive, affective, and physiological dimensions.

The Learning Style Profile (Keefe & Monk, 1988) examines not only differences in the way students receive information, but also differences in the way they bring these perceptions together for analysis. Keefe (1988) reports that the NASSP Task Force, in making decisions regarding the Learning Style Profile, placed the perceptual preferences in the cognitive dimension but included other functions such as field independence/dependence, simultaneous and successive processing, and inductive/deductive reasoning. It also included active/reflective thinking, thinking/feeling, need for structure, sharpening/leveling, focusing/scanning, narrow/broad, reflective/impulsive thought, and complex/simple reasoning. The degree to which these underlying cognitive processes and preferences affect school performance is unclear. However, several of these aspects of cognition sound suspiciously similar to processes considered deficient in the ADHD child.

A few studies have examined the relationship of ADHD and learning style preferences. Zentall and Smith (1992) found that ADHD students reported that they preferred social and activity stimulation while learning, suggesting that ADHD students may require active learning environments that stimulate them and keep their arousal rates high. Mantzicopoulos and Morrison (1994) found that at-risk ADHD students had significantly lower scores on the mental processing scale and the simultaneous processing subscale than students in the control group. This suggests that they may have difficulty scanning information available and relating it to complex concepts being taught.

Differences in learning style may be found to be an important factor in both motivation and attention, which, in turn, affects academic achievement. Therefore, in considering a diagnosis of ADHD, school psychologists should investigate the extent to which the diagnostic criteria of ADHD merely represent style variables associated with learning fluctuating on the normal curve.

Educational consultant, Jeffrey Freed (1997), working with gifted and ADHD students in private practice, strongly argues that ADHD is primarily an issue of style. His

experience suggests that students diagnosed with ADHD are strongly visual, sensory, holistic learners who find that their learning styles are at odds with the linear, sequential style of most classroom teachers. He cites anecdotal evidence from his own practice and that of other clinicians, but admits that empirical evidence is currently lacking to prove its existence. The current study seeks to begin building empirical evidence for this phenomenon. Should a significant relationship be discovered between the style variables and ADHD, this may suggest a contextually driven evaluation of inattention in the classroom, with the school psychologist's assessment looking for a disordered environment as carefully as it looks for within-child pathology. It expects to provide information about the strongest style predictors of ADHD symptoms and the variability of this pattern for girls and boys. Furthermore, a significant relationship may indicate a need to include an evaluation of learning style when completing psycho-educational and psychological evaluations.

Personality and Psychological Type Considerations

ADHD students may also have differences in psychological type that account for difficulties within the typical American classroom (Johnson, 1998). Psychological type, based on Jungian theory, represents the attitudes and functional preferences of individuals across four dimensions. These four bipolar dimensions (Extroversion/Introversion, Sensing/Intuition, Thinking/Feeling, and Judging/Perceiving) help form an individual child's predisposition to react and behave in certain ways (Meisgeier, et. al., 1989). Conflicts in psychological type between students and teachers may contribute to the symptoms of inattention and hyperactivity typically associated with ADHD (Keirse, 1998). This may give the appearance of pathology where none exists.

In conclusion, controversy continues concerning the diagnostic condition Attention Deficit Hyperactivity Disorder. Additionally, there appears to be wide-spread agreement that the instruments and procedures currently being used to diagnose ADHD are

inadequate, prone to bias and misuse. There is evidence that perceptual, psychological type, cultural, and information processing variables may influence the development of a student's learning style and that significant learning style differences may conflict with the instructional environment in many classrooms across the country. Clinicians can provide ample case study evidence that ADHD children have learning styles that are in variance to the mainstream of education in this country. However, few studies exist to prove the relationship. It seems clear that the relationship between learning style and the ADHD symptoms need to be examined. Millions of students across the nation are being diagnosed and treated pharmacologically for this disorder. If learning style and gender are important factors in the manifestation of the symptoms of this condition, a learning style inventory should be an important part of every ADHD evaluation. It is the intent of this study to examine the relationship of these variables to teacher perception of attention and hyperactivity.

CHAPTER III

METHOD

The purpose of this study was to examine the relationship between learning style and teacher perception of student attention and hyperactivity, with deficits in attention and excesses in activity level forming the diagnostic basis of the disorder known as Attention Deficit Hyperactivity Disorder. This chapter reviews the study variables, and describes subject selection, study procedures, and research instruments. Null hypotheses for this study are stated.

What is the influence of learning style and gender to problems of inattention as associated with ADHD (Inattentive type) and to problems of hyperactivity associated with ADHD (Hyperactive/Impulsive type) among students at the sixth grade level? How well does the learning style of a child predict the identification and diagnosis of ADHD? Which style variables are most predictive of ADHD symptoms? Variables expected to predict teacher perception of behavior abnormality will include six learning style variables: Sequential Processing Skill, Verbal-Spatial Preference, Verbal Risk Orientation, Manipulative Preference, Grouping Preference, and Mobility Preference. Gender differences will be addressed through separate bivariate and multiple regression analyses.

Subjects

Approximately 150 sixth grade students from a suburban school district in northeastern Oklahoma were invited to participate in the study. All students of the sixth grade in two selected schools from the Sand Springs Public Schools were solicited to participate in the study without regard to ADHD status. Each sixth grade class were read the verbal script (Appendix A) as a group to explain the nature of the study. All questions or concerns were addressed in group format. Each child received an envelope containing 1) a written explanation of the

study (Appendix B), 2) the parent consent form (Appendix C), and 3) the student assent form (Appendix D). The students were asked to take the envelope and contents home, discuss their participation in the study with their parent(s), and return the consent and assent forms to the school. In other words, parent and child made the participation decision together.

The school system from which the sample was solicited was a predominantly middle class suburban community just west of Tulsa, Oklahoma. The sample (51% male, 49% female) included students who are considered normal, as well as students who have been identified ADHD, learning disabled, or gifted. The sixth grade students ranged in age from 11 to 13 years of age. Demographic information obtained by student report provides the following ethnic composition of the sample (Table 1):

Table 1

Percent of Sample by Ethnicity

<u>Ethnic Group</u>	<u>Percent of Sample</u>
Caucasian	78.2
African American	2.7
Native American	9.0
Hispanic	.9
Asian	.9
Other	3.7
Did not respond	<u>4.6</u>
Total	100.0

Teacher respondents charged with rating student attention and hyperactivity included four females and three males. Of the seven, one teacher had less than five years experience, one had five to ten years experience, and five had been in the field of education more than ten years.

Due to the fact that parent permission is needed for participation in the study, as well as the fact that sampling will occur within selected schools within one district, the sample cannot be considered random and thus limits the generalizability of the results.

Research Instruments

Learning Style Profile

Learning Style was measured using the Learning Style Profile (Keefe, Monk, 1988). It is published by the National Association of Secondary School Principals (NASSP). This instrument was selected because of its design, which fits the Letterri model described in chapter two. Its inclusion of cognitive, affective, and physiological items produced a profile that examined not only study and instructional preferences, but processing strengths, memory, and cognitive styles.

The one-hundred, twenty-six item instrument was factor analyzed through varimax rotation, which produced a nineteen factor, a twenty-five factor, and a four factor solution. The distillation of the data yielded an instrument that measures the following subscale areas: Analytic Skill; Spatial Skill; Discrimination Skill; Categorization Skill; Sequential Processing Skill; Memory Skill; Simultaneous Processing Skill; Perceptual Response for Visual, Auditory, and Emotive; Persistence Orientation; Verbal Risk Orientation; Manipulative Preference; four levels of Study Time Preference; Verbal-Spatial Preference; Grouping Preference; Posture Preference; Mobility Preference; Sound Preference; Lighting Preference; and Temperature Preference.

Selection of Study Variables

The six subscales of the Learning Style Profile (Keefe & Monk, 1988) that were felt to hold the most promise based on the behavioral characteristics of ADHD children are the subscales dealing with Sequential Processing Skill, Verbal-Spatial Preference, Verbal Risk Orientation, Manipulative Preference, Grouping Preference, and Mobility Preference. Student performance on these subscales will be correlated with teacher ratings for inattention and hyperactivity using the ACTeRs scale.

Validity Evidence Evidence for validity on each of the selected study variables was obtained from the Learning Style Profile Technical Manual (Keefe & Monk, 1988). The manual cited the sequential/simultaneous dimensions associated with Luria's work (Luria, 1973) as the basis for the items included in the Sequential Processing subscale. Items for this scale included puzzle pieces of different sizes and shapes arranged in varying combinations. In each combination, one of the original puzzle pieces is missing. The student was asked to analyze each new figure to determine which puzzle piece is missing.

The Verbal-Spatial Preference subscale consists of six items which assess a student's preference for verbal or spatial meaning within the same task. This scale was found to be highly independent of cognitive processing scales. For example a student may score in the superior range for sequential processing ability, score only average for simultaneous processing, but may still prefer spatial tasks to verbal ones. Validity grew out of exploratory and confirmatory factor analysis of items written to assess auditory/verbal or visual/spatial skills and preferences. No concurrent or predictive validity studies had been conducted for this subscale at the time of publication. Items consisted of words embedded into various shapes. The words were related to each other in some way, and the shapes were also related to each other. The student was asked to indicate whether they like the words or the shapes better.

The Verbal Risk Orientation subscale was made up of four items derived from exploratory and confirmatory factor analysis of items written to assess anxiety, risk taking, and extraversion/introversion traits based on Jung's psychological type theory (Myers & McCaulley, 1985). The manual did not report any concurrent or predictive validity studies for this subscale. One item asked the student to identify how often they "bring up ideas in class that are different from my classmates".

The Manipulative Preference subscale was made up of four items derived from exploratory and confirmatory factor analyses to items written to assess tactile or kinesthetic preferences. It measured instructional orientations rather than perceptual or cognitive orientations. Items such as "I like to make things with my hands" comprised this scale.

The Grouping Preference subscale consisted of five items based on factor analytic studies establishing a strong factor structure and internal consistency. A moderate but significant correlation exists between this subscale and the Learning Style Inventory Learning Alone/Peer Oriented Scale (Dunn, Dunn, & Price, 1985). It includes preference questions such as "I would enjoy some of my school work more if I had a chance to work with one other student".

The last select subscale, Mobility Preference, was also derived from factor analytic studies. This subscale, consisting of five items, correlated strongly to the Learning Style Inventory's Needs Mobility scale, (Dunn, Dunn, & Price, 1985). Also an instructional preference scale, it assessed the students tendency to move about and take breaks while studying through Likert-type questions.

The subscale Persistence Orientation was avoided because task impersistence is part of the diagnostic criteria for ADHD. The Simultaneous Processing scale was not used due to reliability and validity problems with that particular scale. Internal consistency has been low in at least three revisions of the Simultaneous Processing scale, with alphas ranging from

-.08 to .29. Though this was an area of interest with regard to learning style, this particular scale lacked the reliability needed for inclusion in this study.

The Learning Style Profile (Keefe & Monk, 1988) was normed on 4,871 American students at the secondary level. The data included responses to all items except the Categorization subscale which was completely rewritten after examining the normative data. That subscale was normed again using a total of 3,862 students from grades six through 12. A two group test-retest reliability study was completed at 10 and 30 days with 483 students participating. Concurrent validity studies were conducted to correlate the Learning Style Profile to the Group Embedded Figures Test, the Edmonds Learning Style Identification Exercise, and the Learning Style Inventory (Dunn, Dunn, & Price, 1985). These instruments were chosen for validity studies because the Learning Style Profile is comprised of mixture of perceptual, verbal, and study preference items that were similar to items from these three instruments. Numbers of students participating in these correlational studies were seventy-eight, ninety, and ninety-five, respectively. Data from the first administrations of the instrument in schools across the country yielded a total of 13,268 students who are represented in the analysis of the data. Distributions for grade, gender, and race were analyzed on the basis of student supplied information, therefore a percentage of data is missing in each category because students chose not to respond to demographic questions (Keefe, Monk, 1988).

Individual item responses were broken down by grade and gender for the sake of comparisons. Mean, standard deviation, standard error, kurtosis, and skewness is reported for each subscale. Internal consistency was calculated using Cronbach's alpha and is reported for each selected subscale (Table 3). Test-retest reliabilities were calculated for each selected subscale with approximately 200 subjects in each test-retest group (Table 3). These values suggest moderate levels of consistency in the internal structure of the scales as well as the tendency of the scales to yield similar results when repeated ten days later. A

complete list of the internal consistency and test-retest values for all twenty-one subscales is provided in Appendix E.

Table 2:

Internal Consistency and Test-Retest Values for Learning Style Profile

<u>Subscale</u>	<u>Alpha</u>	<u>Test-Retest(10 Day)</u>
Sequential Processing	.72	.54
Verbal-Spatial Preference	.76	.58
Verbal Risk	.55	.77
Manipulative Preference	.69	.82
Grouping Preference	.64	.74
Mobility Preference	.64	.58

Multiple factor analyses were performed on the Learning Style Profile. The reason for two different factor analyses was that the perceptual response subscales tended to fragment more than other subscales, due to the fact that all three perceptual response subscales (visual, auditory, and emotive) draw from the same 20 items. The technical manual indicates that this tends to skew the distribution of the initial correlational matrix to a significant degree when factor analyzed. Therefore, the authors of the profile ran one factor analysis with the perceptual response subscales and one without. In addition they performed a higher order analysis with the subscales as variables. This yielded four second order factors: Cognitive, Perceptual Response, Study Preference, and Instructional Preference.

Based on the literature reviewed in chapter two and descriptive information from the Learning Style Profile Technical Manual (Keefe & Monk, 1988), the six style characteristics that have been chosen for this study correspond to evidence regarding perceptual preferences, psychological type, and information processing. The Verbal-Spatial

task Preference, Mobility, and Manipulative subscales were chosen to represent movement differences and perceptual preference traits. Verbal Risk and Grouping subscales are being chosen to measure traits that may be associated with multicultural traits as well psychological type, and the Sequential Processing subscale is measuring information processing style. These six subscales are predicted to vary with teacher perception of attention and hyperactivity.

ADHD Comprehensive Teacher's Rating Scale (ACTeRS)

The ACTeRS (Ullmann, Sleator, and Sprague, 1991) is a brief (24 item) behavior rating scale with items arranged according to four factors: Attention, Hyperactivity, Social Skills, and Oppositional Behavior. The prototype version of the ACTeRS contained 43 items that measured teacher observed behavior. The items were arranged in random order. This original version was administered to a normative sample of 1,339 children, kindergarten through fifth grade. This sample also included children with mild mental handicaps. The correlations from this prototype were subjected to a principal components factor analysis which yielded a four-factor solution. Items that loaded .33 or higher on more than one factor were considered complex and were eliminated. Factor loadings for the items that were retained in the scale ranged from .52 to .91. The authors claim that the final form, a brief 24 item scale, is factor pure by accepted standards, meaning that each subscale has a high degree of factorial independence, high internal consistency, and test-retest reliability (Ullmann, Sleator, Sprague, 1991). This instrument was chosen for the current study because of its brevity, its factor purity, and the items clear relationship to DSM-IV diagnostic criteria. Since teachers will be asked to rate up to 25 students each, the more brief and pure the criteria, the less teacher resistance expected.

Norming The ACTeRS was initially normed on 1,339 student from kindergarten through fifth grade. In 1989 the norms were expanded to include students through the eighth grades. While students were still sampled at the lower grades to further stabilize

those norms, the heaviest sampling during the second phase came from grades six (N=518), seven (N=448), and eight (N=493). The final sample consisted of 2,362 students from 23 schools who had been rated by a 84 different teachers. Further demographic data was not provided in administration manual. Results from both norming samples were factor analyzed and both the initial and expanded samples yielded four independent factors which remained stable even when the older students were added. Standardization tests found that differences between ratings of boys and girls on each subscale were highly significant. Age and grade related trends were not as significant. The test-makers remind the test user that teachers make the ratings and adjust their ratings to match their knowledge of a particular grade or age range.

Validity Evidence While information about the validity of the ACTeRS scale is sketchy, the items comprising the Attention and Hyperactivity subscales correspond closely to the DSM-IV diagnostic criteria. Additionally, evidence of validity has been established by Douglas (1980) who found that the scale significantly differentiated between ADHD and learning disabled students. In another study, (Peoples, 1989) the scale has been successfully used to uncover evidence of deficits in high-order processes located within late-maturing brain structures. He used the ACTeRS to find three groups (Attention Disorder, Learning Disabled, and Normals) differing significantly beyond the .001 level on both the Attention and Hyperactivity subscales. Finally, the ACTeRS scale has shown dramatic sensitivity for monitoring dosage levels for methylphenidate, the most commonly prescribed medication used in the treatment of ADHD (Ullmann & Sleator, 1985).

Reliability Evidence Reliability of the ACTeRS subscales was evaluated for internal consistency using the coefficient alpha, for test-retest consistency, and for interrater consistency. Internal consistency values for the selected subscales are considered very strong, meaning the items of each subscale held together well when applied to the children

in the standardization sample. The internal consistency coefficients for the final (larger) standardization sample yielded the following coefficients:

Attention	.97
Hyperactivity	.95

Test-Retest method, based on data from 80 boys and girls, yielded the following moderately strong coefficients:

Attention	.78
Hyperactivity	.81

Interrater reliability, based on data from 124 boys and girls each rated by two teachers, was judged in the moderate range as evidenced by the following coefficients:

Attention	.61
Hyperactivity	.73

Procedures

Students were rated by a core subject teacher using the Attention subscale of the ACTeRS, consisting of items one through six and the Hyperactivity subscale, items 7-11. The core homeroom teachers were selected to complete the ACTeRS rating because of concrete-sequential instructional style usually seen in these subject areas. Differences in style versus perception of Attention Deficit Hyperactivity Disorder may show up more clearly within these structured classroom environments than they would in a more hands-on subject such as art, physical education, drama, etc.

Students' parents were sent information about the study, via the student, including any potential negative effects of the child's participation (Appendix A). The information packet included a permission form, allowing the student to participate (Appendix B). The

permission form included a space for the parent to decline participation. Parents could request a summary of study results and/or a copy of the student's Learning Style Profile. After copies of each student's profile were provided to parents who request them, names or other identification will be removed from all data. Student incentives included a pizza party for the class when all slips were returned marked either yes or no. Once student permission forms were returned, a party was provided to all students in the class regardless of their participation in the study.

One day was allotted, per school, to complete the data collection. Arrangements were made with the teachers for the researcher to administer the Learning Style Profile to the students in each class, while the teacher rated each child in his/her homeroom class on the eleven questions that make up the two subscales of the ACTeRS.

The Learning Style Profile (Keefe & Monk, 1988) consists of 126 multiple choice items presented in booklet format. Answers were recorded on a separate answer sheet using a #2 pencil. The Profile is untimed, but students were expected to be able to complete it within one class period. The student proceeded through the booklet, then turned the booklet around and begins working additional items on the backs of the pages they have already completed. The items contained a mix of visual reasoning puzzles, visual memory exercises, verbal and math reasoning items, study preference questions, and perceptual preference items. The booklet is printed using blue ink on white paper. Many items are interesting and eye-catching, reducing the likelihood of boredom. As new item types are introduced, a descriptive paragraph precedes the exercises. This material occasionally needed to be explained to poor readers. The profile results were available to the students' parents at their request. They may share it with teachers and the school if they desire.

Once the data are obtained, the Learning Style Profiles were sent to the instrument publisher to be computer scored. Raw scores for the ACTeRS Attention and Hyperactivity scales were hand scored. Upon receipt of the scored Learning Style Profiles, bivariate

correlations and multiple regressions using the selected style variables and the two scores obtained from ACTeRS scale were matched and analyzed for significance. Gender differences were assessed by performing separate analyses for male and female subjects.

Null Hypotheses

Null Hypothesis #1:

Learning style variables of students are not related to teacher perception of attention and hyperactivity.

Null Hypothesis #2:

The pattern of inter-relations between learning style variable and teacher perception of attention and hyperactivity is consistent for boys and girls.

Null Hypothesis #3:

The six selected learning style variables of students are not predictive of teacher perception of attention.

Null Hypothesis #4:

The six selected learning style variables are not predictive of teacher perception of hyperactivity.

Null Hypothesis #5:

Differences in prediction of attention and hyperactivity do not exist for boys and girls.

Research Design

Bivariate correlations and multiple regression analyses were utilized in testing the five null hypotheses. The bivariates assess the degree of relatedness existing between each of the six style variables and the two teacher perception variables: Inattention and Hyperactivity. Multiple regression analysis was used to determine the extent to which the

set of learning style variables are predictive of teacher perception of attention and hyperactivity in sixth grade male and female students. Further, the strength of the predictors were assessed through a post-hoc analysis. To assess the strength of each predictor, the regression coefficient were evaluated for statistical significance. Non-significant predictors were discarded and the remaining were re-analyzed in a second multiple regression to develop a more parsimonious model.

CHAPTER IV

RESULTS

The purpose of this study was to examine the relationship of student learning style to teacher perception of inattention and hyperactivity. One hundred and nine sixth grade students completed the Learning Style Profile published by the National Association of Secondary School Principals. Each student was rated by their homeroom teacher for behaviors associated with Attention Deficit Hyperactivity Disorder using the ACTeRS subscales for attention and hyperactivity. A total of seven teachers participated in the study, four female and three males. Each student was rated by only one core teacher.

In this chapter the results of the statistical analyses for the five hypotheses tested in this study are reviewed. The five hypotheses sought to examine the relationship between variables of learning style (Sequential Processing, Verbal-Spatial Preference, Verbal Risk, Manipulative Preference, Grouping Preference, and Mobility Preference) using the Learning Style Profile and teacher ratings of attention and hyperactivity using the ACTeRS scale. Other research questions investigated gender differences as they related to learning style, attention, and hyperactivity.

Following a discussion of the descriptive statistics of the results from the Learning Style Profile (Keefe, Monk, 1988) and the ACTeRS scale (Ullmann, Sleator, Sprague, 1997), the five research questions are addressed. Null hypotheses were developed to test each of the research questions. Research question one and two dealt with the relatedness of individual learning style variables to teacher ratings of attention and hyperactivity. The null hypothesis for question one were evaluated using bivariate correlational values for the entire sample of 109 students. The null hypothesis for question two was addressed by examining the bivariate for boys and girls analyzed separately. Research questions three, four, and five sought to establish a predictive model for attention and hyperactivity based on the

following learning style variables: sequential processing, verbal-spatial preference, verbal risk, manipulative preference, grouping preference, and mobility preference. The null hypotheses for questions three, four, and five were evaluated using a multiple regression analysis.

The null hypothesis for question three was answered by evaluating the multiple regression analysis using all six learning style variables and comparing to teacher perception of attention. The null hypothesis for question four was answered by evaluating the second multiple regression using all six learning style variables and comparing to teacher perception of hyperactivity. The null hypothesis for question five was addressed by evaluating the multiple regression analyses (for inattention and hyperactivity) on boys and girls separately to examine gender differences.

Descriptive Statistics

Descriptive statistics obtained for each of the variables (Attention, Hyperactivity, Sequential Processing, Verbal Risk, Manipulative Preference, Verbal/Spatial preference, Grouping Preference, and Mobility Preference) can be found in Table 4. This table provides mean scores, standard deviations, and range for each variable. Girls scored, on average, 3.68 points higher for attention than boys. Boys scored, on average, 4.72 points higher than girls for symptoms of hyperactivity. In addition, girls scores were noted to be clustered more tightly around the mean than boys. The ratings for girls exhibited less range and a lower standard deviation. In other words, less variance in teacher ratings was present for girls. The mean rating on the attention variable for girls was 25.661 with a SD of 5.540, while the mean for boys was 21.981 with a SD of 6.705. The mean rating girls on the hyperactivity variable was 7.000 with SD of 3.581, while the mean rating for boys was 11.717 with a SD of 5.754. The ratings indicate that the girls, on average, were rated as more attentive, with lower levels of hyperactivity.

Table 3

DESCRIPTIVE STATISTICS FOR LEARNING STYLE AND ADHD VARIABLES

Variable	Combined Sample (N=109)		
	Mean	SD	Range
Attention	23.872	6.404	(6 - 30)
Hyperactivity	9.294	5.314	(5 - 25)
Sequential Processing	6.780	1.726	(2 - 8)
Verbal Risk	6.706	2.347	(1 - 11)
Manipulative Preference	6.220	2.528	(1 - 11)
Verbal/Spatial Preference	5.128	1.466	(1 - 9)
Grouping Preference	2.550	1.487	(1 - 8)
Mobility Preference	5.771	2.470	(1 - 11)

Variable	Boys (n= 53)			Girls (n=56)		
	Mean	SD	Range	Mean	SD	Range
Attention	21.981	6.705	(6-30)	25.66	5.540	(8-30)
Hyperactivity	11.717	5.754	(5-25)	7.000	3.581	(5-22)
Sequential Processing	7.000	1.637	(3-8)	6.571	1.781	(2-8)
Verbal Risk	7.208	2.201	(3-11)	6.232	2.383	(1-10)
Manipulative Preference	5.849	2.631	(1-10)	6.571	2.374	(2-11)
Verbal/Spatial Preference	4.906	1.495	(3-7)	5.339	1.405	(2-9)
Grouping Preference	2.660	1.479	(1-6)	2.446	1.487	(1-7)
Mobility Preference	5.887	2.237	(1-11)	5.804	5.628	(1-11)

Ratings of attention in boys and girls by classroom teachers produced a 3.600 mean point difference. This means that, on average, males were rated 3.6 points lower on the attention scale. Girls were rated, on average, 4.717 points lower than boys for symptoms of hyperactivity. Differences in teacher rating of attention and hyperactivity for male and female students were evaluated for significance using a two-tailed independent t-test. At 100 df, a critical value of 2.626 is needed for statistical significance at the .01 level, while the critical value of 3.391 is needed to be statistically significant at the .001 level. Based on the

attention ratings provided by the classroom teachers, the mean difference between girls and boys produced a t value of -3.101. This means that gender differences in ratings of attention are significant to .01 level. Gender differences in ratings of hyperactivity were even more pronounced. The gender differences found to exist among teacher ratings of hyperactivity produced a t value of 5.120, which was significant to the .001 level. Teachers definitely rate males higher than females for symptoms of hyperactivity, and lower for attention.

Research Question # 1

The first research question asked "Are there interrelations among student learning style, teacher rating of attention, and teacher perception of hyperactivity?". The null hypothesis for this question states that no interrelations exist between student learning style, teacher rating of inattention, and teacher perception of hyperactivity. The bivariate correlations (See Tables 5 and 6) provide evidence that significant relationships exist for learning style variables and teacher perception of attention and hyperactivity, therefore the null is rejected. Based on 6, 100 df, the .05 and .01 critical value of $r = .195$ and $.254$ (Bartz, 1988). Using this value a significant negative relationship existed between attention and mobility preference, while significant positive relationships existed between hyperactivity and verbal risk, sequential processing and verbal risk, and verbal risk and manipulative preference. In other words, as a student's willingness to risk verbally went up, so did sequential processing skill, manipulative preference and teacher perception of hyperactivity. Teacher variables of attention and hyperactivity evidenced a strong negative correlation. This means that as student activity level decreased, teachers perceived them to be more attentive. Attention and hyperactivity ratings produced an r value of -0.6130 and an r^2 of 0.3757 , which is significant at the .01 level.

The bivariate r values and significance ratings for all interrelations for learning style variables compared to attention and hyperactivity are shown in Table 5 and Table 6.

Table 4

BIVARIATE CORRELATIONS FOR LEARNING STYLE AND ATTENTION

Combined Sample N=109		
Comparison	r	Sig. r
Attention/Sequential	0.1784	NS
Attention/Verbal Risk	0.0555	NS
Attention/Manipulative	- 0.0951	NS
Attention/Verbal-Spatial	0.1914	NS
Attention/Grouping	0.0595	NS
Attention/Mobility	- 0.2390	$p < .05$

Table 5

BIVARIATE CORRELATIONS FOR LEARNING STYLE AND HYPERACTIVITY

Combined Sample N=109		
Comparison	r	Sig. r
Hyperactivity/Sequential	-0.0050	NS
Hyperactivity/Verbal Risk	0.2268	$p < .05$
Hyperactivity/Manipulative	0.1222	NS
Hyperactivity/Verbal-Spatial	-0.0755	NS
Hyperactivity/Grouping	0.0109	NS
Hyperactivity/Mobility	0.0904	NS

The r values and significance levels for intercorrelations among learning style variables are shown in Table 7. Based on tables provided in Bartz (1988), a low but significant positive correlation existed between sequential processing and verbal risk. The positive relationship between verbal risk and

manipulative preference was significant to the .01 level. This relationship, though a little stronger, is also considered low. All other interrelationships were statistically nonsignificant as shown on Table 7.

Table 6
INTERRELATIONSHIPS BETWEEN LEARNING STYLE VARIABLES

Combined Sample N=109		
Comparison	r	Sig. r
Sequential/Verbal Risk	0.2513	p<.05
Sequential/Manipulative	0.0174	NS
Sequential/Verbal-Spatial	0.0184	NS
Sequential/Grouping	-0.0064	NS
Sequential/Mobility	-0.1474	NS
Verbal Risk/ Manipulative	0.3031	p< .01
Verbal Risk/ Verbal-Spatial	-0.0050	NS
Verbal Risk/Grouping	-0.0772	NS
Verbal Risk/ Mobility	0.0596	NS
Manipulative/Verbal-Spatial	-0.0893	NS
Manipulative/Grouping	-0.1201	NS
Manipulative/Mobility	-0.0448	NS
Verbal-Spatial/Grouping	-0.0493	NS
Verbal-Spatial/Mobility	-0.0577	NS
Grouping/Mobility	-0.1180	NS

Research Question #2

The second research question asks "Are learning style to teacher perceptions relations similar for boys and girls?". The null hypothesis developed for question two stated that the pattern of interrelations between learning style variable and teacher perception of attention and hyperactivity would be consistent for boys (n=53) and girls (n=56). Scores were analyzed separately to obtain bivariate correlations and r^2 values. Using the critical values of .273 (.05 level) and .354 (.01 level) at 6,50 df, significant relationships were found

to exist. Utilizing the same table format applied in reporting the results of the combined sample, the statistical data obtained for boys is presented in Table 8, Table 9, and Table 10. It reveals a moderate positive relationship between attention and sequential processing skill for boys, as well as a low, but significant positive correlation between the need for manipulative instruction and teacher perception of hyperactivity. Among boys, there was an additional moderate positive correlation between willingness to risk verbally and the need for manipulative instruction. As sequential processing went up, so did teacher rating of attention

Table 7

BIVARIATE CORRELATIONS FOR LEARNING STYLE AND ATTENTION

BOYS n=53

Comparison	r	r ²	Sig. r
Attention/Sequential	0.4745	0.2251	p<.01
Attention/Verbal Risk	0.1396	0.0194	NS
Attention/Manipulative	0.2248	0.0505	NS
Attention/Verbal-Spatial	0.1823	0.0332	NS
Attention/Grouping	0.0888	0.0078	NS
Attention/Mobility	-0.2152	0.0463	NS

Table 8

BIVARIATE CORRELATIONS FOR LEARNING STYLE AND HYPERACTIVITY

BOYS n = 53

Comparison	r	r ²	Sig. r
Hyperactivity/Sequential	-0.1462	0.0214	NS
Hyperactivity/Verbal Risk	0.1223	0.0149	NS
Hyperactivity/Manipulative	0.2801	0.0785	p< .05
Hyperactivity/Verbal-Spatial	0.0539	0.0029	NS
Hyperactivity/Grouping	-0.0202	0.0004	NS
Hyperactivity/Mobility	0.0986	0.0097	NS

Table 9
INTERRELATIONSHIPS BETWEEN LEARNING STYLE VARIABLES

BOYS n=53			
Comparison	r	r ²	Sig.
Sequential/Verbal Risk	0.2514	0.0632	NS
Sequential/Manipulative	0.0394	0.0016	NS
Sequential/Verbal-Spatial	0.1619	0.0262	NS
Sequential/Grouping	0.0234	0.0005	NS
Sequential/Mobility	-0.2370	0.0562	NS
Verbal Risk/ Manipulative	0.4258	0.1813	p<.01
Verbal Risk/ Verbal-Spatial	0.0575	0.0033	NS
Verbal Risk/Grouping	-0.2392	0.0572	NS
Verbal Risk/ Mobility	0.1082	0.0117	NS
Manipulative/Verbal-Spatial	-0.0084	0.0000	NS
Manipulative/Grouping	-0.2217	0.0492	NS
Manipulative/Mobility	0.0644	0.0041	NS
Verbal-Spatial/Grouping	-0.1083	0.0117	NS
Verbal-Spatial/Mobility	0.1152	0.0132	NS
Grouping/Mobility	-0.1827	0.0334	NS

For girls, a different style/attention pattern developed. A moderate inverse relationship was shown between attention and the need for mobility. No significant relationships between learning style variables and hyperactivity were found among girls. The bivariate r values and interrelations r values are shown in Table 11, Table 12, and Table 13.

Table 10

BIVARIATE CORRELATIONS FOR LEARNING STYLE AND ATTENTION

GIRLS n=56			
Comparison	r	r ²	Sig. r
Attention/Sequential	- 0.0328	0.0010	NS
Attention/Verbal Risk	0.1074	0.0115	NS
Attention/Manipulative	- 0.0409	0.0016	NS
Attention/Verbal-Spatial	0.1272	0.0162	NS
Attention/Grouping	0.0791	0.0062	NS
Attention/Mobility	- 0.4020	0.1616	p<.01

Table 11

BIVARIATE CORRELATIONS FOR LEARNING STYLE AND HYPERACTIVITY

GIRLS n = 56			
Comparison	r	r ²	Sig. r
Hyperactivity/Sequential	0.0364	0.0013	NS
Hyperactivity/Verbal Risk	0.2114	0.0446	NS
Hyperactivity/Manipulative	0.0987	0.0097	NS
Hyperactivity/Verbal-Spatial	-0.1171	0.0137	NS
Hyperactivity/Grouping	-0.0302	0.0009	NS
Hyperactivity/Mobility	0.1233	0.0152	NS

Table 12
INTERRELATIONSHIPS BETWEEN LEARNING STYLE VARIABLES

GIRLS n=56			
Comparison	r	r ²	Sig
Sequential/Verbal Risk	0.2169	0.0470	NS
Sequential/Manipulative	0.0326	0.0010	NS
Sequential/Verbal-Spatial	- 0.0775	0.0060	NS
Sequential/Grouping	- 0.0491	0.0024	NS
Sequential/Mobility	- 0.0523	0.0027	NS
Verbal Risk/ Manipulative	0.2669	0.0712	NS
Verbal Risk/ Verbal-Spatial	- 0.0022	0.0000	NS
Verbal Risk/Grouping	0.0312	0.0009	NS
Verbal Risk/ Mobility	- 0.1096	0.0120	NS
Manipulative/Verbal-Spatial	- 0.2294	0.0526	NS
Manipulative/Grouping	0.0036	0.0000	NS
Manipulative/Mobility	- 0.1909	0.0364	NS
Verbal-Spatial/Grouping	0.0301	0.0009	NS
Verbal-Spatial/Mobility	- 0.2092	0.0437	NS
Grouping/Mobility	- 0.1283	0.0165	NS

Significant gender differences were found to exist for bivariate correlations of learning style and inattention, as well as for interrelationships between style variables. Further, the data indicates that pronounced gender differences existed in the relationship of certain style variables to the teacher ratings of attention and hyperactivity. This supports the rejection of null hypothesis number two (See Table 14), meaning that gender differences were evident.

Table 13

SUMMARY OF GENDER DIFFERENCES FOR ATTENTION, HYPERACTIVITY,
AND LEARNING STYLE

Significant Relationships Only

Comparison	Boys			Girls		
	r	r ²	Sig. r	r	r ²	Sig. r
Attention/Sequential Hyperactivity/ Manipulative	0.4745	0.2251	p<.01	-0.0328	0.0010	NS
Attention/Mobility	0.2801	0.0785	p<.05	0.0987	0.0097	NS
Verbal Risk/ Manipulative	0.0986	0.0097	NS	-0.4020	0.1616	p<.01
	0.4258	0.1813	p<.01	0.2669	0.0712	NS

Research Question #3

The third research question asked "Does student learning style (as measured by sequential processing skill, verbal-spatial preference, willingness to risk verbally, preference for manipulative instruction, grouping preference, and mobility preference) significantly predict teacher rating of attention? The null hypothesis for question three stated that the combined influence of student learning styles would not predict teacher rating of attention. This hypothesis was evaluated using a multiple regression analysis. The regression was run using the combined sample with attention as the criterion variable and all six learning style variables as predictors. The null was rejected based on F (6,102) value of 2.388, significant to p<.05 level. This means that a student's learning style is predictive of inattention as rated by their teachers. The R² value of 0.1232 revealed that approximately 12 % of the variability of a teacher's rating of attention could be attributed to differences in student learning style. The statistical information from this regression is listed in Table 15.

Table 14

MULTIPLE REGRESSION OF ALL SIX STYLE VARIABLES AND ATTENTION

Source	S.S.	D.F.	M.S.	F	Sig.	R ²
Due to Reg	550.656	6	91.776	2.388	p<.05	0.1232
Residual	3919.579	102	38.427			
Total	4470.235	108				

Following the initial analysis, regression analysis performs a t-test to show how much of the regression influence was contributed by each of the variables. These t-ratios can be used to identify individual predictors that may be strong enough to warrant an additional multiple regression based upon fewer variables. The non-significant variables can be dropped, providing a more parsimonious model. The t-ratios associated with this regression (taken from the regression analysis) failed to provide evidence that a reduced analysis was warranted. A stronger relationship was not found to exist, by deleting the non-significant variables using the entire sample of 109 students (See Table 16).

Table 15

t-VALUES FOR PREDICTOR VARIABLES (MULTIPLE REGRESSION)

Combined Sample (N=109)

Variable	t-value	t ²	Significance
Sequential Processing	1.305	1.703	NS
Verbal Risk	0.722	0.521	NS
Manipulative Preference	- 1.111	1.234	NS
Verbal/Spatial	1.806	3.261	NS
Grouping Preference	0.377	0.142	NS
Mobility Preference	- 2.259	5.103	p<.05

Research Question #4

The fourth research question asked "Does student learning style (as measured by sequential processing skill, verbal-spatial preference, willingness to risk verbally, preference for manipulative instruction, grouping preference, and mobility preference) significantly predict teacher perception of hyperactivity?". The null hypothesis for this question stated that the best linear combination of all six learning style variables would not predict teacher perception of hyperactivity. This prediction was evaluated by utilizing a multiple regression analysis where the six learning style variables were the predictors and hyperactivity was the criterion variable. Based on 6,100 df and the critical values of F (2.19 and 2.99) the regression equation failed to provide evidence of predictive power; $F(6,102) = 1.261$; NS. Therefore, the fourth null is retained. This means that learning style of these sixth grade students did not predict teacher rating of hyperactivity in the combined sample of 109 boys and girls.

Research Question #5

The fifth research question asked "Are predictions of teacher perceptions (attention and hyperactivity) based on student learning style similar for boys and girls? The fifth null hypothesis stated that no gender differences would be found to exist in the ability to predict teacher ratings of inattention and hyperactivity by examining student learning styles. To address this null, male and female data were separated and separate regression analyses were run to predict inattention and hyperactivity. The critical values of F (6, 46 df) of 2.30 (.05 level) and 3.22 (.01 level) were used to evaluate the significance of the predictive relationship for males. Evaluation of female results were based upon an F (6,49 df); 2.30 (.05 level) and 3.20 (.01 level). Based on these tabled values, a significant predictive relationship was found for males (Table 17 and Table 18), but not for females (see Table 20 and Table 21). This provides evidence to support rejecting the fifth null. Significant gender differences do exist with regard to learning style and teacher perception of attention and hyperactivity. Learning

style is a much stronger predictor for boys than for girls. Multiple regression results for males are recorded in Table 17 (Attention) and Table 18 (Hyperactivity).

Table 16

MULTIPLE REGRESSION OF ALL SIX STYLE VARIABLES AND ATTENTION

(Boys Only)

<u>Source</u>	<u>S.S.</u>	<u>D.F.</u>	<u>M.S.</u>	<u>F</u>	<u>Sig.</u>	<u>R²</u>
Due to Reg	792.548	6	132.091	3.820	P<.01	0.3326
Residual	1590.433	46	34.575			
Total	2382.980	52				

R^2 0.3326 = 33% of variability of criterion due to predictors

Table 17

MULTIPLE REGRESSION OF ALL SIX STYLE VARIABLES AND

HYPERACTIVITY (Boys Only)

<u>Source</u>	<u>S.S.</u>	<u>D.F.</u>	<u>M.S.</u>	<u>F</u>	<u>Sig.</u>	<u>R²</u>
Due to Reg	206.529	6	34.421	1.023	NS	0.1177
Residual	1548.226	46	33.657			
Total	1754.755	52				

The F-value for learning style variables and attention in males (Table 16) was significant at the .01 level. The analysis of the R^2 yielded evidence that the predictors accounted for more than 33% of the variability in teacher perception of attention among male students.

The t-values of the predictor variables can be analyzed with a t-test for significance to determine if the best predictive model contains fewer variables than the six originally used. In other words, the non-significant variables are thrown out in an effort to identify the strongest theoretical model. Since $t^2 = F$, by squaring the t-value the F table can be consulted to determine

significance (1,50 df). Evaluation of the t-ratios (See Table 19) yielded a reduced model for males using only the variables of sequential processing, manipulative preference, and attention.

Table 18
t-TEST RESULTS FOR PREDICTOR VARIABLES (MULTIPLE REGRESSION)

<u>Boys (n=53)</u>			
<u>Variable</u>	<u>t-value</u>	<u>t²</u>	<u>Significance</u>
Sequential Processing	2.919	8.521	p < .01
Verbal Risk	1.334	1.780	NS
Manipulative Preference	- 2.227	4.960	p < .05
Verbal/Spatial	1.019	1.038	NS
Grouping Preference	0.378	0.143	NS
Mobility Preference	- 1.014	1.028	NS

Using just the two significant predictors (sequential processing and manipulative preference) a new regression was conducted. The results of this reduced equation are summarized in Table 20. The reduced equation F was evaluated against the tabled values of 3.18 (.05 level) and 5.06 (.01 level) based on 2, 50 df. This analysis was significant at the .01 level. The R² value of 0.2845 indicates that sequential processing ability and manipulative preference accounted for 28% of the variance in teacher perception of attention. Analysis suggests that as sequential processing ability goes up, and the need for manipulative instruction goes down, the male attention ratings go up.

Table 19
ANALYSIS OF REDUCED EQUATION:
SEQUENTIAL PROCESSING, MANIPULATIVE PREFERENCE AND ATTENTION

<u>Males Only</u>						
<u>Source</u>	<u>S.S.</u>	<u>D.F.</u>	<u>M.S.</u>	<u>F</u>	<u>Sig.</u>	<u>R²</u>
Due to Reg	677.971	2	328.985	9.941	p < .01	0.2845
Residual	1705.010	50	34.100			
Total	2382.980	52				

R² 0.2845 = 28% of variability of criterion related to the predictors.

The multiple regression results for females are summarized in Table 21 (Attention) and Table 22 (Hyperactivity). Analysis of information collected on females was compared to the critical values of F (6, 49 df); 2.30 (.05) and 3.20 (.01). The F-values for both regressions (attention and hyperactivity) were non-significant for female students. There was no evidence for a combined influence on teacher ratings of attention or hyperactivity using the selected variables with regard to female sixth grade students.

Table 20

MULTIPLE REGRESSION OF ALL SIX STYLE VARIABLES AND ATTENTION

Females Only

<u>Source</u>	<u>S.S.</u>	<u>D.F.</u>	<u>M.S.</u>	<u>F</u>	<u>Sig.</u>	<u>R²</u>
Due to Reg	328.453	6	54.742	1.930	NS	0.1911
Residual	1390.092	49	28.369			
Total	1718.545	55				

Table 21

MULTIPLE REGRESSION OF ALL SIX STYLE VARIABLES AND

HYPERACTIVITY

Females Only

<u>Source</u>	<u>S.S.</u>	<u>D.F.</u>	<u>M.S.</u>	<u>F</u>	<u>Sig.</u>	<u>R²</u>
Due to Reg	55.059	6	9.176	0.678	NS	0.0767
Residual	662.942	49	13.529			
Total	718.001	55				

Summary of Findings

This study demonstrated that learning style is a significant predictor of teacher perceived inattention and hyperactivity in sixth grade students. It further demonstrated that this predictive relationship is strongest for male students, particularly among boys with a

non-sequential processing style and a strong need for manipulative instruction. A girl's need for mobility is often associated with inattention, though it is not associated with hyperactivity. This study also demonstrated that teachers ratings of male students is significantly higher for both inattention and hyperactivity. Further, the ratings of males were significantly higher for male students than for females. The theoretical and practical implications of these findings follow in chapter five.

One interesting finding of this study was unrelated to any of the hypotheses tested. In examining the descriptive statistics of this study for patterns that shed light on diagnostic issues, several surprising findings emerged. Based on the ACTeRS Manual, general guidelines for the interpretation of deficit are set at the 25th percentile. While the authors caution that ACTeRS scores should be combined with all else that is known about the child and should not be considered rigid cut-offs, it is nonetheless stated that "a score at or below the 25th percentile on any subscale should be considered indicative of a major deficit." (Ullmann, Sleator & Sprague, 1997, p. 17). Applying this guideline to the actual data collected on the 109 sixth grade students, troubling and gender specific patterns emerged. While identification percentages fell within expected rates for girls, teacher ratings for boys yielded inappropriately high ratings of inattention and hyperactivity. These results are consistent with trends found by McGuinness (1989). The percentages of student ratings falling at or below the 25th percentile (by gender) are summarized below:

Table 23

PERCENT OF STUDENTS AT RISK FOR DIAGNOSIS OF ADHD (by gender)

<u>Boys</u> Variable	Total n	Potential Number Identified	% of Total
Attention Only	53	7	13
Attention & Hyperactivity (where both are elevated)	53	8	15
Hyperactivity Only	53	8	15
Total	53	23	43

<u>Girls</u> Variable	Total n	Potential Number Identified	% of Total
Attention Only	56	7	12
Attention & Hyperactivity	56	0	0
Hyperactivity Only	56	0	0
Total	56	7	12

Because of the strong gender differences found to exist, the mean scores of male and female teachers were determined and tabled in Table 24. Only one of the seven teachers (4 female, 3 males) rated each student.

Table 24

MEAN SCORES FOR GIRLS/BOYS ACROSS TEACHER GENDER

	Female Teachers		Male Teachers	
	Attention	Hyperactivity	Attention	Hyperactivity
Girls	25.606	6.394	25.739	7.869
Boys	21.704	11.519	21.192	12.160

CHAPTER V

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

This chapter reviews and discusses the relationships of learning style to the traits underlying the diagnosis of Attention Deficit Hyperactivity Disorder (ADHD) - Attention and Hyperactivity. Implications of the practice of school psychology and theoretical implications for understanding and working with students who exhibit attentional problems are discussed. The research design selected for this study provided individual comparisons through bivariate correlations of six selected learning style variables from the Learning Style Profile (Keefe, Monk 1989) with subscales of the ACTeRS (Ullmann, Sleator, and Sprague, 1997) used by clinicians to determine the presence of handicapping levels of inattention and hyperactivity. The study examined the combined influence of learning style variables upon the prediction of attention and hyperactivity through the use of multiple regression analyses. Finally, the study examined gender differences evident in these patterns of relatedness and prediction. In chapter five, the results of these analyses are interpreted for implications related to the practice of school psychology, classroom practice, and future research.

Questions about learning style/diagnosis interrelations are important because of the large numbers of students identified each year as having the condition known as ADHD. With this diagnosis usually comes treatment with stimulant medications such as Ritalin and Dexedrine. Advocates of the use of these stimulants with children diagnosed as ADHD believe it is an effective treatment for a legitimate disorder. Barkley (1998) defends not only the use of stimulant medications, but the six-fold increase in production of Ritalin from 1990 to 1995. He argues that this increase in production does not necessarily reflect an increase in prescriptions. However, critics of this trend state that the diagnosis of ADHD should be interpreted as a set of symptoms indicative of conflict in the child's life, usually

related to adult expectations of submissive, compliant behavior (Breggin, 1998). Breggin further reminds readers that the list of criteria used in the diagnosis of ADHD focuses on behaviors that interfere with an "orderly, quiet, controlled classroom" (p. 9). Rather than adults concentrating on addressing the unmet needs of children, such as frustration, boredom, anger, or academic inadequacy, the use of stimulant medications instead renders the child "neurologically unable" to express those feelings (Breggin, 1998).

The purpose of this research was to examine one possible source of frustration that might affect attention and activity levels in students - that of learning style. This study examined the influence of six learning style variables that were expected to be related to a child's ability to attend to classroom instruction, based on current research. The selected learning style variables (Sequential Processing Skill, Verbal-Spatial Preference, Verbal Risk Orientation, Manipulative Preference, Grouping Preference, and Mobility Preference) were compared directly and in combination to ratings of attention and hyperactivity provided by the child's classroom teacher. Patterns of interrelations were examined for the total sample, as well as girls and boys separately using bivariate and multiple regression analysis. Four of five null hypotheses were rejected demonstrating that significant relationships do exist between learning style and the diagnostic criteria for ADHD.

Limitations of the Study

This study required data collection on students within the public school setting. Permission was obtained from parents before a student was allowed to participate in this study. Because participation was voluntary, true randomization could not be achieved. The researcher increased the number of subjects to add validity to the conclusions, however, the results describe students most like the ones studied and have limited generalizability to students at large. Additionally, each student was evaluated by only one of their core

teachers, namely their homeroom teacher. No effort was made to establish interrater reliability on the ratings of attention and hyperactivity. While the teachers completing the scales were competent and careful in their appraisals, best practice would always dictate that multiple ratings be obtained when diagnosing ADHD or any other disorder in children.

Summary and Conclusions

Based on the total sample of 109 sixth grade students, several interrelationships were found to exist. First, as the need for movement decreased among student learning styles, teacher perception of attention increased. This suggests that teachers perceive student movement be indicative of inattention. In addition to this inverse relationship, several positive correlations were noted for the full sample all of which were related to the style variable of Verbal Risk. The Verbal Risk scale was made up of four items (questions): 1) I bring up ideas in class that are different from my classmates. 2) I am very comfortable speaking in front of a group. 3) I state my own ideas even though others may disagree. and 4) Classmates would generally say that I'm a talkative person. These items not only suggest a student who is not afraid to speak out, but they also suggest a student who is not afraid to think for themselves - an outspoken nonconformist. Understanding not only the denotative but connotative meanings of these items may help in understanding the findings that emerged in this study. First, the perception of hyperactivity was positively correlated to a student's tendency to risk verbally. The more likely the student was to speak out, expressed their own opinions, disagree with others, the more active the student was perceived to be.

Verbal risk was also significantly correlated to sequential processing skill. This second relationship, at first glance, seemed a surprising and unlikely one, until the individual items of the Verbal Risk subscale (previously listed) were examined. Upon reflection it makes sense that a student who readily forms their own often diverse opinions may be a student whose sequential skills are so strong that new and unexpected relationships are

envisioned more readily. In other words, the intuitive leap commonly associated with creative talent may involve some very sequential processes.

A third relationship (moderately positive) was noted between Verbal Risk and preference for manipulative activities. A possible explanation for this finding may be that the preference for building and fixing things may influence the child's ability to know and understand relationships leading to independence of thought. In summary, these three significant relationships suggest that the active child may be one who develops understanding or a sense of truth from experience. Experiences are then fitted sequentially into their cumulative body of understanding. Based on new awarenesses, opinions are set without regard to prevailing or accepted thought.

Gender differences existed for several variables. Many of the relationships identified in the total sample were evident in the results of the analyses for boys. Boys with strong sequential processing skills were judged to be more attentive by their teachers. No such relationship existed for girls. Among boys, a low, but significant positive correlation existed between the student preference for manipulative activities and teacher perception of hyperactivity. In other words, boys with strong sequential processing skills were more likely to be rated as attentive. Boys with a strong preference for manipulative instruction were more likely to risk verbally and be rated as hyperactive by their teachers. This pattern was not evident for girls. Once again, the results suggest that teachers view a sequential processing style as a more attentive style, as long as it is not based on the need to manipulate or build models. If the preference for manipulative activities is strong, teachers are more likely to view the child as hyperactive based on the identified criteria. A moderate relationship was shown for Manipulative Preference and Verbal Risk among boys.

Among girls, the only significant relationship shown was a negative correlation between attention and mobility preference. As the need for mobility decreased among girls they were judged to be more attentive. This was not the case with boys. One possible

explanation is that teachers may expect more movement out of boys, while high mobility need is not seen as typical of most female students.

Two multiple regression analyses (based on the total sample) looked for the presence of a combined influence of the six selected style variables upon teacher perception of attention and hyperactivity. The first multiple regression produced significant results ($p < .05$), demonstrating that the selected learning style variables had accounted for 12% of the variability in teacher perception of attention. The second multiple regression failed to demonstrate that significant predictive influence existed for learning style and teacher ratings of hyperactivity.

Once again, gender differences were examined with regard to learning style and teacher perception of attention and hyperactivity. For males, the multiple predictors yielded a significant predictive relationship ($p < .01$) for learning style and attention. Significant predictive relationships were not evident for the combined influence of all six style variables and teacher perception of hyperactivity for boys. The multiple regressions failed to find evidence of combined predictive influence for girls with regard to attention or hyperactivity and the six selected variables of learning style.

The teachers' appraisals of student attention and hyperactivity suggest that they tend to rate girls acceptably, with few attention problems and virtually no indication of hyperactivity. This data further suggests that typical male behavior may be considered disordered by many classroom teachers. Potential identification rates of 43% among males are indefensible. The ACTeRS items (as previously stated in Chapter 3) are very closely aligned to the diagnostic criteria established in the DSM-IV providing a brief but sound scale for the rating of student behavior. Therefore, it is the opinion of this researcher that the ACTeRS scale itself is not to blame for such high rates of potential identification, though using a 10 percentile cutoff would drastically reduce the risk of a type one error. Additionally, it is probably not true that the teachers who completed the scales lacked

objectivity. Teachers throughout the nation do their best to rate a student's behavior relative to the classroom environment and other students being served. Orth and Martin (1994) found teacher ratings of temperamental variables related to attention, activity, and task persistence was highly consistent with observation of off-task behavior by researchers ($p < .0002$ level). They concluded that teachers appear to be accurate raters of these student temperament variables, unbiased by gender, socioeconomic status, and academic ability. However, these findings do seem to call into question the diagnostic criteria itself. The fact that such exaggerated rates were seen only in male students suggests that gender bias may exist in the criteria itself which has been established for the diagnosis of this disorder.

Another surprising result was the lack of relationship between Verbal-Spatial Preference and Grouping Preference to any other variables tested. Both of these variables were found to have standard deviations of less than 1.5. This likely produced a restriction of range that prevented relationships from being evident. While the mean for Verbal-Spatial Preference fell in the neutral range, the mean for Grouping Preference decidedly favored small group instruction. Since classroom instruction at the sixth grade level often comes in the form of whole group lessons, this fact may have implication for changes in middle school teaching practice.

Style, Temperament, or Disorder?- Theoretical Implications

In contemplating the theoretical implications of the findings of this study about influences on the perception of inattention and hyperactivity, one might be drawn to research from the field of temperament. This is due to some striking similarities in the defining attributes for ADD, temperament, and learning style. Early studies examined individual differences in behavioral style related to nine dimensions: activity, rhythmicity, adaptability, approach/withdrawal, threshold of response, intensity, mood, distractibility, and persistence (Thomas & Chess, 1977). School-based research on temperament have

concentrated on activity, distractibility, and persistence as significant predictors of scholastic performance. In an aptitude-treatment interaction study, Orth and Martin (1994) concluded that students with the lowest ratings on Task Orientation (described as high activity, high distractibility, and low persistence) engaged in significantly more off-task behavior with teacher-directed instruction than with computer-directed instruction where one-on-one interaction, immediate feedback, and a gamelike format appear to increase student attention. No such differences were noted for "ideal" students who scored high on Task Orientation. This would be consistent with the findings of this study where students rated as having attention problems identified themselves as non-sequential learners, needing "hands-on" learning activities, and preferring movement within the classroom.

A further review of literature on temperament provided insight into similarities between the operational definitions of Attention Deficit Disorder, learning styles, and temperament. While the earlier studies by Thomas and Chess identified nine factors, Martin (1994) indicated that in a large-sample, item-level factor analyses, five factors are consistently shown to exist. The factors that were identified include: Inhibition (the initial tendency to withdraw or approach a novel situation), Negative Emotionality (the persistent tendency to experience such negative emotions as anger, sadness, or rage), Adaptability (the speed and ease of adjustment to change in the social sphere), Activity Level (the tendency to engage in fast motoric activity), and Task Persistence (the tendency to remain engaged in a difficult learning task for a relatively long period of time). Three of the five factors (Inhibition, Activity Level, and Task Persistence) form the basis for the diagnostic criteria associated with Attention Deficit Disorder. Is it possible that ADD is nothing but the unbridled expression of high, but normal temperament variations?

More fuel for the ADD, style, temperament debate is provided by temperament researcher, David Keirse. Drawn forty years ago to the work of Isabell Myers and Kathryn Briggs, he used the sixteen personality types identified by the Myers-Briggs Type Indicator

(1962) to develop a theory of temperament. Keirsey (1998) describes how the SP, SJ, NF, and NT groups are alike in many ways. He developed his own scale, The Keirsey Temperament Sorter, which helps to identify temperament styles that pre-dispose the individual's development of attitudes, actions, and self-image. Keirsey, dedicated to the notion that these four temperament styles represent natural diversity among human beings, named each of the four groups and set out to describe each in terms of both strengths and weaknesses. Keirsey reminds his readers that temperament represents inclinations, while character represents habits. This suggests that negative inclinations can be moderated through the formation of adaptive habits. No one temperament group was seen as flawed, each is shown as contributing to the rich diversity of humanity. The SPs (with strengths in the Sensory and Perception realms) were called Artisans. The SJs (Sensory, and Judging) were called Guardians. The NFs (with strengths in Intuition and Feeling) were termed Idealists. Finally, the NTs (Intuitive Thinkers) were named Rationals. While the descriptions of his theories and applications have filled numerous books, of importance to this study was his description of the Artisan temperament.

Keirsey (1998) describes the Artisan as an individual who is concrete in his use of words and practical in his use of tools. Artisans are further described as optimistic, excitable, intemperate, recklessly impulsive, opportunistic, experiential, and creative. They have little patience for considering things that cannot be observed or handled. He describes them as individuals with brilliant tactical intelligence. They can notice the smallest details in their immediate surrounding and "exploit fully whatever resources (are) at hand" (p.38). These people tend to find their way into jobs that are very action oriented and involved the use of tools. The group includes those in the fine arts (artists, actors, dancers, musicians), but the list also includes construction workers, athletes, oil field workers, loggers, ambulance drivers, police officers, etc. They are fun-loving, sensation-seeking, less security-minded, and less hungry for academic achievement than other temperaments. This description is

strangely similar to the DSM-IV Criteria for Attention Deficit Disorder, as well as the style profiles of the students in the current study. Apparently Keirsey also noticed the similarity between the Artisan temperament and ADD. He states that Artisans enjoy discharging and trusting their impulses, and that to be forced to control their impulses is devastating to them, likening it to psychological death.

Regarding Artisan children and school (specifically those in the subcategory, Crafter) Keirsey (1998) states that "their refusal to sit still and cooperate gets them labeled as 'minimally brain damaged', 'hyperactive' or as having 'attention deficit disorder', and they are prescribed stimulant narcotics to drug them into apparent obedience. Such labels are purely fictional, and this experimental narcotherapy is likely criminal. Certainly ISTPs are active, but only in their stubborn insistence upon getting to do something interesting, something that allows them test their mettle. They'll work in a tool-centered curriculum" (p.68). These restless individuals are often the movers and the shakers of the world. The world might still be lighting oil lamps each night if Thomas Edison had been given Ritalin throughout his life.

Carey (1998) agrees that the behaviors that are used to identify ADHD probably originate from normal temperament variations in children. He states that the problem arises from not having a clear border line to divide children with normal-high levels of activity and low levels of persistence from children who levels are truly abnormal (i.e. Which children are really statistical outliers?). Current diagnostic methods fail to identify the "1 to 2% of all children who are so extremely high and disorganized that they pose major management problems for all caregivers in all situations" (p.530) regardless of secondary problems. Other problems listed by Carey include: a) the unsupported idea that ADHD behaviors are caused by brain malfunction; b) the conclusion by adults that the child owns the entire

problem; c) diagnosis ignores the possibility that low adaptability and cognitive disabilities may be the true source of the child's problems; d) the highly subjective questionnaires used to diagnose the disorder; e) the lack of consideration that these traits may have had survival value throughout the evolution of man; and f) the harm that can come from labelling children as disordered (Carey, 1998). Rather than addressing the problems of a "poor fit" between children with certain temperament characteristics and the organization of America's schools, the country chooses instead to medicate the temperament characteristics that are perceived to be undesirable, placing all blame on the child.

Remember Zach from chapter 1? At seventeen, like many other ADD teenagers he has quit taking his medication. His parents report that school grades have not been very good within a tradition school setting. He makes As on his chapter tests, but fails to turn in the daily work. When asked about the medication, Zach states that it makes him feel depressed, like a zombie. He describes it as sapping him of all his personality. He is not able to have any fun and people ask him what is wrong with him all day. A sad price to pay in pursuit of a high grade. More anecdotal evidence for the style/disorder connection comes out of some recent school success achieved by this young man. Zach's parents transferred him to a different school district, one which happens to be organized around block scheduling. Now, instead of six classes per day, he has only four. He reports that he is able to get all his work completed within the class period without the help of stimulant drugs. Teachers report that his grades are currently straight As. This is a phenomenon which has not been observed since Zach was in the primary grades. When the organization of the school day and classroom work suddenly fit his own personal learning style, his attention problems appeared to vanish.

Implications for the Practice of School Psychology

This study suggests that the identification of attention problems or the presence of hyperactivity in school children may suggest the presence of learning style or temperament differences that are likely to go undiagnosed. This is the school psychologist's area of expertise. The school psychologist, more so than medical doctors or clinical psychologists, understand the intricacies of student, teacher, and classroom interrelationships. Teachers who are more traditional in their instructional approach may find these children particularly difficult to manage. The school psychologist can facilitate the education of such children by providing a more comprehensive assessment of student learning style and/or temperament differences. In so doing, parents, teachers, and students will gain important understanding about student strengths, with suggestions for enhancing the education of the individual child with attentional problems. Since most of the involvement of the school psychologist with ADHD children takes the form of consultation or collaboration with parents and teachers, knowledge of an individual child's learning style increases the probability that recommendations and interventions will be effective. Instead of reading or copying material from a generic cookbook of educational modifications, student style differences will begin to drive the efforts to remediate school problems and form the basis of effective and strength-based behavioral intervention plans.

School psychologists in public school practice often shy away from the actual diagnosis of Attention Deficit Hyperactivity Disorder. This is frequently due to pressure from school district administrators who fear that litigation may hold the district liable for the cost of prescription medications. However, this practice causes some serious concerns related to the identification of ADHD in children. Clearly, subtle suggestions of disorder from school personnel continue to prompt parents to seek a medical diagnosis when attention problems are noted within the classroom. Descriptive studies are needed, based on national survey, to establish exactly how such referrals are currently made, who is making

them, and the degree to which school psychologists are involved in these referrals. If the referral suggestions are coming from individual teachers this study suggests that substantial overidentification is possible. By eliminating the school psychologist's role in the identification of this disorder, the risk is great that the one person most able to add perspective to a child's educational problems will be cut out of the process entirely. Consider this possible diagnostic evolution. A teacher may suggest to a parent that an attention problem exists leading parents to act on the teacher's suggestions and seek a medical diagnosis. Then the physician sends a form to the school for the teacher to fill out, which is returned directly to the physician via the parent. The physician prescribes medication based on the rating scale that the teacher filled out. He calls the teacher for input about the effectiveness of the medication. The teacher reports that the child is much quieter in class and has been completing his work at a much higher rate. Physician, teacher, and parent are all satisfied. All this is completed without the knowledge and input of the school psychologist. Considering the potential identification rates that were found to exist in the current study, this is a frightening scenario.

Suggestions for Future Research

An interesting question for future research might be to examine the extent to which children of different temperaments can absorb information while engaged in an active endeavor. Further research might examine teacher attributions associated with movement preference, manipulative preference, sequential processing, and attention for male and female students in order to clarify the differences in the relationships found in this study. In terms of teacher ratings scales, interrater differences in ratings of students by male and female teachers might be an important topic for study. Finally, it might be interesting to assess relationships of other learning style variables to attention and hyperactivity, in an

attempt to further refine theories regarding instructional needs of children with attention problems.

Final Thoughts

The debate about the diagnosis and treatment of ADHD in children will probably rage for decades to come. Important arguments center around the criteria used to diagnose the disorder, appropriate cut-offs to be used, methods used to evaluate the presence and severity of symptoms, and appropriateness of the use of powerful stimulant medication to treat identified symptoms. The findings of this study, in combination with other similar research, suggests that school psychologists should consider adding an assessment of temperament and/or learning style when evaluating referred students. This practice would serve to add valuable information about student learning differences and provide suggestions for classroom interventions. In so doing, many children may find that the classroom becomes a friendlier place and attention problems may decrease.

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APPENDIX A

Verbal Script

I am a student at Oklahoma State University. Today, I would like to talk with you about my research in hopes that you will agree to be a part of my study. College-level research is kind of like a really big science fair project, with a long research report that goes with it. My project investigates the relationship of students' learning styles with their levels of attention and activity in the classroom. I would like to invite each of you to be a part of my study. Here is what you would be asked to do if you choose to participate: First, I will bring learning style booklets like the one you see here and you will be asked to go through the series of questions, marking your answers on an answer sheet. It will take about 1 hour to complete the whole booklet and we will complete it, as a group, during regular class time. That is all you will have to do. In addition to what you do, your teacher will answer eleven questions about your activity level and attention in class. I will send the learning style profiles to the company to be scored. The company will send back a nice print-out that explains how you learn and study best. Your parents may request this form be sent to them after the information has been extracted from it. Once the forms come back I will assign each of you a number. Then I will find the teacher rating scale for you and give that information the same number and remove the names. That way I will know the information about each of you only as Subject #1, Subject #2, Subject #3. I'll use scores from both scales, put them into a computer, and the computer program will help me determine if a relationship exists.

You and your parents will need to decide if you will participate in the study. I'm sending an envelope home with you today that will provide your parents with information about the study. I am also sending a parent consent form that your mom or dad must sign if they are allowing you to participate. There is also a form for you to sign, saying that you want to participate as well. You need to know that all information will be kept under lock and key while the data is being processed to protect your confidentiality. Once the information from you and your teacher have been matched up, names will be deleted from the forms. Your participation in this study will be completely voluntary. Your parent may withdraw you from the study at any time. You may withdraw yourself from the study at any time. Your parents may contact me or OSU if they have any further questions about the study.

The parent consent form has a place for your parent to indicate yes or no to your participation in this research. Please have them sign and return the slip to your teacher even if the answer is no. Once all the slips have been returned, I will provide a pizza party for your class. Everyone may participate in the pizza party whether or not they will be participating in the study. The party is designed to encourage you to quickly bring back the slips so that the study can proceed. Are there any questions before I pass out the envelopes to be taken home?

APPENDIX B

PARENT/GUARDIAN INFORMED CONSENT FORM

Dear Parent,

I have been teaching for many years in Oklahoma. I am also an OSU student in the doctoral program for School Psychology. To fulfill the requirements for this degree, I am planning a research project to examine the idea that student scores on a Learning Style Profile might be related to inattention and hyperactivity in the classroom.

As a parent of a sixth grade student in this school I hope you will agree to be a part of this study. Participation in this research project would require about an hour of your child's school time. Your child would be administered the Learning Style Profile published by the National Association of Secondary School Principals, which will then be sent off to be computer-scored. While the children complete the survey, the teacher will rate each child's typical level of activity and attention using eleven questions. Names will be retained long enough to match the learning style scores to the ratings provided by the teachers. However, once the scores have been accurately matched, names will be deleted and surveys shredded, so that the final research data will be totally anonymous. The one piece of information that will not be immediately shredded will be your child's Learning Style Profile results. At your request, a copy of the profile will be mailed to you. Because of confidentiality concerns, I am unable to provide copies of this information to the school. However, you are encouraged to share this information with your child's teachers. Participation in this project should provide you and the school with valuable information about how your child learns best.

The study will be explained to your child, and all students will be assured that no names will be used in the study. They will also be informed that they may withdraw from participation whenever they want.

Before giving consent, it is important for you to understand that:

- 1) **Your decision to allow the participation of your child in this study is totally voluntary.**
- 2) **As the parent/guardian of this child, you may withdraw your consent at any time without explanation.**
- 3) **Your child may withdraw from the study at any time without explanation.**
- 4) **All of the information collected will be held as confidential and will be coded so that student information will remain anonymous.**
- 5) **If you have any questions about the study, please contact Susan Linde. I can be reached locally during the evening hours at 363-8470. In addition, you may contact my advisor, Diane Montgomery, Ph. D. (405) 744-6040, or Gay Clarkson, Institutional Review Board at Oklahoma State University (405) 744-5700. Please refer to IRB # ED-98-112.**

Enclosed is a permission form to complete and return. It provides a place for you to indicate if you *do* or *do not* wish for your child to participate in this study. There is also a place for you to indicate your desire to receive a copy of your child's Learning Style Profile and/or a summary of the findings. Should you choose *not* to allow your child to participate, other arrangements will be made for your child during the survey session. Additionally, if your child requires special accommodations for testing situations, you are asked to indicate such on the permission slip so that appropriate accommodations can be arranged for your child. There is also an assent form for your child to sign. This assures that they are participating willingly in the study.

As an incentive for the quick return of the permission slips, I am providing a pizza party for each class when the slips have all been brought back to school. All students, whether participating in the study or not, will be included in the pizza party. This incentive merely serves to hasten the permission gathering process so that the study may proceed.

Please return the attached consent form along with your child's assent form to your child's teacher. You may keep this letter for your records. Thank you for your consideration.

Sincerely,

Susan M. Linde, M. S.

APPENDIX C

PARENT/GUARDIAN INFORMED CONSENT FORM

As the parent of _____, I have read the summary of the study on learning style and inattention provided by Susan Linde, a student researcher from Oklahoma State University. Should I have further questions, I may also call Susan Linde, Diane Montgomery, or Gay Clarkson at the phone numbers indicated in the study explanation letter. I understand that my child will be administered the Learning Style Profile published by the National Association of Secondary School Principals, and that parents may request a copy of the results of that assessment. I also understand that my child's teacher will complete an eleven question assessment of attention and hyperactivity. This information will be correlated to learning style. Identifying information will be deleted as soon as the two sets of data have been matched for statistical analysis. Based on the information provided to me, I...

do allow my child to participate in the proposed study and to be assessed with the above named instruments by Susan Linde, Certified School Psychologist.

do not wish my child to participate in the proposed study.

Parent Signature

I would like to have a summary of the research results.

I would like to have a copy of my child's Learning Style Profile.

Mailing Address:

Special Accommodations:

My child is on an Individual Educational Plan (IEP) and needs special accommodations when taking tests. Please notify the IEP teacher of the pending test session.

"I certify that I have provided a written explanation of all elements of this study and the consent form to the subject and his/her parent or guardian. I have also made myself available for further questions should they arise. These explanations have been provided prior to requesting the parent(s) or student sign the informed consent form."

Signed: _____

Susan M. Linde, Student Researcher, Oklahoma State University

APPENDIX D

STUDENT INFORMED ASSENT FORM

I, _____ have listened to an explanation of the research on learning styles and inattention by Susan Linde, a student researcher from Oklahoma State University. I understand that I will be administered the Learning Style Profile. My parents may request a copy of the results of that assessment. I also understand that my teacher will complete an eleven question assessment of my typical levels of attention and activity. Identifying information will be deleted as soon as the two sets of data have been matched up, so that any of my scores will be anonymous.

_____ I agree to be a part of the study and complete the learning style inventory.

_____ I do not wish to participate in the study.

Student Signature

"I certify that I have provided a verbal explanation of all elements of this study and the assent form to the subject. I have also made myself available for further questions from the participant. These explanations have been provided prior to requesting the subject sign this informed assent form."

Signed _____
Susan M. Linde, Student Researcher, Oklahoma State University

APPENDIX E

Internal Consistency and Test-Retest Values for Learning Style Profile

<u>Subscale</u>	<u>Alpha</u>	<u>Test-Retest(10 Day)</u>
Analytic Skill	.56	.54
Spatial Skill	.60	.77
Discrimination Skill	.51	.53
Categorization Skill	.74	na
Sequential Processing	.72	.54
Simultaneous Processing	na	na
Memory Skill	.62	.58
Verbal-Spatial Preference	.76	.58
Perceptual Response		
Visual	.51	.74
Auditory	.49	.66
Emotive	.48	.70
Persistence Orientation	.67	.65
Verbal Risk	.55	.77
Manipulative Preference	.69	.82
Study Time Preferences		
Early Morning	.47	.46
Late Morning	.67	.36
Afternoon	.60	.47
Evening	.58	.51
Grouping Preference	.64	.74
Posture Preference	.52	.72
Mobility Preference	.64	.58
Sound Preference	.69	.78
Lighting Preference	.73	.63
Temperature Preference	.72	.59

APPENDIX F

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD
HUMAN SUBJECTS REVIEW

97

Date: 05-11-98

IRB #: ED-98-112

Proposal Title: THE RELATIONSHIP OF LEARNING STYLE TO INATTENTION AND HYPERACTIVITY

Principal Investigator(s): Diane Montgomery, Susan M. Linde

Reviewed and Processed as: Expedited/Special Population

Approval Status Recommended by Reviewer(s): Approved

ALL APPROVALS MAY BE SUBJECT TO REVIEW BY FULL INSTITUTIONAL REVIEW BOARD AT NEXT MEETING, AS WELL AS ARE SUBJECT TO MONITORING AT ANY TIME DURING THE APPROVAL PERIOD.

APPROVAL STATUS PERIOD VALID FOR DATA COLLECTION FOR A ONE CALENDAR YEAR PERIOD AFTER WHICH A CONTINUATION OR RENEWAL REQUEST IS REQUIRED TO BE SUBMITTED FOR BOARD APPROVAL.

ANY MODIFICATIONS TO APPROVED PROJECT MUST ALSO BE SUBMITTED FOR APPROVAL.

Comments, Modifications/Conditions for Approval or Disapproval are as follows:

Signature: _____

Thomas C. Collins

Date: July 27, 1998

Interim Chair of Institutional Review Board
and Vice President for Research
cc: Susan M. Linde

VITA

Susan Marie Linde
Candidate for the Degree of
Doctor of Philosophy

Thesis: THE RELATIONSHIP OF LEARNING STYLE TO INATTENTION
AND HYPERACTIVITY

Major Field: Applied Behavioral Studies

Biographical:

Personal Data:

Born in Tulsa, Oklahoma, May 20, 1954, the daughter of
Eugene and Margaret Fleming. Married Gary D. Linde, June 6, 1975.
Children: Matthew M. Linde, Benjamin S. Linde, and Allison P. Linde.

Education:

Bachelor of Science degree in Elementary and Special Education from
the University of Tulsa, in May, 1977;
Master of Science degree in Applied Behavioral Studies from Oklahoma
State University in August, 1994;
Completed the requirements for the Doctor of Philosophy at Oklahoma
State University, Stillwater, Oklahoma in May, 1999.

Experience:

Elementary and Special Educator, Cleveland Public Schools,
Cleveland, Oklahoma, 1977-1981;
Elementary and Special Educator, Sand Springs Public Schools, Sand
Springs, Oklahoma, 1982-1994.
Psychological Assistant, Lloyd E. Rader Treatment Center, Sand Springs,
Oklahoma, 1996-1997;
Graduate Teaching Assistant, Oklahoma State University,
Stillwater, Oklahoma, 1997-1998;
Special Education Teacher, Behavior Specialist, and School Psychologist,
Jenks Public Schools, Jenks, Oklahoma, 1994-present.

Professional Memberships:

National Association of School Psychologists
Oklahoma School Psychological Association