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UNIVERSITY OF ALBERTA

IDENTIFICATION OF ATTENTION DEFICITS: DISCRIMINATION OF PSYCHOMETRIC INSTRUMENTS

BY

MICHELLE MCLARTY

A THESIS

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled IDENTIFICATION OF ATTENTION DEFICITS: DISCRIMINATION OF PSYCHOMETRIC INSTRUMENTS submitted by MICHELLE MCLARTY in partial fulfilment of the requirements for the degree of MASTER OF EDUCATION in SCHOOL PSYCHOLOGY.

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Abstract

The purpose of this study was to examine correlations between the Third Factor of the Wechsler Intelligence Scale for Children-Revised (WISC-R), the abbreviated Conners teacher rating questionnaire, and selective attention subtests from the Das-Naglieri Cognitive Assessment System (CAS) (expressive, receptive, auditory, and number finding). It was desired to see if the Third Factor measured lack of attention, corresponding to objective measures of attention from the CAS. Thirty-three children ages 8 to 10 from selected Edmonton resource classes, took part in the study. Reading difficulty was assessed first, using the word identification and word attack subtests of the Woodcock Reading Mastery Test. Results indicate that while 27 children in this sample have significant reading difficulties they do not equally have attention difficulties. Children were divided into two separate groups: those with and without significant attention difficulties (bottom 33.3% and top 50% based on their test performance). The results confirmed some previous hypotheses but also alerted one in the use of test results. There was a significant relationship between the WISC-R Third Factor and CAS subtests. The Third Factor was correlated with both the expressive attention tasks, $r(33) = -.41$, $p < .01$, as well as the number of correct responses from the Number Finding and

auditory tasks of the CAS, $r(33) = .45$, $p < .01$. Teacher ratings unexpectedly did not correlate with Third Factor ratings, nor the CAS scores, as each one of the teachers may have used a different personal interpretation of the scale. As expected, correlations between similar CAS attention subtests were obtained. Distinctions between different types of selective attention (*e.g.*, expressive versus receptive) were also observed in the results. The Third Factor, while useful in accounting for some of the attention component, did not provide the variety of perspectives on attention of which the CAS is capable. Specific feedback from the CAS was reported by both parents and teachers to be helpful. These findings, relating especially to the diagnostic values of the attention tasks, have important implications for remediation techniques currently being investigated for children with attention deficit disorders.

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I. INTRODUCTION

Educators have long been aware of the importance of attention for successful learning and performance. Maintenance and control of the attention process is necessary, especially in the event of changing task demands (Krupski, 1985). For those who have attention difficulties that impede the learning process, accurate diagnosis and suggestions for remediation are essential. To provide the best source of remediation, there is a need to accurately identify attention problems. The purpose of this study was to compare the outcomes of three psychometric instruments which test attention or its components. Comparisons may assist educators and those involved in the remediation process in regard to the following: (a) how to best ascertain an attention problem, as well as, (b) how to determine the type of intervention which best suits the needs of the child.

The general attention construct is not viewed as a single element. Attention is described under many headings: with or without hyperactivity, sustained versus selective. Samuels and Edwall (1981) describe general attention as entailing arousal, alertness, vigilance, capacity and selectivity. The DSM-III-R definition depicts attention by means of externalizing symptoms. Rudel (1974) also provides a definitional

structure for attention deficit disorders. He feels differently from some others, believing that all attention deficit disorders include "impulsivity"; impulsivity is internal, but may or may not be manifested in a conduct disorder, or some external behavioural manifestation. Three components which he has suggested to be present in an attention deficit disorder are: (a) responding without waiting for the critical stimulus (*e.g.*, in tasks which require sustained alertness, children may respond immediately after a preparatory signal which precedes the critical reaction signal), (b) insufficient organization of materials, and (c) action without planning (inadequate search and organization strategies). If exploratory behaviour is haphazard and lacking goal orientation, the child cannot compare and eliminate unnecessary features when occupied in a thinking or reasoning task.

Rudel (1974) gives an example of this aforementioned distractibility. In a game of "twenty-questions" the children with an attention deficit can understand and retain instructions. Their responses, however, are random and unorganized. Logical cues do not seem to be followed. If the children are not just guessing, their focus may be too narrow. Differentiation between relevant and irrelevant cues is not made. In addition, distraction keeps the children

from generalizing. In this case, the problem is not an inability to understand and learn rules of the process, for the children may understand the rules and repeat them. It is the act of organizing ideas and thoughts, without being distracted by others, that is arduous.

From a theoretical perspective, Posner and Snyder (1990) define attention as both the facilitatory and inhibitory effects of one message or signal on another. When both effects are present it is proposed that facilitation develops earlier than inhibition. As well, it was determined that the use of a prime or cue both facilitated and inhibited attended and unattended messages respectively.

Lahey and Carlson (1989) conclude from their review of the literature that two independent dimensions are involved in attention deficit disorders: (a) motor hyperactivity and impulsive behaviour; and (b) inattention, disorganization, and difficulty completing tasks. Children with characteristics from the latter category are often "characterized by fewer serious conduct problems, less impulsivity, greater sluggishness, greater anxiety, and greater depressed mood" (Lahey & Carlson, 1989, p.5). Lahey *et al.* (1988) cluster analyzed the attention deficit disorder variables, inattention-disorganization, motor hyperactivity-impulsivity, and sluggish tempo, and

found that two attention deficit disorder profiles emerged. Seventy-five per cent of children diagnosed to have an attention deficit disorder with hyperactivity (by means of the Revised Behaviour Problem Checklist, Quay & Peterson, 1982) were located in the first cluster (inattention-disorganization with motor hyperactivity-impulsivity) and 95% of the children previously diagnosed as attention deficit disorder without hyperactivity fell in the cluster low on motor hyperactivity-impulsivity, but high on inattention-disorganization and sluggish-drowsy.

Children with attention problems have often been labelled by teachers to be more problematic than other children in the classroom. Their inability to remain with a task, and/or the tendency to interrupt class frequently with disruptive behaviour, causes them to be troublesome. Much focus is on keeping the hyperactive child stationary, while the quieter, inattentive, disorganized child slips by. Additionally, behaviour modification of the hyperactive child may not be addressing the source of the attention problem. A child's ability to sustain attention on a task, or be selective in his or her attention (the child's capacity to inhibit responses to distracters), may still require treatment.

Children without hyperactivity, but with an

attention problem, tend to be more quiet and cooperative, being rated lower on conduct problems and over-activity (King, & Young, 1982). It would appear that they could give the semblance of sustaining attention (maintaining attention over time), and not seem distracted from the overall task. Attention to selected aspects of the task, however, were still lacking for them. While sustained attention for overall task compliance may exist, attention to details within the task cannot be presupposed.

Samuels and Miller (1985) found no differences in sustained attention between normal children and those with learning disabilities. In fact, both of these groups in Samuels' and Miller's study (1985), showed significant increase in attention when moved from large classroom activities to small group and teacher-directed operations. Children with learning disabilities did show a difference on tasks requiring much selective attention, regardless of the setting (Das, Snyder & Mishra, 1992). Therefore, in the present study, only selective attention tasks from the Das-Naglieri Cognitive Assessment System (CAS) were used (Das & Naglieri, 1989).

The CAS came from development of a theory called the PASS (Kirby & Das, 1990). Behaviour was described in terms of interdependent functioning of planning,

arousal/attention, and (simultaneous and successive) processing (PASS). The attention component is the focus of the present study.

The main questions are (a) whether reading problems affect an individual's ability to attend, and (b) whether different measures used to identify attention deficits (with or without hyperactivity) equally discriminate children in a classroom for children with learning difficulties. Specifically, do the WISC-R Third Factor, Conners teacher ratings of attention problems, and the selective attention component of the CAS model, equally discriminate? If the WISC-R Third Factor does measure distractibility, how does it compare with respect to objective measures of the CAS? In addition, do specific subtests within the selective attention measure correlate more or less highly with the aforementioned tests?

The present study has been pursued in order to try and answer some of the above questions. It will also repeat comparisons of teacher ratings on the Conners and the CAS selective attention component. While teachers have been said to reliably diagnose attention deficit disorders (Brown, 1986; Kuehen *et al.*, 1987), how do they compare to the results received from other tests? The WISC-R Third Factor has been added as it is often observed during intellectual assessments as a

possible indicator of distractibility. The WISC-R Third Factor, however, has many factor explanations. Is it, therefore, comparably effective in determining attention deficits? If it is often low for children with learning disabilities, will it be able to discriminate between children with and without attention problems?

II. REVIEW OF THE LITERATURE

Historical Background

An historical concept of Attention-deficit Disorder was presented by Lahey *et al* (1988). It followed the trend of labels from minimal brain damage, to hyperkinesis, to DSM-III-R ratings. In DSM-III (1980) Attention-deficit Disorder was classified with and without hyperactivity and was divided into three categories: impulsivity, inattention, and hyperactivity. In the revised version (1987) there was only one category and eight out of fourteen descriptors were required to be present in order to classify a child as having Attention-deficit Hyperactivity Disorder (ADHD) (see Appendix A). While the category "without hyperactivity" was dropped, an Undifferentiated Attention-deficit Disorder was added. This included "disturbances in which the predominant feature is the persistence of developmentally inappropriate and marked inattention" (p.95).

Attention problems have often been found in tandem with learning difficulties. Historically, like attention deficits, learning difficulties in general have disadvantaged individuals both socially and culturally. Early researchers, such as Strauss and Lehtinen (1947), suggested that slight or minimal brain damage caused these learning difficulties. The

observations of the medical profession, of both behavioural and cognitive consequences to the brain following trauma, served in the evolution of terms such as "brain damage" and "dysfunction" (Black, 1981). Black also related that those without known injury, but who demonstrated similar symptoms to the trauma cases, were assumed to have brain damage. This term was thus used to refer to behavioural components and not necessarily perceived damage. Silver (1990) commented that later research did not demonstrate actual brain damage in many individuals, but instead, brain functioning difficulty. The term minimal brain dysfunction was thus eventually adopted.

A published report was provided in 1966 (Clements, 1966) pinpointing the source of dysfunction to be located in the central nervous system (CNS). Children who were defined as having minimal brain dysfunction had near-average to above-average intelligence accompanying their functional difficulties. While the IQ's of these children were in this range it became obvious that there were accompanying difficulties. Children with minimal brain dysfunction have often been found to have a cluster of difficulties, including learning disabilities, ADHD, emotional and social problems.

The definition of "learning disability," used by

the Learning Disabilities Association of Alberta consists of the following:

> The term "learning disability" refers to any one of a heterogenous group of chronic disorders that may have as its basis either an identifiable or inferred central nervous system dysfunction. These disorders may be manifested by difficulties in one or more processes such as attention and planning. This results in demonstrable weaknesses in language arts, mathematics, and/or social acceptance.
>
> Learning disabilities may affect anyone. However, if a student is underachieving relative to his or her learning potential, and has no sensory impairment, no motor impairment, adequate motivational and learning opportunities, and an adequate learning environment, then learning disabilities are considered the primary disabling condition.
>
> For the majority of students with learning disabilities, modification of the instructional process and/or the learning environment is required to meet their unique learning needs. In some instances, the use of a specific curriculum, directed to a student's needs and abilities may be required.

Students with learning disabilities exhibit one or more of the following characteristics: disorganization, distractibility, weak habits, hyperactivity or hypoactivity, impulsivity, inflexibility, perseveration, weak social relationships. Learning disabilities also refers to deficit functioning in one or more learning processes (i.e., auditory and visual receptive channels, and verbal and written expressive channels).

Attention-deficit Disorders have also followed a developmental pattern similar to that of learning disabilities, moving from damage to dysfunction to deficit. In the early 1900's Attention-deficit Disorder was perceived as a medical, CNS problem whose onset began before the age of eight. It was defined as a defect in motor control, despite adequate training. Due to the paucity of details in the definition, such difficulties as conduct disorder may have been included under this umbrella diagnostic term.

In North America, during the encephalitis epidemic of 1917-1918, survivors demonstrated impaired attention, regulation of activity, and impulse control. Impaired memory and social disruptiveness were also common characteristics. Due to this condition being caused by CNS damage, the generalization appears to

have been made that attention problems would [illegible] caused by CNS injury.

Hyperkinetic impulse disorder was the next applied label. Poor filtering of stimuli in the thalamus region, and thus excess stimuli reaching the brain, was thought to be the cause. This characterization was in contrast to today's perception of an attention deficit.

Treatment was not well documented during these years. Medicative therapies and the use of amphetamines began in the late 1930's. Behaviour modification techniques were also said to provide some improvement. Strauss and Lehtinen (1947) documented the first classroom change. They recommended the creation of an austere classroom by removing distracting stimuli such as pictures and window views.

The 1960's saw the concept of generalized brain dysfunction replaced with more specific labels: dyslexia, language disorder, learning disability, hyperactivity. This movement to objective criteria, as Barkley (1990) clearly notes, helped remove the blame from parents and a brain damage syndrome to a more behavioural syndrome. With this came a multi-modal treatment approach including family therapy, behaviour modification, psychotherapy, medication and special education.

By 1969 the term "damage" had become even less

many of the symptoms. Virginia Douglas and her many publications of the 1970's differentiated between children with and without hyperactivity. This was because some children still had difficulty sustaining attention and impulsivity, even though their hyperactivity decreased.

The issue of parenting resurfaced. With changing societal norms the deviance threshold also changed. Cause was attributed to poor conditioning to stimulus control by command or instruction, combined with negative responses to activity level. There was thus another rise in behaviour modification for both behaviour control and learning disabilities.

In order to document change, behaviour ratings were often kept. Today's perception of Attention-deficit Disorder still reflects this with the use of such scales as the Conners. Conners' Abbreviated Symptom Questionnaire (ASQ) (Goyette, Conners, & Ulrich, 1978) permitted conduct and hyperactive identification. It was not, however, a pure measure of ADHD, as aggression and hyperactivity were confounded. While checklists such as the ASQ were still labelled as predictive and treatment sensitive, psychophysiology research and the use of EEG's were entering the field. Research has seemed to show an underactive EEG

children who had an Attention-deficit Disorder.

It has appeared that children display either over or under-arousal. The 1986 edition of the Diagnostic Screening Manual (DSM-III) differentiated between children with and without hyperactivity. Thus, while all children in a research group may have had attention problems, discrimination between children who were overactive and those who were hypoactive and daydreamy was possible. Due to paucity of research before the revised version was printed, the DSM-III-R edition did not include a category without hyperactivity. It did include in a separate section an Undifferentiated Attention-deficit Disorder.

Barkley (1990) provided another perspective. He judged ADHD to be a motivation deficit disorder. It was suggested that responses to behavioural consequences were impaired due to decreased activation of brain reward centres. Motivation, as a conscious and active decision to control one's attention, was demonstrated very early on by Spong, Haider and Lindsley (1965). They suggested that a person's intention controlled brain responses. They measured evoked potentials in their subjects. Subjects were asked to respond to either a click at the ear or flash of light to the eyes, both of which were presented.

orienting response by their internal motivation.

While Barkley (1990) supported the motivational concept of ADHD, he also saw it as having a strong biological base. He described the often accompanying conduct disorder as due more to dysfunctional rearing. While "biological" was the suggested term, it could perhaps be better described as being influenced by "context," which could impact ADHD. Therefore, a combination of family system intervention, cognitive behavioural approach, social skills training and medication would be the preferred treatment approach.

It is clear that through history there has been fluctuation in the perception of ADHD. According to Barkley's research (1990), it has changed from "little affected" to "significantly modulated" by social circumstances. What was perceived as a chronic condition became one that could be outgrown. The definition then returned full circle to be labelled as a chronic developmental disorder.

Attention-deficit Disorder and Learning Disabilities

Rudel (1974) stated that the difference between Attention-deficit Disorder with hyperactivity and without was strictly one of control. It was suggested that while the motor activity may have been contained or regulated, mental restlessness, which is the

also related to ...

Lack of self control to motivate was hypothesized to affect attention level.

By observing development of attention from its infant stage, the potential for loss of selective attention was recognized. An infant was observed attending to a new stimulus until he or she discriminated or learned (object recognition). The infant eventually turned its head away when the stimulus was reintroduced due to habituation; otherwise, it would not have sought new stimuli. This process is a type of survival mechanism. If, however, over or rapid habituation occurred before learning was complete, similar stimuli were treated as new.

Freedom-from-Distractibility required differentiation of relevant from irrelevant stimuli. Distractibility impaired differentiation and generalization. The learning process thus took much longer. Increasingly novel stimuli would also be required in order to focus the individual's attention. While some children might appear to filter out irrelevant environmental stimuli, and while hyperactive behaviour might be brought under control, internal fantasies, feelings, thoughts and ideas could still interfere with learning as they distracted attention

discussion on the current controversy regarding whether attention deficit-hyperactivity disorder (ADHD) is a learning disability or a disorder related to learning disabilities. One of the major problems listed was the tendency of researchers to study different aspects of ADHD in isolation as well as subsuming different definitions. This would appear to accentuate the problem of providing labels without accurately describing the needs of the children.

Silver (1990) suggested that between fifteen and twenty per cent of those with a learning disability also had ADHD. ADHD has thus created two challenges, a) distinguisning between relevant and irrelevant stimuli, and b) learning to reflect before acting. Relevancy, discrimination and reflection, although associated with attention, could adversely affect academic functioning, and create or coexist with a learning difficulty.

Ozawa and Michael (1983) felt that there was much commonality between children labelled with a learning disability and those with an attention deficit disorder. The short attention span, and or low concentration, resulted in poor academic performance. A variety of symptoms were obvious: limited attention,

difficulty following directions, carelessness, impulsivity, difficulty in completing assignments, and problems starting tasks as directed. What should be pointed out is that the authors were demonstrating how an attention deficit could affect learning. They did not claim that learning disabled students all had attention deficits, but they pointed out that many with attention problems also had accompanying learning problems. The nature of the disorder would generate this. In their study, they compared the Ozawa Behavioural Rating Scale (1987) (a 5 point Likert scale) to the three subtests which form the Third Factor on the WISC-R. Intercorrelations ranged from .33 to .48, differentiating between children with a learning disability and normal children, and defining an attention component.

There have been a variety of attention studies with children who had accompanying learning disabilities. Cherry and Kruger (1983) looked at selective auditory attention abilities. In their lab tasks children with learning disabilities performed more poorly and acquired lower attending-behaviour outcome measures.

Copeland and Reiner (1984) also used a selective attention measurement. Three studies were conducted: a Speeded Classification task in which children sorted

twelve decks of twenty-four cards into piles as quickly as possible (piles were separated according to form stimulus: circle or square, line stimulus: horizontal or vertical, and star stimulus). Children with learning disabilities were slower sorters than non-learning disabled children. The number of irrelevant features present also affected sorting time. The authors felt this was indicative of a processing difficulty and selective attention strain. Children had more difficulty with stars than form, which was the easiest when no other stimuli were present. In addition, non-learning disabled children improved over time whereas those with a learning disability showed more errors over time, perhaps indicative of decreased sustained attention. The same task was performed again but with the addition of verbal mediation; surprisingly this hindered performance. It was hypothesized that it may have required the children to process two types of information simultaneously, another factor altogether. For the Central-Incidental Learning task older children, regardless of learning disability, remembered more for the central memory portion of the task. They also demonstrated primacy and recency effects. Learning disabled children, however, remembered more incidental information than children without learning disabilities. This seemed to indicate selective

attention difference between groups; however, in this study the differences did not significantly interfere with central memory.

Copeland and Wisniewski (1981) performed a similar investigation. They had children participate in a sorting task. The results supported Copeland's previous experiment, demonstrating differences in selective attention deficits between groups of children with and without learning disabilities.

During classroom observation children with learning disabilities appeared less on-task. The variables which are thought to affect attention are peer modelling, class size, and the context or situation in which the activity is performed.

Walter (1983) investigated the affects of peers modelling attention. When the average class attention was eighty per cent the attention of a child with a learning disability was actually greater than average at eighty-seven per cent. However, when average class attention was less than eighty per cent the attention of a child with a learning disability was sixty-two per cent.

Class size or type has also been thought to be a variable affecting attention. Both Bryan (1974) and Haynes and Jenkins (1986) found that children with learning disabilities demonstrated better attending

behaviour in a resource or special education classroom. Bryan (1974) found that attention in this case was even greater than "normal" children in the regular classroom.

Samuels and Miller (1985) found no differences in sustained attention between normal children and those with learning disabilities, regardless of learning environment. Both groups, however, showed significant increase in attention in small groups and teacher-directed activities.

Thirdly, affects of context have been raised as a variable influencing attention. A question which has been raised is whether or not it is context, or a fixed inherent quality of the child, that affects attention?

Friedman, Cancelli, & Yoshida (1987) observed twenty-four mainstreamed children in a regular classroom and a resource room setting. Instructional contexts with learning disabled children and the variability of their attention-to-task was noted. More attention was paid in the resource room than regular classroom. Regardless of room type, more attention was applied for teacher directed work than independent seat work. This demonstrated that attention degree was related to the context, NOT to a fixed quality of the child. Variation was found instead of stability.

Krupski (1985) concluded that lack of attention

was not cross-situational and thus was related to context, not an inherent quality of the child. The tasks in which attention was lower were due to a) an incapability, or b) avoidance of the task. Both these factors were thought to be related to the tasks' cognitive demands. Children with learning difficulties demonstrated more attending skills when tasks were less cognitively demanding (for example, art), but were less on-task when there were increased cognitive demands (academic materials). Krupski (1985) therefore felt that the children did not have an attention deficit, as they were capable of attending. He felt, instead that inattention was a symptom of a fundamental cognitive limitation (instead of the primary cause of the problem). Implications for remediation would thus involve focus on basic skills instead of highlighting inattentive behaviour.

Failure To Find Differences

Samuels and Miller (1985) examined attention across a variety of tasks and contexts. No differences between children with a learning disability and normal children were found for accuracy and response latency (sustained attention) or type of task (academic versus art). Interestingly, they found that for both groups a distractor near or in a target would create greater distraction than one at a more extreme distance.

They presented an hypothesized reason for this lack of difference between groups. They suggested that previous studies which had compared learning disabled students to normal children had found no differences because the populations were too homogenous. Not all children with learning disabilities had an attention deficit disorder (e.g., Ozawa & Michael, 1983). Therefore, to compare these children to a "normal" population, some of whom may have had an Attention-deficit Disorder, one should not expect a difference to always appear.

It has often been proposed, according to Fleisher, Soodak, and Jelin (1984), that attention deficits were a differentiating characteristic of children with learning disabilities. Evidence of a selective attention deficit, however, does not warrant classification nor intervention! The only conclusive evidence the authors were able to accumulate was a difference in central information recall for learning disabled children in comparison to those without a learning disability. This type of recall, however, was concluded to lack generalizability to the classroom.

Classroom learning is largely semantic; that is, there is always a pattern or relationship in the memory process (contextual stimuli). In the central-incidental task, often used to determine attention

difficulties, meaningless sequences were utilized. According to Fleisher *et al* (1984) conclusions from researchers using, "inappropriate stimuli, unusual processing demands... generalizability to classroom learning can be challenged" (p. 138).

In response therefore, it would be necessary when performing such testing to acquire teacher ratings of attention and classroom learning success. If these correlated with the central-incidental task, then perhaps, even though the test possessed poor face validity, it might adequately help distinguish one aspect of attention difficulties.

There was one fear that Fleisher *et al* (1984) voiced that should be considered by all. While it was true that some students with learning disabilities had an attention deficit disorder, it should not be assumed that all had one. If a test discriminated between normal children and those with a learning disability, but could not further discriminate between those with and without an attention deficit disorder, its classification properties would be limited.

Attention-deficit Disorder Without Hyperactivity

Lahey (1989) concluded that the literature suggested two independent dimensions: (a) motor hyperactivity and impulsive behaviour, and (b) inattention, disorganization, and difficulty completing

tasks. Those with the latter difficulties were often referred for social and academic developmental problems. They were "characterized by fewer serious conduct problems, less impulsivity, greater sluggishness, greater anxiety, and greater depressed mood" (p.5). They were more often unpopular, socially withdrawn, and actively rejected by peers than purely hyperactive children. According to Lahey (1988), of the two factors which appeared in the DSM categories, only three symptoms were found to lack consistency across studies: "difficulty sticking with a play activity", "excessive shifting from one activity to another", and "frequently engages in physically dangerous activities". When Lahey (1989) cluster analyzed the three factors of Attention-deficit (inattention-disorganization, motor hyperactivity-impulsivity, and sluggish tempo), two Attention-deficit profiles emerged. Seventy-five per cent of children were diagnosed as Attention-deficit with hyperactivity (ADD/H) (by means of the Revised Behaviour Problem Checklist; RBPC; Quay & Peterson, 1982) and were located in the first cluster (inattention-disorganization, and motor hyperactivity-impulsivity, but low on sluggish-drowsy). Ninety-five per cent of the children were diagnosed as Attention-deficit without hyperactivity (ADD/WO) and fell in the cluster

low on motor hyperactivity-impulsivity, but high on inattention-disorganization and sluggish-drowsy.

Instead of viewing this from simply a clinical perspective Lahey (1989) examined school based samples. He found that ADD/H children had more conduct problems whereas ADD/WO demonstrate more anxiety, depression and shyness. The two separate categories suggested in the earlier DSM-III, thus reemerged.

Intervention and Treatment

Depending on the manner in which a child's difficulty has been defined, intervention strategies vary. For the child diagnosed as having a learning disability, educational interventions have been the norm. For ADHD, however, treatment is varied. Behaviour management has been popular, as has treatment by medication. Counselling may also be added. While it is indisputable that many methods are available, it is crucial that those which are utilized, provide long-term benefits. If emphasizing attention span does not benefit the child on a long-term basis, then precious learning time has been wasted.

While many ADHD symptoms have been treated using medication, further treatment may also be required. Behaviour intervention has often been added here. In a study by Harrison and Romanczyk (1991), however, there was no correlation between impulsivity control,

measured by use of the Matching Familiar Figures Test and actual academic progression in the classroom. To only pursue an academic intervention though, such as one might use for a learning disability, attentiveness to the actual problem might be neglected. On the other hand, merely using management techniques to control attention would be insufficient if there was the accompanying complication of an unidentified learning disability. The child or adolescent might continue acting out or might withdraw because of failure to thrive in the classroom.

Rudel's (1974) third component of Attention-deficit, exhibition of attention without planning, raised some interesting speculation. If attention was positively correlated with planning ability then future research should examine this with regards to intervention, perhaps at the planning level. This could be observed with Das' PASS model as well.

Academic Perspective

An academic perspective will be presented as attention inadvertently affects the educational process. The area most distinctly affected is reading. All the children from the sample of the present research who had attention problems, as will be outlined in the Methodology, had accompanying reading problems. Often, an attention problem may initially

affect decoding and single word recognition. As children develop, they find coping mechanisms; however new areas of trouble emerge, such as difficulties with reading comprehension. This next section of the paper deals with some of the issues regarding reading, especially with respect to attention.

Although many children have mastered reading, others are deficient in this area. Much research has been completed, but there are conflicting arguments as to how attention affects learning in general, and reading in particular. What actually has contributed to reading difficulties? What can benefit them?

What has succeeded is an approach which deals with academics themselves. An example comes from a comprehensive study by Treiber and Lahey (1983). They found that direct reinforcement of academics improved scholastic performance and subsequently behaviour problems such as attention deficit disorders. Modification of external behaviours such as attention deficits, incompatible with learning, did not appear to improve actual learning and thus, was not a judicious use of learning time. Direct modification of academic deficits, from their perspective, appeared to be of greater value.

There are many subskills in reading. For good readers these subskills are highly intercorrelated;

that is, if a child has good decoding skills, he or she also has a large vocabulary, an ability to perform temporal sequencing and a good attention span. Poor readers, on the other hand, show an inferior intercorrelation (Guthrie, 1973), in which ability in one area does not imply ability in another. Parcelling these areas to work on improvement of one deficit, does not infer change in any other area. This would seem to imply that while there are different units within the single reading skill, each factor alone will not affect one's reading capability. Reading could perhaps be envisaged as a gestalt.

A student may have the capacity to read, but not have time to finish the exercises; thus, he or she could be labelled as not paying sufficient attention, or as having an intrinsic reading problem, when in reality it is only a matter of speed. Learning can be assisted by the positive reinforcement of completing a task and doing well; if a student does poorly simply because of a time restraint, he or she is being deprived of his or her ability to perform.

An argument in favour of speeded assessment came from Cronbach and Snow (1977) who said, "if aptitude is an ability to learn, and a curriculum is intended to develop such an aptitude, the obvious way to test its success is to assess how easily its graduates master

subsequent lessons covering fresh content from this subject area" (p. 108). Speed to complete tasks would thus be important.

If learning to complete a test faster actually correlated with improved reading ability, timing would seem to be beneficial; if it did not affect one's ability to understand a passage and express its information astutely, then perhaps its use has been of little value. The worth of timing tests needs to be evaluated immediately, taking into consideration those students who do poorly, as well as those who do well but need additional time.

Actual speeding of the reading process could be detrimental according to some researchers, especially if reading rate was only a subskill and not necessarily a correlate or cause of reading ability. Just because the child was slower might not imply that he or she was below average in understanding; the problem might be a difficulty in expression. Consequently, intervention techniques which focused on speed or the process of understanding could merely succeed to frustrate the child whose difficulty was in expression. If time restrictions were instituted, the child due to his or her difficulty, would be kept from presenting what he or she comprehended. What if the problem was maintaining attention and inhibiting distractors, which

in turn was causing slower speed of processing or was obstructing expression? As the child learned to inhibit distracters and became aware of important cues it would seem logical that he or she would become more proficient in an area such as reading, and that his or her speed would increase. Would improving attention strategies improve learning? Treiber and Lahey (1983) said that working on peripheral behaviours would not improve learning. Is it even possible to improve attention?

Siegel and Ryan (1984) segmented the reading process, stressing the differentiation between reading comprehension and decoding. A reading disability was defined by them to be an inability to read words related to the children's agemates. However, based on research which investigated means of improving reading problems (eg., Willows, 1978; Treiber & Lahey, 1983), assistance of decoding did not improve actual reading comprehension, which ultimately is the critical factor! By concentrating on testing students, and investigating various teaching methods that have not shown themselves beneficial for children with learning problems, time is squandered that should be used for the actual learning process.

When viewing reading developmentally, it was evident that younger students lacked temporal

organization and inferential ability (eg., Cross & Paris, 1988; Wilson, 1979). This, from a Piagetian perspective, would develop with formal operations, beginning around age ten or eleven. Readers who had difficulty reading, and had passed the age when formal operations should have begun were observed lacking advanced developmental stages. They depended more on concreteness and experience in their reading, lacking synthesis and inferential ability. For factual information, Wilson (1979) saw both good and poor readers as equally capable; what the poor readers lacked was the ability to make inferences when presented with more complex information.

If a reading disability was due to delayed development, simply describing procedures of inference and drilling ancillary skills would not benefit the student. He or she would need to master more basic steps of development before moving on. In addition, if control of attention had developmental properties that children needed in order to learn to discriminate and generalize among stimuli, basic skills from attention development would also need to be acquired. If development of attention had halted, then an attention deficit would always be present (Rudel, 1974).

Factors Created by Attention Deficits

Due to their attention deficit many children

perform poorly in school. This compounds the problem for they may then develop affective processes such as perceived lack of ability; Johnston and Winograd (1985) investigate such characteristics of failure. Often individuals fail, not because of inability, but because they feel they are incompetent of performing. As adults they may continue to avoid using learning strategies, even those of which they are capable (eg., Johnston, 1985). Some work has been accomplished with students who have been labelled as having learning disabilities. Bos and Filip (1982) found that some of the children, better described as inactive learners, were inefficiently organizing learning tactics, or not using them at all in the learning process. Covington (1987) suggested that motivational strategies could be used to encourage a person to attribute success to their own effort or self ability. While this could enhance the control a person feels, which often determines their self worth, it could also improve academic achievement and reading ability.

In conclusion, it would appear that reading disabilities and attention deficits could be classified as distinct but also overlapping. Due to genetic differences, environmental variations, and developmental factors, individualistic profiles are inevitable. The need presented by Silver (1990) is to

move from a singular perspective, that is, either a disease model or an educational model, and to combine the two positions. Murphy and Hicks-Stewart (1991) take Silver's argument further and say that it is not a question of whether or not ADHD is a learning disability, but it concerns whether or not educational needs are being recognized and met in the schools. Their proposal is interactional in style, combining genetics, individual differences and environment throughout development. The use of environment is presented as a critical factor; awareness of environment would allow respect for societal values to be shown during the course of development (Murphy and Hicks-Stewart, 1991). This clearly demonstrates the need to contract more individualized instruction instead of using large group norms.

Classification of Attention Deficits

The THEMAS, a structured thematic apperception technique, was used by Constantino, Colon, Malgady, and Perez (1989) to discriminate between normal children and those labelled ADHD. The children, having been shown a picture, were expected to tell a story including characters, setting, event and conflict resolution. The pictures were familiar bipolar situations, such as relating to parents versus peers, aggressive versus cooperative behaviour and delayed

versus immediate gratification. Children labelled ADHD omitted significantly more information than normal peers in their stories. A lack of attention was presumed.

Constantino *et al* (1989) felt that other measures of attention were confounded by underlying cognitive, verbal or neurological problems. Because THEMAS was pictorial and had no reading component it was felt this would be a better measure. The form of testing was also preferred as it was associated with the WISC-R picture completion subtest. This subtest was correlated with attention-to-detail, following Kaufman's investigation (1979a).

Misclassification Problems

Conflicting theories were often at the heart of the matter. Authors, such as Ostrom & Jenson (1988), felt that valid psychometric procedures were lacking. Kuehen, Kehle and McMahon (1987) inquired into instruments which discriminated between children with Attention-deficit Disorder, specific learning disability, and normal behaviour. Attention-deficit Disorder children (without academic deficit) were not misclassified as normal. Those children with a specific learning disability (without Attention-deficit Disorder), however, had a greater tendency of being misclassified as normal (27 per cent) than did those

with an attention-deficit (13.3 per cent).

Samuels (1986) felt that due to apparent contradictory findings, reasons for academic difficulties, such as attention problems, remained unclear (*e.g.*, contrast findings of Krupski, 1985, and Samuels, 1986). Krupski (1986) disagreed with Samuels' argument and contended that there was adequate explanation for the differences between studies and that conclusions were quite clear. He pointed out that there was a greater difference between the "normal" children and those with a deficit in his study than in Samuels'. He stated that the control subjects in the two studies were different, thus causing the seeming lack of clarity. In addition, the two distractors used by Samuels on the Flanker task did not meet the significant number of eight distractors suggested by other studies to cause significant distraction. Krupski (1986) thus concluded that attention was shown to be a symptom of the type of task and the environment. He concluded that attention deficit was not the underlying problem and one should abandon the traditional view of "within-child" attention deficits. An explanatory framework based on external variables should be taken instead for incidents of inattention.

The Conners Rating Scales (1969, 1973)

Teachers were able to accurately differentiate

between Attention-deficit Disorder children with and without hyperactivity according to the results of a study by Brown (1986). Three dimensions of classroom behaviour were assessed: (a) attention/concentration, (b) emotional lability/conduct, and (c) temperament (in addition to the usual cognitive and behavioural components). Not only global ratings were observed, but specific items for more precise diagnosis were examined. Because of the accuracy in teacher ratings it was recommended that diagnosticians utilize this resource. The American Psychiatric Association (1980) advocated giving primary consideration to teacher ratings over parents, as teachers were said to be more familiar with age-appropriate norms. Although Kuehen *et al* (1987) found that parent ratings were slightly better than teacher ratings, both were concluded to be reliable indicators.

Kuehen, Kehle and McMahon (1987) concluded that the Conners Parent and Teacher Questionnaires were the best discriminators between normal, Attention-deficit Disorder and specific learning disability children. As mentioned earlier, when using the questionnaire, children who were labelled Attention-deficit Disorder (without academic deficit) were not misclassified as normal. With a specific learning disability, however, and without Attention-deficit Disorder there was a

greater chance of being misclassified as normal than if the child had an accompanying Attention Disorder.

In contrast to those studies which would support the Conners, some have criticized the short form as too behaviourally oriented (Das, Snyder and Mishra, 1992). They found that it had both an attention function (2 items) and a hyperactivity factor (8 items). Based on the attention portion Das and Melnyk constructed a rating scale that had no items referring specifically to impulsivity nor conduct problems.

Das, Snyder and Mishra (1992) reported the results of this rating scale for attention, the Attention Checklist (ACL) (Das & Melnyk, 1989). They predicted the performance on measures of attention with children who were educable mentally retarded. This measure, when factor analyzed, produced only one factor, versus the two (attention and hyperactivity) found in the Conners rating scale. Three measures of selective attention corresponded with teacher ratings of attention. The three measures were (a) selectivity, (b) resistance to distraction, and (c) shifting or switching strategies. While the factors of the two scales differed, there was a correlation of .84 on the two tests for this sample.

WISC-R Third Factor

Kaufman (1979a) described the Third Factor as a

"sufficiently large and stable factor" (p. 10). This factor, commonly called Freedom-from-Distractibility, has been subject to much debate. There is a pre-requisite in order to use it as a separate factor. All three subtest scores, arithmetic, decoding, and digit span, must reflect similar magnitude.

The confusion which has arisen over the use of the Third Factor was partially due to its wide variety of explanations such as general mental alertness, perceptual interpretation ability, capacity for focusing and extracting pertinent relationships, and ability to suspend irrelevant thought processes while attending (Kaufman, 1975). Kaufman (1979a) clarified the intent of the factor's name by saying that it was not meant to only imply attention or concentration, as that would be limiting explanation to just a behavioural perspective. Kaufman (1979b) classified the possible Third Factor explanations into three categories: (a) sequencing impairment, (b) short term memory problem, and (c) distractibility.

Torgesen (1985), one of a few investigators, reported that memory deficits were often found with children who had learning difficulties. This affected their performance on the WISC-R Third Factor score. By calling it a Freedom-from-Distractibility score, it has been interpreted as measuring attention, which seemed

logical at the point of factor analysis. However, because the nature of two of the three subtests required memory to receive elevated scores, a low score would more likely be achieved by a student with this disability. The low score would thus be due to poor memory not a lack of attention.

While poor memory was the reason given for inferior performance it is possible that poor memory could also be due to an attention deficit. Causality would thus not be limited to two factors, but three (learning difficulty, poor memory, attention problem), and perhaps more, though as yet, unknown.

The noncognitive explanation given by Kaufman (1979a), however, for the WISC-R Third Factor was stated as the freedom from disruptive state or test anxiety. If it actually represented freedom from a disruptive state, it would be interesting to observe how it discriminated between children with and without an attention-deficit disorder in comparison to teacher ratings and the Cognitive Assessment System (CAS) attention components.

The Third Factor was often observed to be low for children with reading disabilities (Kaufman, 1979b). This would cause one to question whether the Third Factor measured a behavioural, or intellectual component, or both. If, on the other hand, a

behavioural element was assumed to be influential, cognitive or psychomotor functioning would not be the deficient quality as has sometimes been inferred.

Ozawa and Michael, (1983) by using the Ozawa Behaviour Rating Scale, received results of intercorrelations between the WISC-R Freedom-from-Distractibility factor and the Behaviour Ratings of impulsivity, distractibility, and their composite. It would appear, therefore that the Third Factor was influenced by a behavioural element.

While both the Third Factor of the WISC-R and the attention components of the CAS demonstrated recognition of attention problems, each has appeared to measure different qualities. The Third Factor required memory or verbal rehearsal strategies (Kaufman, 1979a, 1979b). Verbal rehearsal, as an indicator, has not identified children with attention problems in congruence with Das' attention component on the CAS.

Selective Attention as the Critical Factor

Selective attention has been seen as an important feature as early as 1958 in Broadbent's filter theory. He hypothesized that while many stimuli were received, an individual would need to screen for meaningful information in order to function. The manner in which selection occurred could be limited due to emotional, attitudinal and strategic concepts; nevertheless,

selection had to occur as he believed there was limited storage capacity.

A precursor to selective attention that must be addressed is arousal. It has been referred to as an orienting response which increases as the cognitive load increases. Hull's work (1948) demonstrated this when he plotted the reaction curve of arousal and attention. Attention was observed to increase with arousal to a critical level at which point attention and performing ability gradually declined. Thus, while arousal was shown as necessary it needed regulation.

According to Luria's conception of arousal, as cited in Das and Naglieri (1991, unpublished book, chapter on attention), arousal is a function of the first block of the brain regulating body and mind. "Arousal is the state of being active" (subcortical process), versus "attention is controlled by the cortex" (one attends to something in particular) (p.4). The relationship between arousal and attention was that if arousal were low, selective attention would be likewise.

Sustained and selective attention have both been cited as important. Das and Naglieri (1991, unpublished book, chapter on attention) reviewed the areas of attention. Sustained attention demonstrated an ability to maintain attention and remain vigilant.

Continuous performance tasks have often been used to measure this aspect. Selective attention, on the other hand, has been shown to involve receiving and coding of information (*e.g.*, physical and name match tasks), as well as, expression of attention. The ability to be selective in attention requires mental effort to resist distraction and change strategies.

Selective attention was greater than sustained attention for information processing demands (Melnyk & Das, 1992, in press), which is perhaps why academic tasks created an attention problem when art tasks did not (Krupski, 1986). Selective attention measures (testing for false detections) were able to discriminate between educable mentally retarded adolescents who were attending to task and those who were not (Melnyk & Das, 1992, in press). Scores of selective attention (the child's capacity for inhibiting responses to distracters) also corresponded with teacher ratings of attention.

Melnyk and Das (1992, in press) discussed the results of increasing the information process load. By making signal and nonsignal events more similar in an attention task, individuals were required to both maintain concentration and become more selective in their responses, in order to avoid false detections. This increase in information load required increased

attention that was selective.

The selective attention tasks of the CAS were timed. As previously mentioned, some have argued that timing tasks was discriminatory against those who were capable of performing but simply needed more time. Support for speeded tests came from Cronbach and Snow (1977) who had a mastery-learning perspective, including speed of mastery over time. Thus, as a child became more proficient in an area, his or her speed would increase. Just because the child was slower, however, did not need to imply that he or she was below average in understanding. The rationale suggested was that there may also have been a difficulty in expression or maintaining attention.

As far as assessment is concerned, a technique which is independent of the cognitive abilities of the child is needed. Constantino *et al* (1989) tried to impress their readers with the amount of extraneous material that may be being measured, other than attention deficit: intellectual confounds (e.g., concept formation), persistence, motor performance, and verbal rehearsal.

In contrast, others have suggested a more behavioural focus. They have felt that it is more testable and objective. Due to the malleability of behaviour, results could be confounded by medicine

prescription and other external variables.

In the present study, the independent variable was whether or not the child had an attention difficulty as assessed by (a) the Third Factor score (Freedom-from-Distractibility) on the Wechsler Intelligence Scale for Children: Revised; or (b) the selective attention components of the CAS, using expressive, receptive, auditory selective attention, and Number Finding subtests to determine a score. The dependent variables were level of reading difficulty (as assessed by the Woodcock Reading Mastery subtests: word identification and word attack) and the Conners teacher's rating of attention deficit. "Good" and "poor" levels of attention (as created by percentile splits, discussed in the Results section) were also separately held as dependent variables.

The purpose of this study was to examine correlations between psychometric instruments which have been used in determining attention deficits in children. It was hypothesized that lower scores of selective attention would be observed in all children who were distractible, as indicated by the Third Factor on the WISC-R and teacher's ratings on the Conners. It was also hypothesized that children with a reading difficulty would receive lower WISC-R scores on the Third Factor than those without a reading difficulty,

but that reading difficulties, by themselves, should not affect selective attention.

A comparison group of normal children was not used as the focus of this study was not to differentiate children with attention problems from normality. The focus of the present paper was on similarities and differences within the syndrome; specifically as it manifested itself in test conclusions. There was a desire to see if there were any meaningful differentiations between the various subtests used.

III. METHODOLOGY

Subjects

Thirty-three children, ages 8 to 10, from Edmonton's elementary resource centres, in the Edmonton Catholic school system, took part in the study. Children with sensory or motor deficits were not included in the study. There were 12 females and 21 males who took part. All children who participated completed all subtests.

Selection

Edmonton's Catholic school board granted permission for 4 schools to participate in this research project. One of the schools declined due to a number of other projects to which they were committed. The three remaining schools' principals were contacted. Following detailed explanation of the study they handed out permission forms to teachers who had children receiving help in a resource room. Written, informed consent was obtained from the parents of those children who participated in the study (see Appendix B).

Procedure

Following receipt of permission from parents, teachers were asked to fill in the abbreviated Conners Teacher Ratings Attention Checklist for these students (see Appendix C). The totals were computed with 30 being the maximum score. The same examiner tested each

child separately due to the nature of the tests. Each child spent approximately a one hour session with the examiner.

The Woodcock Reading Mastery word and letter identification subtests were given to identify the level of single word reading. The combined raw scores and mean of the age-normed scores were both tabulated. The children were also given the arithmetic, coding, and digit span subtests of the WISC-R, in order for a Third Factor score to be determined. Combined raw scores were tallied as well as the Freedom-from-Distractibility Third Factor score, determined from scaled scores based on age (Deviation Quotient). Subsequently, the children were given selective attention tasks from the CAS (described in detail below).

The results of the tests were analyzed for significant differences between children with and without decoding problems, with and without attention deficit disorders, as well as discrimination differences between tests.

Cognitive Assessment System

The attention component of the CAS has been validated through factor analysis (Naglieri, Das, Stevens, & Ledbetter, 1991). Face validity was initially important in creating the components, and following

this, construct and criterion validation studies have taken place (*e.g.*, Das & Naglieri, 1992; Kirby & Das, 1990).

Selective Attention

Selective attention tasks were divided into four categories: (a) expressive attention; (b) receptive attention; (c) auditory selective attention; and (d) Number Finding.

The expressive selective attention tasks were similar to the Stroop task and included two subtests with three sections each. The first subtest, Pictures, required the child to identify stimulus pictures of animals as large and small, regardless of relative picture size. For each section a practice trial was given. The first section of this subtest depicted animals of the same stimulus size. In the second section the animals were sized relative to the actual size. The third section had animals sometimes similar as well as opposite to actual size.

The second subtest of expressive selective attention, Words, first required the child to read the words red, yellow, blue, and green. Next, coloured inks (red, yellow, blue, and green) were to be identified by name. Finally, the child was to name the colour of the print, regardless of the colour name which was written. For example, if the word "yellow"

were written in green, it would be correct to say, "green." Scoring was kept by recording the number of seconds for each section within a 3 minute time interval. All children completed each section within the time limit.

The receptive attention tasks were paper and pencil tasks called Physical Match and Name Match, similar to that described by Posner and Boies (1971). The Physical Match task required the subject to select, by crossing out, letters which were identical in name and case, that is, either both lower or both upper case (*e.g.*, NN not Nn). The Name Match task required only letter name to be the same, that is Nn and not Nr. Scores for both sections were determined by finding the number of correct responses as well as the number of false alarms, or commission errors. The ratio of the total time to the total number correct was not tabulated as all children required more than the 2 minute limit, thus receiving 2:01 as their final time. A practice trial was given before each test.

The auditory selective attention component entailed a tape recording of a man's and woman's voice naming fruits (apple, pear, cherry, plum, and grape) and colours (red, blue, green, yellow, and purple). If the man's voice named a fruit the child was to indicate such by tapping on the table top. If the man's voice

said a colour, or a woman's voice listed an item, no response was to be given. Fifteen presentations of the stimulus were given every minute in the presence of 45 distractors. Scores were made for the number of correct responses as well as the number of false alarms/commission errors.

A second set of scores were intended to be obtained during a second auditory selective attention task. Responses were to be made whenever a man's voice said an animal and a woman's voice an item of furniture. No other combinations were to be signalled. The first few children who attempted this task asked that it be stopped. There appeared to be too many overwhelming stimuli, despite the fact that this second auditory task is to be used with children from age 8 and up.

The subtest Number Finding required the child to find and underline specific numbers within rows of numbers that contained both targets and distractors. A 90 second limit was given; however, none of the children completed the task within the time limit. Therefore, as in the receptive attention tasks, the ratio of the total time to the total number correct was not tabulated. Scores were determined by enumerating the number of correct responses as well as the number of false alarms, or commission errors.

IV. RESULTS

Descriptive statistics were examined to determine the mean, median, and standard deviation of each variable. Table 1 details these results with the exception of the median. Due to the fact that the median was not significantly different from the mean, it was not included.

Examination of the data revealed that 82% of the children (27 children) in the sample had significant reading difficulties with scores 18 months or more below age norms (below the 7th percentile), according to the updated (form H) Woodcock Reading Mastery Test norms. All but one of the children labelled as having an attention problem overlapped those with reading difficulties. There were ten children with reading difficulties only, and five without an attention or reading problem.

Observation of the Third Factor, Freedom-from-Distractibility score (mean of 100, standard deviation of 15), confirmed 15 children within one standard deviation above or below the mean. The 18 other children had scores more than one deviation below the mean. Fourteen of these 18 children were between one and two standard deviations below the mean. Four were more than two standard deviations below the mean. In short, 55 per cent of the children were below the mean,

Glossary of Terms and Short Forms in Table 1

Age-Months: age in months of the sample

Reading Level-Raw: Raw scores from the Woodcock Reading Mastery Word and Letter Identification subtests

Reading-Age Norms: Woodcock Reading Mastery scores normed for age

3rd Factor WISC-Raw: Combined raw scores from subtests

3rd Factor WISC-FFD: Combined scaled scores for the Freedom from Distractibility Third Factor

Conners Teacher Rating: Score from 0 to 30

Animal Naming 1: number of seconds naming animal size

Animal Naming 2: second attempt

Animal Naming 3: third attempt with distractor added

Colour Naming 1: number of seconds to read colour words

Colour Naming 2: naming coloured ink squares

Colour Naming 3: naming colour of words with distractor

Physical Match: number of correct responses

False Alarms: number of responses to non-targets

Name Match: number of correct responses

False Alarms

Number Find 1: number correct responses, first attempt

False Alarms

Number Find 2: second attempt with added distractor

False Alarms

Auditory Task: total number correct responses

False Alarms

Table 1

Maximum Possible Value, Means, and Standard Deviations

	Statistics (n=33)		
Variable	Max Value	Mean	Std Dev
Age-Months	97-131	114.58	11.71
Reading Level-Raw	151	62.30	25.28
Reading-Age Norms	309	95.94	26.00
3rd Factor WISC-Raw	139	50.24	9.10
3rd Factor WISC-Scld	159	85.51	13.40
Conners Teacher Rating	30	9.85	6.83
Animal Naming 1-Seconds	180	39.64	9.67
Animal Naming 2	180	32.63	6.63
Animal Naming 3	180	55.70	14.36
Colour Naming 1	180	27.79	8.13
Colour Naming 2	180	41.76	10.93
Colour Naming 3	180	82.33	25.72
Physical Match	50	37.54	7.51
False Alarms	150	0.09	0.38
Name Match	50	18.64	5.03
False Alarms	150	0.12	0.45
Number Find 1	45	34.64	9.96
False Alarms	135	3.21	10.21
Number Find 2	45	12.21	3.25
False Alarms	135	4.76	13.56
Auditory Task	75	55.36	10.17
False Alarms	225	33.61	30.94

Note. Only the mean is given as there is less than a 2 point difference between mean and median at any time.

22 per cent of them at more than two standard deviations below.

In comparison to the 18 children in the sample who were identified as being significantly low on the Third Factor, only nine children were rated by their teachers as having an Attention-deficit Disorder. These were not always the same children either. This would imply that there is a discrepancy between the two methods of identification.

Scores on the Conners and the CAS attention tasks were changed into z scores. The raw scores had different rating measures requiring change in order to make valid comparisons between groups. Pearson product-moment correlations were then run to establish possible relationships between tasks (see Table 2).

While the first Number Finding subtest was correlated with other variables (r ranged from .30 to .52, accounting for 9 to 25 per cent of the variance), the second Number Finding subtest did not correlate with any subtests in this sample. In fact, it seemed to be too cognitively difficult, with an average of 12.21 correct out of 45, compared to 34.64 on the first Number Find task. Moreover, there was very little variance in the second subtest (S^2= 3.25), suggesting that there was not a normative distribution of subjects in this sample for this type of task. Thus, whenever

Glossary of terms and short forms in Table 4

Age: age in months of the sample

Reading: Scores from the Woodcock Reading Mastery Word and Letter Identification subtests

3rd Fctr: Combined raw scores from subtests

3rd Scld: Third Factor, Freedom from Distractibility

Conners: Score from 0 to 30 allotted by the teacher

Animal 1: number of seconds naming animal size

Animal 2: second attempt

Animal 3: third attempt with distractor added

Colour 1: number of seconds to read colour words

Colour 2: naming coloured ink squares

Colour 3: naming colour of words with distractor

Ph Match: Physical Match task

False Al: number of responses to non-target

Nm Match: Name Match task

False Al

Find 1: number correct responses on Number Find task

False Al

Find 2: second attempt with added distractor

False Al

Aud Task: number correct responses on Auditory task

False Al

Table 2

Intercorrelations Between Students' Scores

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1 Age																				
2 Reading																				
3 3rd Fctr		.49																		
4 3rd Scld	-.46	.43	.67																	
5 Conners																				
6 Animal 1	-.38		-.58																	
7 Animal 2			-.27			.56														
8 Animal 3						.50	.51													
9 Colour 1	-.33	-.65	-.51				.29													
10 Colour 2		-.41	-.54	-.33		.63	.60	.40	.38											
11 Colour 3			-.51	-.34	-.28	.58	.57	.56		.70										
12 Ph Match			.56		.32	-.40				-.31	-.33									
13 False Al																				
14 Nm Match			.45			-.58		-.37		-.34	-.38	.64								
15 False Al				-.30								.31	.32							
16 # Find 1	.38	.46	.36			-.[illegible]			-.40	-.32		.50		.52						
17 False Al															.51					
18 # Find 2								-.35								.36	.29			
19 False Al		-.33	-.31						.30								.74	.34		
20 Aud Task		.31	.33	.42						-.37	-.37			.29						.30
21 False Al	-.37					.29						-.39		-.34						

Note. n = 33
r at p <.05 is .29
r at p <.01 is .40

Number Finding is mentioned in this paper it is in reference to the first subtest, unless otherwise specified.

Correlations With Age

The correlations revealed a statistically significant relationship between age and the Freedom from Distractibility Third Factor (r = -.46, accounting for approximately 20 per cent of the variance), as expected, and Number Finding (r = .38, only 14 per cent of the variance). The negative correlation reflected that with increasing age the child attention capacity decreased. This follows logically, as a child's ability to attend should improve with age, but a child who has an attention difficulty would continue to have attention difficulties. A correlation between age and false alarms in auditory tasks was observed (r = -.37). No hypothesis had been formed concerning this correlation, but the result was reasonable.

Correlations With Reading

Reading was correlated with the Third Factor (r =.43). This would suggest the existence of a logical relationship between the ability to be free from distraction and an increased competence to read with age. A relationship was also observed between reading and naming words on the expressive attention task (r = -.65). This correlation, higher than some of the

others, reflects the purer nature of the task to measure reading ability. There were not the distractors of the third Colour Word Naming task. As children demonstrated better reading ability, their time to name colours simply increased. Reading and Number Finding (r = .46), and correct responses on the auditory task (r = .31) demonstrated relationships between these variables also.

Correlations With the Third Factor

Correlations with the Third Factor help support the hypothesis that while each of the instruments may measure attention there are differences between them. The Third Factor was correlated with expressive attention (r = -.51), receptive attention tasks (Physical and Name Match, r = .56 & .45, respectively), Number Finding (r = .32), and the auditory task (r = .33). Receptive and expressive attention tasks seemed to be more strongly related to the Third Factor than the other CAS tasks. Additionally, with increasing Freedom from Distractibility fewer false alarms appeared to be made on some of the tasks. The Third Factor and Conners, however, did not, as initially expected, correlate.

Correlations With Expressive Attention

The expressive attention Animal Naming and Colour Word Naming task components were correlated with each

other, as expected. Expressive attention, as measured by the third Colour Word Naming task, was also correlated with the receptive attention Physical and Name Match tasks. This meant that as time to complete the Colour Word Naming task decreased number of correct responses on the receptive tasks correspondingly increased.

Correlations between the CAS tasks ranged from r = .29 (between Name Match and the auditory task), to r = .74 for the false alarms on the first and second Number Finding tasks. Included with the above correlations, and consistent with expectations, were the following relationships. The first Colour Word Naming subtest and the number of errors on the second Number Finding task were correlated. Time taken on a simple naming task decreased in relation to a decreasing number of errors in the difficult task of Number Finding. As well, there were more correct responses on the auditory task when time for Colour Word Naming was lower, demonstrating improved competency.

Correlations With the Conners Teacher Rating Scale

The Conners Teacher Rating scale unexpectedly did not have a significant relationship with 19 of the 21 variables. The two "significant" relationships were in a direction opposite to the hypothesis. Too many raters, or the small range of the sample, may be

factors affecting this variable.

Comparison of Psychometric Instruments

To make more detailed comparisons using the selected attention tasks the following variables were constructed: "Stroop", combined scores of the third Animal Naming and Colour Word Naming expressive attention tasks; "Total Hits", number of correct responses made on the first Number Finding and combined auditory tasks; "Total False Alarms", number of incorrect responses made on the first Number Finding and all auditory tasks.

In order to differentiate between good and poor attenders in the available sample, percentiles were calculated for constructed variables. Poor attenders were identified as those in the bottom 33 per cent. The good attenders were classified as those equal to or greater than the 50th percentile. The Third Factor score was also used as an independent variable. By use of a median split good and poor attenders were identified on this variable, with 16 and 17 in the two groups respectively.

For the constructed variable Stroop, poor attenders were those with the higher scores, as time to complete the task was the recorded value. Eleven children were identified as poor attenders with the total time beginning at 204.08 seconds. Good attenders

had a time score of 193.30 seconds or less and were 17 in number. Quite similarly, the Total Hits variable had 11 poor attenders and 16 good attenders. The identifying scores were 153.88 and 161.61. Total False Alarms were divided in the same manner as the Stroop scores, as a lower number of false alarms represented better attention. There were 17 good attenders with number of false alarms falling from 118.75. In comparison, there were 12 poor attenders in this group with a minimum of 133.28 false alarms.

Pearson product-moment correlations were run for the newly constructed variables to determine existing relationships (see Table 3). The total number of 33 subjects in the sample was small for comparison of 21 variables as outlined in Table 2. A limited number of comparisons was thus given in Table 3 to reduce sampling error.

Children having a significantly low WISC-R Third Factor score were compared with children indicated as having an attention problem based on CAS selective attention subtest scores. In turn, these children were compared with those indicated as having attention deficits based on teacher ratings. As mentioned previously, the 16 children who were identified as having low WISC-R Third Factor scores were taken from the bottom 33.3 per cent of the sample. The children

Glossary of Terms and Short Forms in Table 3

Age: age in months of the sample

Reading: Scores from the Woodcock Reading Mastery Word and Letter Identification subtests

Third Factor (raw score): Combined raw scores from subtests

Third Factor (scaled score): Third Factor, Freedom from Distractibility

Conners Rating: Scores from 0 to 30

Stroop: total of scores from third animal and colour naming expressive attention tasks

Total Hits: number of correct responses made on first Number Finding task and auditory tasks

False Alarms: number of incorrect responses (false alarms) made on Number Finding and auditory tasks

Table 3

Intercorrelations Between Constructed Variables

	1	2	3	4	5	6	7	8
1 Age								
2 Reading								
3 Third Factor (raw score)		.49						
4 Third Factor (scaled score)	-.45	.43	.67					
5 Conners Rating								
6 Stroop Score (timed task)			-.41	-.26	-.27			
7 Total Hits		.52	.45					
8 False Alarms	-.32							

Note. $n = 33$
r at $p < .05$ is .29
r at $p < .01$ is .40

with lower CAS selective attention task scores were those 33.3 per cent who did most poorly in each group.

Of theoretical interest were significant negative correlations between the Stroop and Third Factor scores (r = -.41). As Freedom from Distractibility increased, demonstrating greater competency, the time to complete the Stroop expressive attention tasks (with distractors) decreased.

The same relationship, between Stroop and Third Factor, was examined by means of a one-way ANOVA (see Table 4); however, in this case the relationship was not significant. The range was restricted due to comparison of outermost subjects when the two groups (high and low attenders) were formed from the Stroop variable. Variance was thus decreased, making it less likely that significantly different F values would be found. With a larger subject pool this would likely have been a significant relationship.

Referring back to Table 3, the Total Hits constructed variable was positively correlated with the reading score (r = .52) and Third Factor raw score (r = .45). Total false alarms were negatively correlated with age (r = -.32). It appeared that with increasing ability to respond correctly, reading increased and distractibility decreased. Incorrect responding, while not correlated with these other variables did seem

Table 4

One-way ANOVA for High and Low Attenders Divided on Their Expressive Attention Scores (Stroop: Animal and Colour Naming)

Variable	MS error	DF	F	P
Third factor (raw scores)	83.72	1,24	.955	NS
Third factor (scaled)	105.40	1,24	.584	NS
Conners	128.80	1,24	.602	NS

One-way ANOVA for High and Low Groups Based on Their Total Hits from Number Find and Auditory Tasks Taken Together

Variable	MS error	DF	F	P
Reading (raw scores)	4354.21	1,25	7.246	<.01
Third factor (raw scores)	601.61	1,25	8.380	<.01

Note. NS = Not Significant

Table 4 continued

One-way ANOVA for High and Low Groups Based on Their False Alarms from Number Find and Auditory Tasks Taken Together

Variable	MS error	DF	F	P
Age	962.03	1,24	8.727	<.01

One-way ANOVA for High and Low Attenders Divided on WISC-R Third Factor Scores

Variable	MS error	DF	F	P
Reading (raw scores)	1983.06	1,32	3.330	NS

Note. NS = Not Significant

related to age. That is, with maturity, the children seemed more capable of controlling some of their responses.

Comparisons of mean difference scores for each of the three constructed variables were conducted by means of a one-way ANOVA (see Table 4). The one-way ANOVA confirmed expectations of significant differences between the total number of hits and the WISC-R scaled score, as well as the reading score. As hypothesized, a significantly greater total number of correct responses were achieved for those with higher WISC-R scores and higher reading scores [$F(1, 25) = 8.38$, $F(1, 25) = 7.246$, $p < .01$] than did those with lower scores.

The one-way ANOVA also verified significant differences between the total number of false alarms and age. Comparison of difference scores demonstrated that younger children in the sample had a significantly greater number of false alarms than did the older children [$F(1, 24) = 8.73$, $p < .01$].

A comparison of time for task between high and low attenders, divided on their Stroop expressive attention scores, exhibited no difference for either the Third Factor rating or Conners' teacher rating. There was also no significant difference between groups divided on Third Factor scores when reading ability was compared.

V. DISCUSSION

The present study examines correlations between psychometric instruments used in testing children with learning and/or attention deficits. One of the intentions of this research was to examine the sample characteristics in relation to reading and attention problems. The children with reading difficulties overlap and outnumber those with attention problems. As mentioned previously in the results section, the number of children with reading problems were 27, while those with attention problems were 18. Seventeen of these children with attention problems overlapped those with reading difficulties. This would also imply that ten of the children with reading problems did not exhibit attention problems. The number of children below reading age norm is not surprising, as all children in the sample receive resource help due to learning and/or attention problems. It would be expected, therefore, that word identification and word attack would be more problematic for all subjects.

As reading scores increase so do scores on the WISC-R Third Factor and many of the attention tasks. This is logical as age is taken into account when the WISC-R Third Factor is constructed. Thus, age and the Third Factor are also correlated. This seems logical also from the view point that reading ability and

attention increase with maturation. The same would seem to be true for correlations of age with expressive attention and Number Finding.

Children in this study with attention problems do demonstrate a relationship with reading disability. This raises a question for many educators: should one concentrate on increasing attention level and thus enable the student to gain better reading skills; should concentration be spent on improving reading skills and thus improve overall attention? It is crucial to remember that while these areas are related, improving one area does not necessarily cause another to improve.

New Information from the CAS

The Third Factor of the WISC-R and the attention component of the CAS overlap in the information they provide. The expressive Colour Word Naming, Physical and Name Match tasks were most strongly related to the WISC-R Third Factor (r = .51, .56, .45, p < .01). While both the Third Factor and CAS overlap, new information can be gleaned from the CAS. The attention component of the CAS is thought to be a purer measure as it is less affected by the broader cognitive measure of the WISC-R, and is less language based. The WISC-R Third Factor, as mentioned previously (*e.g.*, Kaufman, 1975), has been faulted with having too many elements

affecting it to be a pure distractibility or attention component: (a) sequencing impairment, (b) short term memory problem, and (c) distractibility.

Information gained from the CAS is partially due to the number of available variables. Each requires increasing levels of attention. There are increasing levels of interference in the subtests (*e.g.*, Physical and Name Match tasks). As well, receptive, expressive, and auditory attention are all elements in the subtests. There is also the ability to differentiate between impulsivity in response style (false alarms), and ability to attend and respond to correct answers.

Unexpected Results with Conners Teacher Ratings

The teacher ratings did not relate to attention task in any meaningful manner. The relationship between the Conners and the expressive Colour Word Naming is only significant at the $p < .07$ level and in an unexpected direction. This unexpected relationship is probably due to the number of teachers used and the small sample size of subjects. While a teacher's rating scale may be beneficial for screening, there may not be consistency across raters. In comparison to previous research which found significant results, the subject samples from this study are not comparable which might also explain differences (*e.g.*, Das, Snyder, and Mishra, 1992, all from regular classes;

Das and Melnyk, 1989, all mentally handicapped).

Correlations Lacking Significance

Task demands may seem to increase for children with an Attention-deficit Disorder as less concentration is directed toward the task. Due to learning and attention problems which greatly impede success on tasks of difficulty such as Number Finding, there would be little expected variance in ability, with most children performing poorly. It would be expected that a more heterogenous group (and one of larger sample size) would demonstrate greater variance and thus allow one to compare correlations with other attention tasks. Tests which did not demonstrate significant relationships, nonetheless showed a weak relationship in the expected direction.

Correlations Between Similar Subtests

There are correlations between related subtests as expected. For example, two versions of a Stroop test were used: Animal Size Naming (for children under 8 years old) and Colour Word Naming (for children over the age of 8). There were demonstrated significant relationships.

While both the receptive and expressive tasks deal with attention, however, there does appear to be some difference between these two tasks, limiting the strength of their relationship. This may be due to

hypothesized qualitative differences between these two areas. When examining individual data it was observed that some children have difficulty in both areas, while others did very well in one and quite poorly in the other. These individual differences for types of attention could be examined in research with a larger sample size.

Limitations

The sample size for this study was small due to access complications. With a small number of students distribution curves are not as likely to be normal, as within group variance becomes less. This is especially true when creating independent variables for the ANOVA measures. Compared variables which had significant correlations were not always significant when an ANOVA was run. The top of an already limited population was sampled, restricting the range even further. This could also account for the number of correlations which, while demonstrating correlation in the expected direction, were not significant.

While sex was not a recorded variable, the preponderance of Attention-deficit Disorder subjects with hyperactivity are usually males, and those without hyperactivity, females. There were insufficient numbers per group in the present study to warrant a comparison. Further studies should attempt to access a

larger group so that differences between gender, on sustained or selective attention tasks, can be investigated.

A further limitation concerns the ability to differentiate between those with only a reading difficulty and not an attention problem. While use of the Ozawa Behaviour Rating Scale (Ozawa & Michael, 1983) enabled researchers to differentiate between normal and deficit children, there was much commonality between children with a learning disability and those with an Attention-deficit Disorder. This may be a confounding variable, therefore, in this study.

Another factor limiting the study were influences on the Conners. A possible factor affecting the Conners ratings was that the scale is behaviourally based and some children were receiving Ritalin to control behaviour. While the teachers rated the children as they were without Ritalin, the comparison may have been somewhat influenced. Usually, impulsivity correlates well with attention problems, but if the children's impulsivity were controlled by Ritalin then their behaviour ratings would be lower, despite continuing inattention problems. There were also six different teacher raters and thus six different internal ratings or standards which could have affected the outcome of the study.

Qualitative Observations

Those children who were more hyperactive seemed to enjoy verbalizing aloud. This could be due to the amount of energy and speed some children seemed to put into these tasks in which they could verbalize aloud. In contrast, there were others whose answers seemed to take much effort. Barkley (1990) referred to these children as having a "sluggish tempo." Not much credence can be given to this contrast, however, due to the small sample size. It would be interesting to compare differences between types of children and see if the same occurred in a larger sample, especially if the sample were large enough to compare children with and without a hyperactive component to their attention problem.

Parents and teachers reported that they have found the detailed feedback from the CAS attention components helpful. Some children did well on tests which had only one component. With the addition of another factor their time to complete the task and the number of errors made increased. For other children, the number of task elements did not seem to create differences; however, the type of task did. For example, some children performed well on tasks allowing them to express themselves verbally. Other children did poorly on these tasks, but did well when performing

pencil and paper attention tasks. Finally, some children who did well on both the aforementioned did poorly when having to attend to auditory information. These individual differences were shared with parents and teachers who reported that the results either confirmed what they had been thinking, or provided an alternate approach when working with the child.

Unfortunately, some tests are not adequate to discriminate children with and without attention problems when a learning difficulty is present. Some newer models of investigation for Attention-deficit Disorders, such as the CAS, have a number of components, permitting more detailed feedback. Further research should pursue the utility of this type of feedback to ascertain whether or not knowledge and use of this information actually assists to increase attention longitudinally.

The present results reinforce the theory that inattention is related to one's ability to selectively attend to information (*e.g.*, Das, Snyder, & Mishra, 1992; Fleisher, Socdak, & Jelin, 1984). Children with attention problems may perform more poorly due to complexity inculcated by lack of general arousal or conversely, due to extra attention given to motor behaviour. Due to today's fast-intake, heavy academic education system, such children are left far behind.

Remediating basic problem solving skills, or simplifying a task's cognitive demands, or improving selective attention may all be effective strategies, depending on the needs of the child. Monitoring academic task completion may be more beneficial than having the child monitor attention to task. In order to complete an academic task, however, one must be able to pay attention! One needs to be aware of factors affecting and affected by Attention-deficit Disorders, and the alternatives for remediation. Much more study needs to be executed as there are still many unanswered questions.

VI. GENERAL CONCERNS REGARDING ASSESSMENT AND REMEDIATION

This research project's focus is on diagnosis. The implications, however, of diagnosis/identification must be confronted. Has economic impact or children's needs dictated the type of labels resulting from diagnosis? Is assistance more accessible for medical or societal dysfunctions? Are dysfunctions, in fact, more or less pleasing than disorders or damages? The fact that these questions might be asked demonstrates the effect of social stigma. What is most important, however, is whether the label or diagnosis actually assists a child. The condition itself "...has a significant impact on academic and social outcomes for many children" (Barkley, 1990, p. 36).

Cross and Paris (1988) say that metacognition is "the knowledge and control children have over their own thinking and learning activities, including reading" (p. 133). Therefore, if a child has neither the knowledge nor the control, it is unlikely that attention, let alone reading ability, will improve. If difficulties have arisen due to delayed development simply describing procedures of inference and drilling ancillary skills will not benefit the student. He or she needs to master more basic steps of development before moving on. Additional research needs to be

undertaken to study metacognition and the developmental stages of attention in children.

Teachers are interested in their children's academic process. Therefore, when attention is identified as a problem, they hope that remediation may ultimately assist academic learning. A teacher's main concern is often reading. There are many subskills in reading. For good readers these subskills are seen as highly intercorrelated; that is, if a child has good decoding skills, he or she also has a large vocabulary, an ability to perform temporal sequencing and good attention. Poor readers, on the other hand, show an inferior intercorrelation (Guthrie, 1973), in which ability in one area does not signify ability in another. Parcelling areas to work on improvement of one deficit, does not seem to change ability in another area. This would seem to imply that though there are different parts within the gestalt of reading, each factor alone does not necessarily affect one's reading capability, especially if one is a poor reader to begin with.

While it is indisputable that many methods are available for diagnosis, and a variety for remediation, it is crucial that the interventions provide long-term benefits. If a subsection of reading comprehension such as decoding, attention span, or repetition is

emphasized and yet does not benefit the child on a long-term basis, then precious learning time has been wasted.

As mentioned in the literature review, what has been shown to succeed is an approach which deals with basic skills themselves. An example comes from a comprehensive study by Treiber and Lahey (1983). They found that direct reinforcement of academics improved scholastic performance and subsequently behaviour problems such as Attention-deficit Disorders. Modification of external behaviours incompatible with learning did not appear to be a judicious use of learning time. Direct modification of academic deficits would be of greater value.

Information concerning attention is thus only a clue to solving the overall problem. Miller in his 1979 literature review cautions researchers against the assumption that the interaction between student and method of remediation overrides the impact of all other variables. Because so many extraneous variables could have affect, singling out one variable will not cure the problem. When remediating attention it is important to remember that attention may not necessarily be the causal factor for other learning problems (e.g., Harber, 1980), it may simply be a precursor to a larger problem.

Nevertheless, dealing with an attention problem may subsequently enable the child to take part in the remediation process for other academic activities. It may also allow the child to socialize more appropriately in an academic setting. By identifying an attention problem and receiving clues as to how to rectify it, one can then hopefully engage a child to read or participate in other academic endeavours.

One would hope that research and diagnoses would not exacerbate the negative outcomes with which many children cope. As mentioned earlier, perhaps the most important reminder to both educators and those who assess children is to take the path which provides the greatest opportunity and the least encroachment of a child's potential. Special education may not be necessary for the child with adequate ability. Special accommodations, however, may need to be made for a child with unique ability.

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Appendix A

Diagnostic Criteria for Attention-deficit Hyperactivity Disorder

Note: Consider a criterion met only if the behaviour is considerably more frequent than that of most people of the same mental age.

A. A disturbance of at least six months during which at least eight of the following are present:

(1) often fidgets with hands or feet or squirms in seat (in adolescents, may be limited to subjective feelings of restlessness)
(2) has difficulty remaining seated when required to do so
(3) is easily distracted by extraneous stimuli
(4) has difficulty awaiting turn in game or group situations
(5) often blurts out answers to questions before they have been completed
(6) has difficultly following through on instructions from others (not due to oppositional behaviour or failure of comprehension), e.g., fails to finish chores
(7) has difficultly sustaining attention in tasks or play activities
(8) often shifts from one uncompleted activity to another
(9) has difficulty playing quietly
(10) often talks excessively
(11) often interrupts or intrudes on others, e.g., butts into other children's games
(12) often does not seem to listen to what is being said to him or her
(13) often loses things necessary for tasks or activities at school or at home (e.g., toys, pencils, books, assignments)
(14) often engages in physically dangerous activities without considering possible consequences (not for purpose of thrill-seeking), e.g., runs into street without looking

Note: The above items are listed in descending order of discriminating power based on data from a national field trial of the DSM-III-R criteria for Disruptive Behaviour Disorders.

B. Onset before age seven.

C. Does not meet the criteria for a Pervasive Developmental Disorder.

Appendix B

Letter of Consent

Dear Parent/Guardian:

Your child has the opportunity to participate in a paper and pencil study which is concerned with identifying effective means to perceive and help children who have attention and/or learning difficulties. This will be a fun time, and would not cause frustration nor concern. I am from the University of Alberta, doing research on attention difficulties in children. Permission for this study has been given by the Edmonton Catholic School Board.

This will not be a time of testing to see how your child does specifically, but of how children, in general, with an attention and/or learning difficulty concentrate. Therefore, any information received will be confidential and will not be shared concerning specific children; this material will not be used for evaluation purposes nor kept on School Record. If you wish to be briefed following the study it will be possible to arrange a session to speak to you about your child's performance. This will be a fun time for the students and would be of benefit, not just for them, but for other students and teachers who wish to use methods that can best help children learn effectively.

Although you may sign the consent form for your child to participate, if he or she suggests at any time to a teacher or myself that he/she does not wish to participate, this will be honoured. When meeting with myself, your child will be reminded that if he or she wants to stop, he/she will not be made to continue.

If you have any questions, please feel free to contact me at the University of Alberta (492-5245).

Sincerely,

Michelle McLarty

Please detach and return to school as soon as possible, whether your child is participating or not.

Appendix B continued

I give / do not give permission to _____
(please circle one) (child's name)

to take part in this activity, supervised by the Edmonton School Board.

Signed _____
(parent/guardian)

Appendix C

Conners Teacher Rating Scale

Student's Name

_____

Conners Teacher Rating Scale

Listed below are descriptive terms of behaviour. Circle the number which best describes this child. Please answer all items.

Response alternatives:

0 Not at all; 1 Just a little; 2 Pretty much; 3 Very much

Items:

1. Restless or overactive	0	1	2	3
2. Excitable, impulsive	0	1	2	3
3. Disturbs other children	0	1	2	3
4. Fails to finish things he starts, short attention span	0	1	2	3
5. Constantly fidgeting	0	1	2	3
6. Inattentive, easily distracted	0	1	2	3
7. Demands must be met easily frustrated	0	1	2	3
8. Cries often and easily	0	1	2	3
9. Mood changes quickly and drastically	0	1	2	3
10. Temper outbursts, explosive and unpredictable behaviour	0	1	2	3