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Working Memory and Disinhibition In Children with ADHD

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Working Memory and Disinhibition In Children with ADHD

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Abstract

This research sought to test predictions from Barkley's (1997) theory of disinhibition in Attention Deficit Hyperactivity Disorder (ADHD). To this end, the performance differences among younger and older children with and without ADHD were measured. The testing paradigm used in this study was originally developed by Hale, Bronik, and Fry (1997), who sought to measure the verbal and spatial working memory differences in school age children. In this study, ADHD children performed significantly worse on the tasks than did non-ADHD children, indicating that the working memory of the children with ADHD was more subject to interference. Also, younger children performed significantly worse on the tasks than did older children. Finally, older ADHD children performed worse than younger non-ADHD children within testing paradigm. These results provide some support for Barkley's theory of disinhibition.

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Chapter 1

Introduction

If there ever was a diagnosis that characterized a given era of time, "Attention Deficit with and without hyperactivity"(ADD/ADHD) would have to be the diagnosis of the 1990's. The debate as to the etiology of ADD/ADHD symptoms ranges from allergies to neurological defects. Throughout all of these theories what is often lost is a critical look at the actual effect of the disorder.

The Diagnostic and Statistical Manual fourth edition (DSM-IV: American Psychiatric Association, 1994) states that ADHD is symptomatically defined as deficits in three areas of behavior. These deficit areas are inattention, hyperactivity, and impulsivity. The DSM-IV states that in order for the diagnosis to be given, six or more of the criteria of inattention need to have been met and have persisted for at least six months to a degree that they are maladaptive and inconsistent with the child's developmental level. The criteria of inattention appear in Table 1. The criteria of hyperactivity appear in Table 2. The criteria of impulsivity appear in Table 3.

The DSM-IV further clarifies that there are four ways that Attention Deficit Disorder can be diagnosed:

1. Attention-Deficit/Hyperactivity Disorder, Combined Type (both criteria for inattention [Table 1] and hyperactivity [Table 2] are met for the past 6 months).

2. Attention-Deficit/Hyperactivity Disorder, Predominantly Inattentive Type (criteria for inattention (Table 1) are met but criteria for hyperactivity (Table 2) are not met for the past 6 months).
3. Attention-Deficit/Hyperactivity Disorder, Predominantly Hyperactive-Impulsive Type (if criteria for hyperactivity (Table 2) are met but criteria for inattention (Table 1) are not met for the past 6 months).
4. Attention-Deficit/Hyperactivity Disorder Not Otherwise Specified. This category is for disorders with prominent symptoms of inattention or hyperactivity-impulsively that do not meet criteria for Attention-Deficit/Hyperactivity Disorder.

This paper is concerned with Attention-Deficit/Hyperactivity Disorder, Combined Type (314.01).

ADHD is a problem that affects all areas of a child's world and how the child interacts with that world. Children experiencing ADHD commonly have difficulties in three broad categories of behavior. The first is inattention and distractibility. ADHD children have difficulty remaining on task and focusing attention in contrast to other children of similar ages. They additionally have difficulty screening out distracting events in their environments as they attempt to pay attention. The second category is impulsivity. ADHD children have difficulty thinking before doing. In other words, they do not think, they just act. They often interrupt, find themselves in dangerous situations and do not follow directions. In short, they do what seizes them at the moment. Further, they also have trouble weighing the consequences of their actions in planning for the future. They often times have difficulty following rule-governed behavior.

Table 1

Criteria of Inattention for DSM-IV ADHD Diagnosis

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

Note. Adapted from Diagnostic and Statistical Manual of Mental Disorders (4th ed; DSM-IV; pp. 83-84), by the American Psychiatric Association, 1994, Washington, D.C.: Author

Table 2

Criteria of Hyperactivity for DSM-IV ADHD Diagnosis

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

Note. Adapted from Diagnostic and Statistical Manual of Mental Disorders (4th ed; DSM-IV; pp. 83-84), by the American Psychiatric Association, 1994, Washington, D.C.: Author

Although they may know the rule and be able to explain it, they are unable to control their actions or to think before they act. The end result is impetuous, non-reflective behavior. The third category is over-arousal or hyperactivity. ADHD children tend to be excessively restless and overactive. Their difficulty in controlling bodily noises and movements is especially noted in situations in which they are required to stay still or quiet for periods of time.

In describing ADHD, it may be just as helpful to explain what it is not. ADHD is not a form of mental retardation. ADHD children are usually at least average in intellectual potential; many are higher than average. They are not primarily emotionally disturbed children; although many will develop emotional problems. These emotional problems are

Table 3

Criteria of Impulsivity for DSM-IV ADHD Diagnosis

a) Often blurts out answers before questions have been completed.

b) Often has difficulty waiting turn.

c) Often interrupts or intrudes on others (e.g. butts into conversations or games).

d) Some hyperactive-impulsive or inattentive symptoms that caused impairment were present before age 7 years.

e) Some impairment from the symptoms is present in two or more settings (e.g. at school (or work) and at home).

f) There must be clear evidence of clinically significant impairment in social, academic, or occupational functioning.

g) The symptoms do not occur exclusively during the course of a Pervasive Developmental Disorder, Schizophrenia, or other Psychotic Disorder and are not better accounted for by another mental disorder (e.g Mood Disorder, Anxiety Disorder, Dissociative Disorder, or a Personality Disorder).

Note. Adapted from Diagnostic and Statistical Manual of Mental Disorders (4th ed; DSM-IV; pp. 83-84), by the American Psychiatric Association, 1994, Washington, D.C.: Author

usually the result of poor self-concept that is the result of poor academic progress and peer acceptance (Silver, 1992).

A variety of theories have been proposed to explain the etiology of ADHD. Many of these theories have not been supported through research. These theories range from

dietary allergies, ingestion of lead based paints, to genetic influences. In the 1970's and 1980's it was commonly believed that ADHD was largely due to allergies from food additives, particularly salicylates, food dyes and preservatives. This food allergy theory of ADHD was proposed by Dr. Feingold (1975). Feingold was a pediatric allergist who had noticed through his years of practice that a number of his patients who had skin disorders had identifiable allergies. When certain foods or food additives were removed from a child's diet, particularly those containing salicylates, the sores vanished. Eventually, Feingold made the observation that those who had suffered with skin problems also had been labeled with hyperactivity or minimal brain dysfunction. Dr. Feingold found that by eliminating the salicylates and additives, the hyperactivity quite often disappeared, or was reduced so dramatically that parents and teachers noticed the change. It was on the basis of these findings that Dr. Feingold formulated his theory that hyperactivity was the result of allergies directly related to foods and food additives high in salicylates. This theory of ADHD generated a substantial amount of research that was unable to support Feingold's claims (for a review see Taylor, 1990).

Another proposed cause of ADHD has been lead poisoning. It has been known for some time that individuals who absorb too much lead develop both psychological and neurological problems. There is some correlational evidence that exists to show that elevated blood lead in children may be associated with a higher risk for hyperactivity and inattention (David, 1974). "At present, there is enough evidence to show that body lead levels are associated to a very small degree with hyperactivity and inattention in the general population of children" (Barkley, 1997 p. 42).

Genetic etiological factors have also not produced convincing evidence for a genetic component, although it has been found and established that many children who have ADHD often also have at least one parent who also has ADHD. Barkley (1997) states, "Genetic studies have shown that environmental factors, such as parental child-rearing as well as all nongenetic sources of neurological impairment, combined account for less than 10% to 15% of the variance in ADHD symptoms" (p. 37). "The strong hereditary influence of ADHD may also contribute to an apparent link between poor child management by a parent and ADHD—a link that may be attributable to the parent's own ADHD" (Frick & Jackson, 1993, pp. 56). The vast majority of the potentially causative factors of ADHD that have been researched have been biological in nature. However, there has been little evidence to show a purely psychosocial etiology for ADHD.

In general, regardless of the etiological factor, it is probable that a neurological disorder/ anomaly exists in ADHD children. A variety of research projects have been conducted over the years that support this understanding of ADHD. In particular it is noteworthy that over the years investigators have repeatedly noted the similarities between symptoms of ADHD and those produced by lesions or injuries to the frontal lobe, more generally, and the prefrontal cortex, specifically (Benton, 1991; Heilman, Voeller, & Nadeau, 1991; Mattes, 1980). Still other investigators have used Neuropsychological tests (e.g., the Wisconsin Card Sorting Test) to show that those with ADHD indeed do have problems with inhibition, persistence, planning, working memory, motor control and verbal fluency (Barkley, 1990; Barkley, Grodzinsky, & DuPaul, 1992).

Many current theories of ADHD focus on explaining the three primary symptoms: inattention, impulsivity, and hyperactivity. Inattention is the primary characteristic that is

emphasized by most theories. Yet research on ADHD often finds that inattention is not reliably found in children with ADHD nor does it distinguish the condition from other psychopathological disorders (Barkley, 1997). Instead, Barkley (1996, 1997) suggests the most consistent findings show a primary deficit in behavioral or response inhibition, the ability to delay responses, or the tolerance for delay intervals within tasks. Barkley (1996, 1997) suggests that the real nature of ADHD is not to be found in the lack of attention but rather in a disinhibition of responses. Thus, the primary component of ADHD is more one of disinhibition or a poor delay of response rather than inattention.

Barkley (1996, 1997) bases his new theory of ADHD on a theory proposed by Jacob Bronowski (1967, 1977) on the evolution of human language. In his work dealing with the theory of delayed responding and language, Bronowski (1967, 1977) argued that a major advancement in the evolution of human communication arose initially as an increase in the simple capacity to delay responses to a signal, message, or event. This capacity to inhibit initial reactions to events, arising primarily from the expansion of the frontal lobes, permitted the later development of four uniquely human mental abilities: separation of affect, prolongation, internalization, and reconstitution. Barkley (1997) has hypothesized that these four mental processes described by Bronowski (1967, 1977) contribute to the response inhibition system and ADHD represents a relative deficit in the development of delayed responding or response inhibition in the individual. Thus, the four mental processes described by Bronowski (1967; 1977) should be less proficient and less likely to guide or inform ongoing adaptive behavior of those with ADHD.

In general, behavioral inhibition (i.e. disinhibition) is the inability of an individual to inhibit a given behavior or thought. Barkley (1997) states,

> Behavioral inhibition refers to three interrelated processes: (1) inhibiting the initial prepotent response to an event; (2) stopping an ongoing response or response pattern, thereby permitting a delay in the decision to respond or continue responding; and (3) protecting this period of delay and the self-directed responses that occur within it from disruption by competing events and responses (interference control)." (p. 101)

It is not just the delay in response that results from response inhibition nor the self-directed actions within it that are protected, but also the eventual execution of the goal-directed responses generated from those self-directed actions (Bronowski, 1967, 1977). The prepotent response is defined as that response for which immediate reinforcement (positive or negative) is available or with which reinforcement has been previously associated.

Of primary concern with this research proposal is Barkley's (1997) understanding of working memory as it relates to ADHD. Barkley argues that the delay in human responding permits the referral of the incoming signal, message, or event to more than one brain system at a time, allowing simultaneous processing of the event by multiple reference centers. Barkley, like Bronowski (1967), believes that this simultaneous processing is the advantage of having a large brain. By dividing incoming messages into various components, individuals can split the incoming signals into their affective charges and the information or content of the incoming stimulus. Bronowski suggests that all other species respond to these two features of a signal or message immediately and in total. The ability of humans to hold information and events in working memory permits humans the power of objectivity, perspective, logic and rationality.

With Bronowski's (1967) theory as the basis for his theory of ADHD, Barkley (1997) suggests that there will be a variety of deficits evident in each of the major subcategories of behavioral inhibition (i.e., working memory /self-regulation of affect, motivation, and arousal / internalization of speech /reconstitution). Figure 1 describes the role of behavioral inhibition / disinhibtion with respect to Bronowski's theory. When the individual is confronted with an incoming stimulus, the behavioral inhibition system comes into effect. It is at this point that the four executive functions permit human self regulation, and bring human behavior under control with respect to time and the influence of the future over immediate consequences. The end result of this process is that the individual is better able to "predict and control one's environment so as to maximize future consequences for the individual. More generally, the interaction of these executive functions permits far more effective adaptive functioning" (Barkley, 1997, p. 110).

These deficits of behavioral inhibition, Barkley (1997) believes, should lead to secondary deficiencies in working memory and its subfunctions. The predictions regarding these sub function deficits include:

(a) Children with ADHD should be more influenced by context and less controlled by internally represented information than same-age peers without ADHD.

(b) Children with ADHD should be more influenced by immediate events and their consequences than by events more distant in time.

(c) Children with ADHD should be less likely to recall and hold in mind information about the past for thought and planning.

(d) Anticipatory or preparatory behaviors founded on such planning should be less evident in individuals with ADHD.

(e) A form of temporal myopia should exist in children with ADHD, in that behavior is more controlled by the temporal "now" than by internally represented information pertaining to the past, the future, and the sense of time.

(f) Children with ADHD should exhibit less control of behavior by time and more deficient organization of behavior relative to time.

(g) Performance under cross-temporal (if-then) contingencies should be less effective in those with ADHD because they cannot bridge the delays in the contingencies, using internally represented information (Barkley, 1997, p. 180).

Barkley (1997) further describes specific behaviors that correspond to these general deficits with respect to working memory. These deficits are:

(a) The inability to imitate lengthy sequences of goal-directed behavior demonstrated by others, given that such sequences cannot be held in mind as well for the orchestration of their execution.

(b) The subject's sense of time should be impaired.

(c) Information recalled from memory should be temporally disorganized—that is the very syntax of recall should be deficient.

(d) The syntax of motor planning and execution should likewise be disorganized.

(e) Discourse with others should reflect fewer references to time, the past and especially the future.

(f) Significant deficiencies should exist in the performance of those social skills (i.e., sharing, cooperation, etc.) as well as other adaptive behaviors (i.e., concern for safety, health consciousness, etc.) that are predicated on the valuation of future personal and social consequences over immediate ones. Barkley states that the problem for those with ADHD is not one of knowing what to do but one of doing what would be most adaptive in a given situation.

For the purposes of this dissertation, deficits (a) and (c) are particularly relevant. This study was designed to investigate the inability of ADHD children to imitate lengthy sequences of goal-directed behavior and show that information recalled from the memories of ADHD children is temporally disorganized when information is being processed in working memory.

As of this writing, no direct test of the hypothesis proposed in Barkley's (1997) Disinhbition Theory has been conducted. In the effort to test his Disinhibtion Theory, Barkley suggested that a study examining the differences between ADHD children and non-ADHD children on their verbal and spatial working memory abilities would provide a direct test of his hypothesis (Barkley, personal communication, February, 2, 1998). Specifically, Barkley suggested that an examination of the performance differences between children with ADHD and those children who do not have this disorder on a task of verbal and spatial differences would help to show that there is a working memory difference between children with and without ADHD. Barkley suggested using a paradigm developed by Hale, Bronik, and Fry (1997), that measures the verbal and spatial working memory ability of non-ADHD children, and noted that this study "helps to illustrate the development of nonverbal and verbal working memory in tandem with the development of

interference control, a form of inhibition that protects the contents of working memory from disruption" (Barkley, 1997, p. 48).

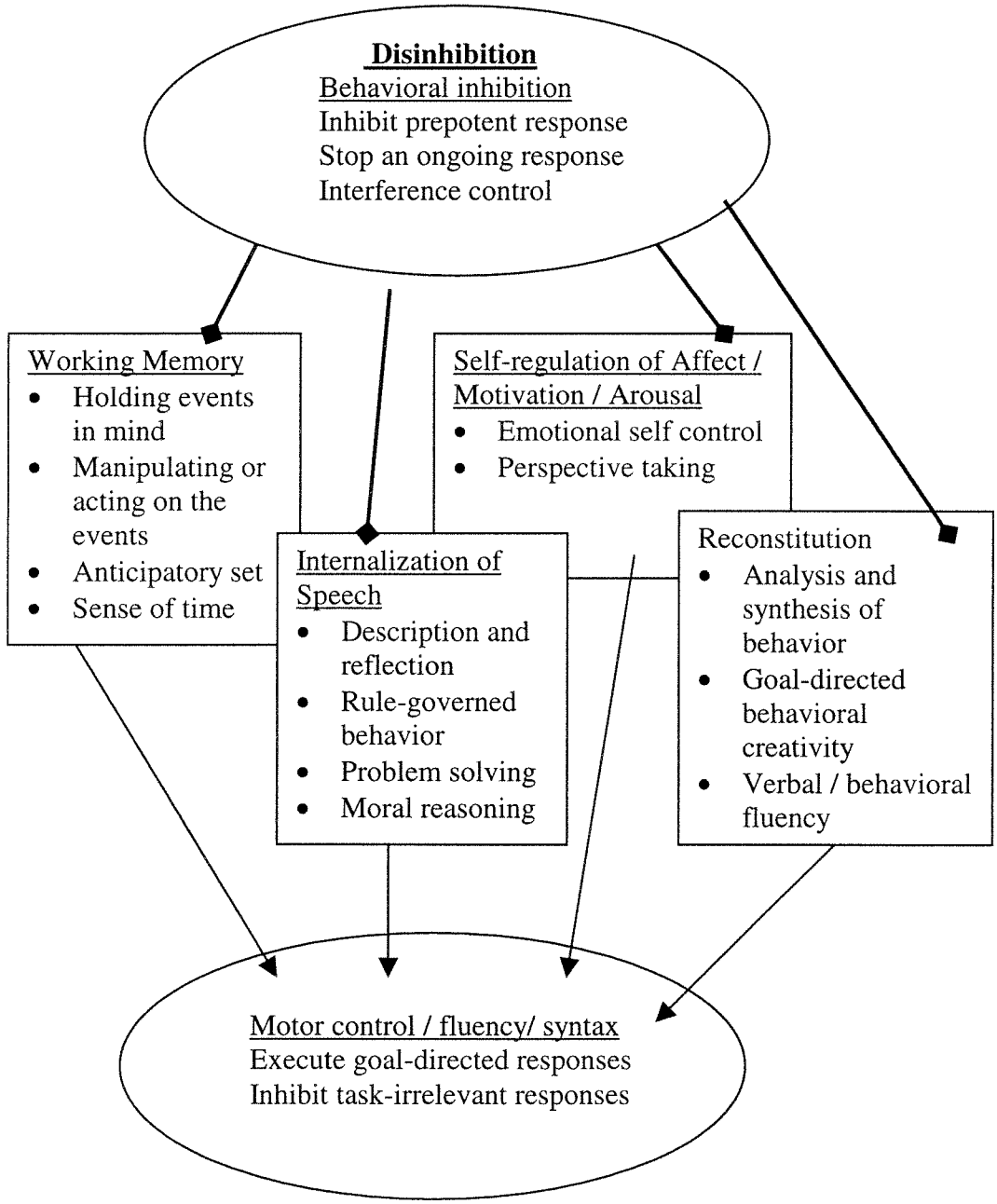


Figure 1. Disinhibition Theory Diagramed. ADHD and the nature of self control, (p.237), by R. Barkley, 1997, New York: The Guilford Press.

In the effort to measure the verbal and spatial working memory ability of ADHD children, a systematic replication of Hale et al.'s (1997) study. This study examined the verbal and spatial working memory differences in school-age children and their susceptibility to interference. Hale et al. (1997) developed an interference paradigm that permits comparison of performance on a primary working memory task presented in isolation with performance on the primary task under two different types of interference conditions. In their study, Hale and her colleagues hypothesized that younger children would be more susceptible to interference (from any source) than older children and children would show more susceptibility to interference than adults. In an earlier study (Hale, Myerson, Rhee, Weiss, & Abrams, 1996) these working memory components had been assessed in adults. Hale et al.'s (1997) study sought to examine the development of both the efficiency and independence of the verbal and visuospatial components of working memory using tasks that produce comparable levels of performance in adults. Hale et al.'s (1997) study consisted of presenting six conditions on a computer screen. These screen conditions consisted of combinations of numbers, colors, and shapes in combination with a verbal task. Each participant was exposed to six different conditions: (a) verbal primary task only, (b) verbal primary plus verbal secondary task, (c) verbal primary plus spatial secondary task, (d) spatial primary task only, (e) spatial primary plus spatial secondary task, and (f) spatial primary plus verbal secondary task.

Hale et al. (1997) concluded that all subjects (8, 10, and 19 year olds) experienced a significant amount of nonspecific interference. Hale et al.'s conclusion was that the central executive component of working memory may reach maturity sometime between the ages of 8 and 10 years of age. Hale et al.'s findings suggest that the mean memory spans of 8-

year-olds was smaller than 10-year-olds in all of the testing conditions and that the 8-year-olds showed significant interference when a secondary task was different from the primary memory task, whereas the 10-year-olds did not. Hale et al. concluded that "as the increase in the ability to retain information over a brief period of time improves, as indicated by improved performance in the absence of any secondary task, resistance to the detrimental effects of interference also improves" (1997, p. 370). In light of Hale et al.'s findings, it is hypothesized that ADHD children will continue to show deficits in the inability to disinhibit interference and will continue to show a reduced ability to filter out extraneous information.

In summary, the present study is a systematic replication of Hale et al.'s (1997) study which examined the verbal and spatial working memory differences in school-age children and their susceptibility to interference. Unlike Hale et al. however, a defined group of ADHD children and a defined group of non-ADHD children were used in this study.

With Barkley's (1997) theory in mind it was hypothesized that ADHD children would show deficits in their ability to disinhibit incoming interference and they would show a reduced ability to filter out extraneous information, and thus would perform more poorly on the task in comparison to non-ADHD children.

The second hypothesis of this study was that younger (8 and 9 year old) non-ADHD children would perform significantly better than older (10, 11 and 12 year old) ADHD children.

Chapter 2

Method

Subjects

A total of 40 subjects were involved in this research project. Twenty ADHD children from two different community mental health centers participated. Another 20 non-ADHD children were obtained through an elementary school. The mean age of the 16 "younger" children was 8.69 (SD = 0.48). The mean age of the 24 "older" children was 10.71 (SD = 0.75). Children ranged in age from 8 to 12 years for the entire sample. The sample included 24 boys and 16 girls. Seventy percent of the ADHD sample were boys and 50% of the non-ADHD sample were boys. Each child was paid as compensation for their participation in this study.

Each participating ADHD student had been previously formally diagnosed as having ADHD. A chart review of each participant's file revealed that formal diagnosis was given by a qualified mental health provider (e.g., psychologist or psychiatrist) employed by Clackamas Community Mental Health. Formal diagnosis was congruent with official diagnosis as found within DSM - IV. The non-ADHD population of students did not contain any formally diagnosed ADHD individuals. To minimize the effects of medication on the testing paradigm, ADHD children who took medication as a part of their treatment regime received their last dosage of the day no later than 12:00 P.M. on the day they were

tested. A signed consent form and a demographics sheet was sought from each parent or legal guardian before the child was able to participate in the study (See Appendix A).

Design

Each participant was exposed to six different conditions (subtests) as determined by Hale et al.'s (1997) study. During exposure to each of the subtests, each participant was exposed to trials until the child could no longer answer correctly. Each subtest began with two exposures of the task. If the child successfully passed both exposures of the task, the task increased by one (either an additional number or an additional spatial mark in the grid). Participants continued until they could no longer accurately answer both tasks. Participants could have progressed up to twelve numbers or spatial marks. No child progressed beyond 9 numbers or spatial marks. Each of the conditions the child was exposed to were:

(a) verbal primary task only,

(b) verbal primary plus verbal secondary task,

(c) verbal primary plus spatial secondary task,

(d) spatial primary task only,

(e) spatial primary plus spatial secondary task, and

(f) spatial primary plus verbal secondary task.

Apparatus

The working memory tasks were presented on a Sony laptop computer with a 14-inch active matrix color monitor. Super Lab software was used to present the stimuli.

Schematic representations of the stimuli for the different conditions are shown in Figure 2. For the verbal tasks, the stimuli were digits (1.5cm X 1.0 cm) that appeared, one

at a time, inside a black square (3.25cm x 3.25 cm) centered in the left half of the video screen. The recall signal was a filled green square (3.25cm x 3.25 cm) located in the same position as the square in which the digits had appeared. For the spatial tasks, the stimuli were X's (1.25 X 1.0 cm) that appeared, one at a time, in individual cells of a 4 x 4 black grid (6.5 cm x 6.5 cm) centered in the left half of the video screen. The recall signal was an empty 4 x 4 white grid located in the same position as the grid in which the Xs had appeared.

In all conditions, all stimuli except the recall signals were simultaneously accompanied by a circular palette (diameter = 4.5 cm) with six small circles (diameter = .5 cm) arranged inside the palette near its perimeter, centered in the right half of the video screen. For the conditions with a spatial secondary task requirement, three of the small, inner circles in the palette were filled with three different colors (i.e., red, white, and blue) and three remained empty (i.e., filled with background color of the screen). In the two conditions in which the primary tasks were administered without any secondary tasks, the stimuli were always red. Finally, for all conditions that included a secondary task requirement, the stimuli (digits or Xs) appeared in one of three colors (red, white, or blue). The color of the stimuli was varied randomly, with the constraints that no color occur more than twice in a row and that each color appear approximately equally often across each task.

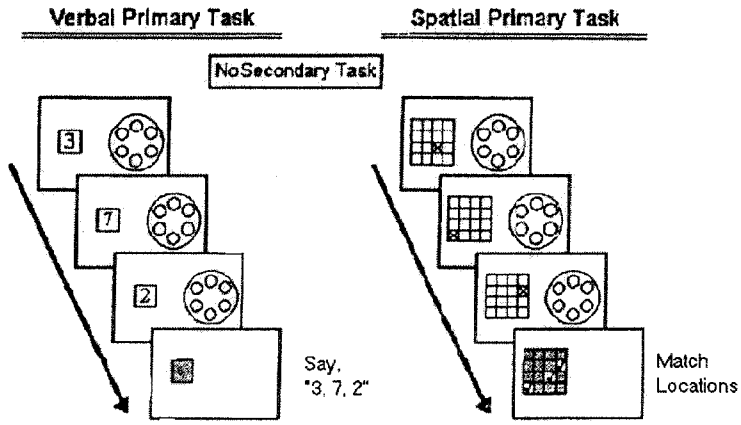
Procedure

Children were tested at Clackamas Community Mental Health and Rivera Christian School. Child and parent were met in each of the facilities' waiting room. From the waiting room the parent and child were taken to an office where the informed consent was

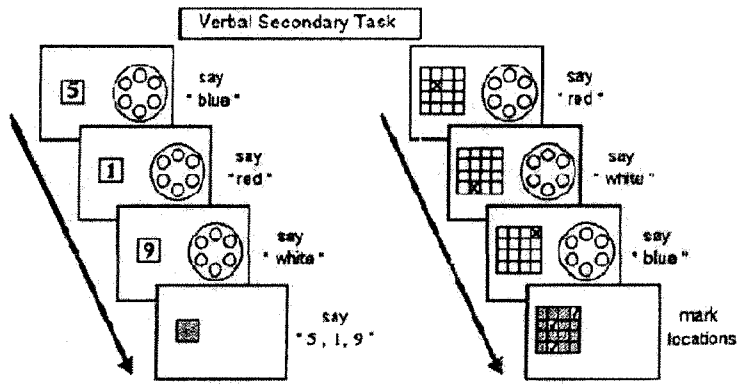
explained and the parent and the child were asked to sign the informed consent. Each parent or legal guardian was then given an envelope to address if they wished to receive a summary of the results. The parent then left the room. The child was then asked to sit in front of a computer which was on a desk in the office. The examiner then trained the subject on two orientation tasks. After the examiner determined that the subject understood the testing process the testing began.

In the test session a fixation point, consisting of a small black square outlined in white, was presented on the computer screen immediately before each series to signal the experimenter and the participant that a series of items was ready for presentation. When the participant indicated that he or she was ready, the experimenter pressed a button to initiate the series. In each series, each stimulus appeared on the screen for 2.25 seconds followed by a .75 seconds blank interval. When the series was completed, a recall signal appeared on the video monitor. For the three conditions in which the primary task was verbal (i.e., remembering the names of a series of digits) the recall signal served as a cue for the participant to say the digits in the order that they had been presented. For the three conditions in which the primary task was spatial (i.e., to remember a series of locations), the recall signal served as a cue for the participant to mark the locations in the grid on the video screen with an erasable marker.

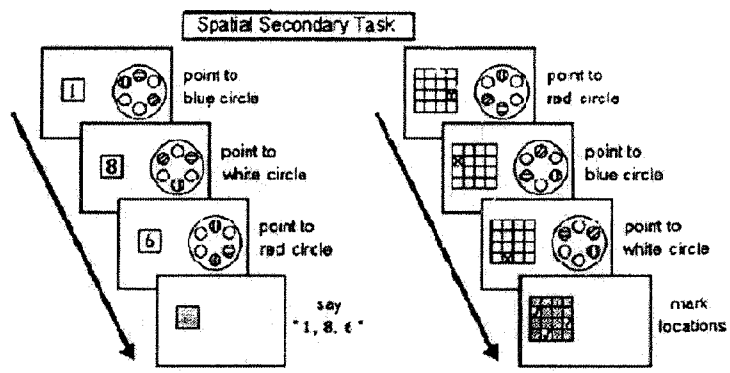
When the task was completed, participants were returned to the waiting room where any general questions or concerns were addressed. Parents were reminded that results of this research would be forwarded to them in the form of an abstract.



TASK 1 TASK 2



TASK 3 TASK 4



TASK 5 TASK 6

Figure 2. Schematic representations of the stimuli for the six tasks.

Chapter 3

Results

The purpose of this research was to measure the performance differences between children with Attention Deficit Disorder with Hyperactivity (ADHD) and those children who do not have this diagnosis. In this research we followed the testing paradigm used by Hale et al. (1997), who created a procedure to measure the verbal and spatial working memory differences among school age children.

Performance on the six subtests by children with and without ADHD are shown in Table 4. It should be noted that ADHD children produced fewer correct responses to each of the subtests than did children without ADHD. This is especially true for subtests 1, 3, and 5. Also note that the scores of younger children are consistently lower than those of the older children.

Part of the design for this study was to use a systematic replication of Hale, et al.'s (1997) study. A one-sample t-test was used to compare the mean performance of young and old non-ADHD children in this study and the mean performance reported for the Hale et al.'s sample. The mean performance on each subtest of these four groups appear in Table 5. Although a comparable pattern of responses to the inhibition tasks can be observed, the children in this study performed significantly better than did Hale et al.'s sample. This was especially true for the younger children who performed significantly better than Hale et al.'s younger children on subtest 3 ($t(5) = 3.08$, $p < .05$), subtest 4 ($t(5) =$

3.04, $p < .05$), and subtest 6 ($t(5) = 4.09$, $p < .05$). The older children in this study performed significantly worse than Hale et al.'s sample on subtest 5 ($t(13) = -3.83$, $p < .05$), but significantly better than Hale et al.'s sample on subtest 6 ($t(13) = 3.20$, $p < .05$).

Table 4

Mean Performance Ratings of ADHD and Non-ADHD Groups among Subtests

	Non-ADHD				ADHD			
	Younger[a]		Older (>10-yrs)[b]		Younger[c]		Older (>10-yrs)[d]	
Subtest	M	SD	M	SD	M	SD	M	SD
Subtest 1	4.42	1.11	5.00	0.81	2.35	1.00	3.10	0.94
Subtest 2	4.33	0.88	4.61	1.04	2.15	0.85	2.20	0.42
Subtest 3	3.08	0.38	3.61	0 .59	1.55	0 .55	1.75	0.42
Subtest 4	3.17	0 .41	4.29	1.35	1.45	0.28	1.80	0 .54
Subtest 5	4.17	1.44	3.93	1.22	1.40	0.46	2.30	0 .89
Subtest 6	3.00	0.71	3.21	0 .98	1.35	0.41	1.60	0 .52

[a] $n = 6$. [b] $n = 10$. [c] $n = 14$. [d] $n = 10$.

A multivariate analysis of variance (MANOVA) was computed with scores on each of the six subtests serving as the dependent variables. The independent variables were group (with or without ADHD) and age (younger versus 10-years and older). Main effects for group (Wilks $\Lambda = .15$, $F(6,31) = 30.57$, $p < 0.05$) and age (Wilks $\Lambda = .68$, $F(6,31) = 2.45$, $p < 0.05$) were found. However, no interaction of group and age was found (Wilks $\Lambda = .78$,

F (6,31)= 1.44, p> 0.05). The effect size for the group factor is large (eta^2 = .86). The effect size for age is small (eta^2 = .32). The effect size for the interaction is small (eta^2 = .22). This finding confirmed the original hypotheses of this research that ADHD status and age would affect performance on the various subtests.

Table 5

A comparison of Mean Performance on the Six Subtests of Young and Old Non-ADHD Children in this Study and Hale et al.'s Sample

	Young		Old	
Subtest	Dietlein	Hale	Dietlein	Hale
Subtest 1	4.42	4.66	5.00	5.38
Subtest 2	4.33	3.89	4.61	4.48
Subtest 3	3.08 *	2.61	3.61	3.93
Subtest 4	3.17 *	2.66	4.29	4.13
Subtest 5	4.17	3.84	3.93 *	5.18
Subtest 6	3.00 *	1.82	3.21 *	2.38

*p < .05

Analysis of univariate effects (ANOVA) demonstrated an effect of ADHD status and age on each of the six subtests. The F-values for the six subtests are shown in Table 6. On all the subtests, the non-ADHD children scored higher than ADHD children.

Additionally, on subtests 1, 3, and 4, the children who were older than 10-years score significantly higher than younger children. There were no univariate interaction effects on any of the subtests.

Table 6

Univariate Results for the Effects of Group (ADHD versus Non-ADHD) and Age (Younger and Older than 10-years) on the Six Subtests.

	Group		Age		Group x Age	
Subtest	F	p	F	p	F	p
Subtest 1	40.87	.01*	4.62	.04*	0 .07	.79
Subtest 2	66.48	.01*	0 .33	.57	0 .16	.69
Subtest 3	97.91	.01*	4.46	.04*	0 .89	.35
Subtest 4	51.80	.01*	6.33	.02*	1.76	.20
Subtest 5	40.95	.01*	0.93	.34	2.75	.11
Subtest 6	46.62	.01*	0.94	.34	0.01	.94

*$p<.05$

Subtests one and two measured the child's ability on a verbal and spatial task, respectively. Neither of these tasks have an interference requirement. The performance of younger and older children differed significantly on subtest one (t (38) = -2.50, $p < .05$), but not on subtest two (t (38) = -1.38, $p > .05$). In other words, the older children made

significantly fewer errors than the younger children on the verbal task but the performance of the two age groups was comparable on the spatial task. Subtests three and four measured the child's ability on a verbal and spatial task with an additional verbal interference task. The performance of the two age groups was found to differ significantly on tasks three (t (38) = -2.18, p <. 05) and on test four (t (38) = -2.55, p <. 05), such that the older children made significantly fewer errors. Subtests five and six measured the subject's ability to perform on a verbal and spatial task with a visual/spatial interference task. Neither subtest five (t (38) = -1.70, p >.05) nor six (t (38) = -1.65, p >.05) produced significant differences between the younger and older children. Thus, age differences were found on those tasks with an important verbal component.

A second hypothesis of this study was that younger non-ADHD children would perform better than older ADHD children on interference tasks. To test this hypothesis, the performance of 8 and 9 year-old non-ADHD children from this study and from Hale et al.'s (1997) sample were compared with the 10, 11, and 12 year-old ADHD children from this study. The mean performance of these three groups and the t values comparing the older ADHD children with both samples of younger children are shown in table 7. Performance of young non-ADHD was significantly better than the performance of older ADHD children on all but one of the subtests. Specifically, the older ADHD children did not perform significantly differently than Hale et al.'s younger children on subtest 6. In summary, the results confirm the second hypothesis.

Table 7

A Comparison of Mean Performance on the Six Subtests of Older ADHD Children from this Study & Younger Non-ADHD Children in this Study and Hale et al.'s Sample with

	Old ADHD	Young Non-ADHD			
Subtest	Dietlein M	Dietlein M	t	Hale M	t
Subtest 1	3.10	4.42	2.54 *	4.66	-5.27 *
Subtest 2	2.20	4.33	6.63 *	3.89	-12.68 *
Subtest 3	1.75	3.08	6.33 *	2.61	-6.40 *
Subtest 4	1.80	3.17	5.34 *	2.66	-5.06 *
Subtest 5	2.30	4.17	3.24 *	3.84	-5.48 *
Subtest 6	1.60	3.00	4.58 *	1.82	-1.35 (ns)

* $p<.05$

Chapter 4

Discussion

The purpose of this research was to measure the performance differences between younger and older children with Attention Deficit Disorder with Hyperactivity (ADHD) and those who do not have this diagnosis. This research followed the testing paradigm used by Hale et al. (1997) who created a testing procedure to measure the verbal and spatial working memory differences in school age children. The stated hypotheses were that ADHD children and those without this disorder would perform differently when compared using this testing procedure. It was also hypothesized that older children with ADHD would perform worse than younger non-ADHD children. Results confirmed that ADHD children performed significantly worse than non-ADHD children, and that older children in both groups performed better than younger children on more verbal tasks. Results also support the hypothesis that older children with ADHD would perform worse than younger non-ADHD children.

Barkley (1997) hypothesized that children with ADHD would show an "inability to imitate lengthy sequences of goal-directed behavior demonstrated by others, given that such sequences cannot be held in the mind as well for their execution" (p. 77). In this study, each of the six subtests required the subject to perform sequences of goal-directed behaviors. Testing results showed that ADHD children performed significantly worse than those without ADHD. These research findings confirm Barkley's theory of disinhibition.

Barkley suggests that the information from exposure to the stimulus is held within working memory. While in working memory the information about the target is replaced by information about the distractor. Information about the target becomes irretrievable because of the child's inability to inhibit the distractor stimulus and disinhibit the target stimulus. Barkley also suggested that information recalled from working memory of ADHD children would be temporally disorganized. Testing results from this study showed that when children with ADHD tried to respond to the stimuli, the information that they held in working memory became disorganized and frequently became irretrievable.

An examination of the data shows that the only significant age differences were found for tasks 1,3, and 5 (the verbal tasks). This finding is consistent with the Hale et al. (1997) results which describe verbal and spatial working memory differences in children of similar ages. In their research Hale et al. demonstrated a domain-specific interference. Specifically, tasks 2, 4, and 6 were susceptible to interference from the secondary task in the same domain (either verbal or spatial). This finding helps to show that the closer the interference is to the content of working memory the more difficult it is to preserve the contents of working memory.

In Hale et al.'s study (1997) each of the age groups studied showed domain-specific interference from the secondary task. That is, the verbal secondary task was more likely to disrupt the primary verbal working memory performance, and the spatial secondary task was more likely to disrupt the primary spatial working memory task. This pattern of results was replicated in the present study, although as mentioned, the non-ADHD sample in this study performed better than the subjects in Hale et al.'s study on many subtests. The results of Hale et al.'s study also suggest that younger children are

more susceptible to non-domain specific interference. This result was replicated in this study. Finally, this study demonstrated that both younger and older ADHD children are more susceptible to both domain specific and non-domain specific interference than are non-ADHD children.

In retrospect, one of the limitations of this study was the sample. The non-ADHD population was from a private Christian School while the ADHD population was from a community mental health population. The children in the non-ADHD sample performed better than Hale et al.'s (1997) sample. This was especially true for the younger non-ADHD group. Although no specific information on their socio-economic status (SES) was collected, it is likely that children from the non-ADHD population came from a higher SES than those from the county mental health populations.

Another limitation to this study was the sample size. However, it is noteworthy that the effect size for groups was large, showing a significant difference between the two groups, while the effect size for age and group x age were both small. It is likely that a larger number of test subjects would confirm the significant differences between ADHD children and Non-ADHD children.

In retrospect, future research would benefit by the following considerations. First, it would be of interest to test ADHD children who have been medicated and look at the performance differences between those children who were theoretically at the optimal level of medication performance and those ADHD children who were at the end of their dosage effectiveness. This would help to show the effectiveness of medication on ADHD symptoms. Another item of interest would be to reduce the duration of the stimulus during the test administration. By reducing the stimulus response time, it is possible that the

performance of ADHD children may get better. By varying the stimulus duration it may be possible to determine when disinhibition becomes activated.

If this study were replicated, one equipment enhancement that would improve the administration of the subtests, both for the administrator as well as for the participant, would be the use of a computer monitor with touch screen capabilities. The testing paradigm as administered was an arduous task for the administrator. A monitor with touch screen capabilities, in tandem with a computer program used to gather the data, would greatly alleviate administrator fatigue and would enhance data collection. Another enhancement would be to use a dedicated key entry system. Keyboard entry on a laptop can at times be cumbersome. Although data collection was difficult, it should be noted that no data was lost in the collection process.

Finally, future research with this research model would benefit by collecting data on the differences in processing speed in addition to the number of correct answers. Results from studies by Hale et al. (1996) suggest that processing speed differences that are age related are the beginning of the expression of higher cognitive abilities, and therefore may be a more sensitive measure of inhibition and disinhibition than is the number of correct answers. Hale et al. (1996) found that increases in processing speed were correlated with improvements in working memory. An examination of processing speed differences between children with and without ADHD would be a more sensitive dependent variable with which to test Barkley's (1997) theory of disinhibition.

In retrospect, the findings of this study are most important for lending support to Barkley's (1997) theory. The significant finding of this research is that on this series of subtests a significant performance difference exists between those children with ADHD

and those who do not have this diagnosis. It also seems likely that with further research this testing paradigm may be helpful as a tool in diagnosing those with ADHD.

References

American Psychiatric Association (1994). Diagnostic and statistical manual of mental disorders (4th ed.). Washington, DC: Author.

Benton, A. (1991). Prefrontal injury and behavior in children. Developmental Neuropsychology, 7, 275 – 282.

Barkley, R.A. (1990). Attention – deficit hyperactivity disorder: A handbook for diagnosis and treatment, New York: Guilford Press.

Barkley, R.A. Grodzinsky, G, & Dupaul, G. (1992). Frontal lobe functions in attention deficit disorder with and without hyperactivity: A review and research report. Journal of Abnormal Child Psychology, 20, 163 – 188.

Barkely, R.A. (1996). Behavioral inhibition and executive functions: Constructing a unified theory of ADHD. New York: Guilford Press.

Barkely, R.A. (1997). ADHD and the nature of self control. New York: The Guilford Press.

Berk, L.E. & Potts, M.K. (1991). Development and functional significance of private speech among attention-deficit hyperactivity disorder and normal boys. Journal of Abnormal Child Psychology, 19, 357 - 377.

Bronowski, J. (1967). Human and animal languages: Vol. 1. To honor Roman Jakobson. The Hague, Netherlands: Mouton & Co.

Bronowski, J. (1977). Human and animal languages: A sense of the future (pp. 104 –131). Cambridge, MA: MIT Press.

David, O.J. (1974). Association between lower level lead concentrations and hyperactivity. Environmental Health Perspective, 7, 17 – 25.

Feingold, B. (1974). Why your child is hyperactive. New York: Random House.

Frick, P.J. & Jackson, Y.K. (1993). Family functioning and childhood antisocial behavior: Yet another reinterpretation. Journal of Clinical Child Psychology, 22, 410 – 419.

Hale, S., Myerson, J., Rhee, S.H., Weiss, C.S., & Abrams, R.A. (1996). Selective interference with the maintenance of location information in working memory. Neuropsychology, 10, 228 – 240.

Hale, S., Bronik, M., D. & Fry, A. (1997). Verbal and spatial working memory in school-age children: Developmental differences in susceptibility to interference. Developmental Psychology, 33, 364-371.

Heilman, K.M., Voeller, K.K. S., & Nadeu, S.E. (1991). A possible pathphysiological substrate of attention deficit hyperactivity disorder. Journal of Child Neurology, 6, 74 – 79.

Mattes, J.A. (1980). The role of frontal lobe dysfunction in childhood hyperkinesis. Comprehesnive Psychiatry, 21, 358 – 369.

Silver, Larry. (1992). Attention-deficit hyperactive disorder. Washington, DC: Amercian Psychiatric Press.

Taylor, John. (1990). Helping your hyperactive child. Rocklin, Ca.: Prima Publication & Press.

Appendix A

Consent Form and Demographics Sheet

INFORMED CONSENT TO PARTICIPATE IN TEST ADMINISTRATION

The following test administration is part of a dissertation project in partial fulfillment for a Doctoral Degree in Clinical Psychology. The researcher, Nick Dietlein, M.A., currently has a Master's Degree In Clinical Psychology and is in his last year of formal schooling at George Fox University.

The purpose of this research is to examine the relationship between memory and a child's ability to focus on specific information while excluding other pieces of information presented at the same time. The total procedure is estimated to take about 30 minutes. The testing process will consist of the following format. The child will be presented with a stimulus on a computer screen and a response from the child will be sought. Testing will continue until the child is unable to successfully answer. No physical harm or discomfort should be apparent to the child during the testing process.

If you the parent or the child at any time do not wish to participate in this research project you are not obligated to start or complete the testing process. However, once the testing is complete you may not withdraw from the study. Your participation in this research project is completely voluntary.

If you have any questions or concerns please feel free to contact the researcher, Nick Dietlein, M.A., at 399-6430. Or you may contact the dissertation chair, at George Fox University, Dr. Kathleen Gathercoal at (503) 538-8383.

Individual results will be furnished to participants requesting them. Results will be in the form of a written summary of the individual and / or study findings and will be sent to those who fill out a return envelope with the request (s).

Consent:
I the parent have read the description of this research project and I voluntarily choose to authorize my child to participate in this research project. I understand that research information will be maintained in confidence and used for research purposes only. I also understand that if I wish to discontinue participation at any time during the testing process, I may do so without penalty. However, I realize that once the testing has been completed I may not withdraw from the study. I have also received a signed copy of this consent form.

_____

Signature of Parent Authorizing Child's Participation Date

_____

Signature of Child Date

Demographics Information

Name:_____

Date of Birth:_____/_____/_____

Gender: Male Female
Please circle

ADHD diagnosed? Yes_____No_____

What medication does the child take on a regular basis?

_____

_____

_____

_____

Is the child currently on his or her medication: Yes___ No____

Does the child have any learning disabilities? Yes___ No____

Is your child currently on any other medications such as allergy or cold medications?
Yes___ No____

If your child is currently taking any medications please list them here:

_____

_____

_____

_____

_____

Appendix B

Raw Data Table

Raw Data

Non-ADHD Population

Gender	Age	test 1	test 2	test3	test4	test5	test6
.00	12.00	5.00	5.00	3.50	4.00	4.50	3.50
.00	10.00	4.50	4.50	4.00	5.50	3.00	4.00
.00	9.00	650	5.00	3.00	3.00	5.50	3.00
.00	11.00	5.50	4.00	3.00	3.00	4.00	2.50
1.00	9.00	3.50	3.00	2.50	3.00	2.00	2.00
1.00	9.00	3.50	5.00	3.00	3.00	3.00	2.50
1.00	9.00	4.50	3.50	3.50	4.00	4.00	3.00
.00	10.00	5.50	4.00	3.50	3.00	2.00	3.00
.00	10.00	6.00	3.00	5.00	3.00	5.00	3.00
1.00	10.00	5.50	4.00	3.50	3.00	4.50	3.00
1.00	10.00	5.50	4.50	4.00	4.00	5.00	3.00
1.00	12.00	5.00	3.50	3.00	4.50	3.50	3.00
.00	11.00	4.50	7.00	4.00	3.50	4.50	3.00
.00	12.00	3.50	4.00	3.00	3.00	2.00	2.00
.00	11.00	3.50	6.00	4.00	6.50	6.50	6.00
1.00	12.00	4.50	5.00	3.00	5.00	3.00	3.50
1.00	11.00	5.50	4.50	3.00	7.00	4.00	2.00
1.00	10.00	6.00	5.50	4.00	5.00	3.50	3.50
.00	8.00	4.00	5.00	3.00	3.00	5.50	3.50
1.00	8.00	4.50	4.50	3.50	3.00	5.00	4.00

ADHD Population

1.00	10.00	2.00	1.50	2.00	2.00	1.50	1.00
1.00	9.00	1.50	2.00	1.50	1.50	2.00	1.50
.00	11.00	4.00	2.00	2.00	1.50	2.00	1.00
.00	10.00	2.50	2.50	2.00	1.00	1.50	1.50
.00	10.00	5.00	2.50	1.00	2.50	4.00	1.50
.00	9.00	2.00	2.00	1.50	1.50	2.00	1.50
.00	8.00	4.00	3.00	1.00	1.00	1.00	2.00
.00	8.00	3.50	2.00	2.00	1.50	1.00	1.00
1.00	9.00	3.00	2.50	1.50	1.50	1.50	2.00
1.00	8.00	1.50	2.00	1.50	1.50	1.00	1.00
.00	10.00	3.50	2.00	2.00	2.00	2.00	2.00
.00	9.00	1.00	1.50	.50	1.50	1.00	1.00
.00	9.00	3.00	1.00	1.50	1.00	1.00	1.00
1.00	9.00	1.50	1.50	2.00	1.50	1.50	1.00
.00	9.00	2.50	4.00	2.50	2.00	2.00	1.50
.00	11.00	3.00	3.00	2.00	2.00	3.50	2.50
.00	11.00	3.00	2.50	2.00	2.50	3.00	2.00
.00	11.00	2.50	2.00	2.00	2.00	2.00	1.00
1.00	11.00	2.00	2.00	1.50	1.50	2.00	1.50
.00	10.00	3.50	2.00	1.00	1.00	1.50	2.00

Appendix C

Curriculum Vitae

Nick R. Dietlein, M.A.

3155 Granada Way S.
Salem, Or. 97302
(503) 399-6430
Dietlein@home.com

Educational Experiences:

August 1998-Present	Psy.D. student, George Fox University, Graduate School of Clinical Psychology (APA accredited). Newberg, OR. Specialty Area: Clinical Psychology
August 1996-May 1998	M.A., George Fox University, Graduate School of Clinical Psychology (APA accredited). Newberg, OR. Specialty Area: Clinical Psychology
August 1993-May 1995	M.A., George Fox University, Religion Dept. Newberg, OR. Specialty Area: Theology
August 1986-May 1991	B.S., Boise Bible College, Boise, ID. Specialty Area: Biblical Studies/Ministerial

Clinical Experiences:

July 2000-Present — Psychology Intern, Clackamas Community Mental Health – Rotations: Children & Families, Acute Adult and Crisis Stabilization Program; Oregon City, Or.
Supervisors: Dr. Jeanne Tyler, Jean Wilson, LCSW.
Clinical Population: Outpatient adults and children

Provide therapeutic services to outpatient children and families and acute adult clients. Co-facilitated a Dialectical Behavioral Therapy Group, and two Child Therapy Group's. Provide case management services to clients to assist with the client's interaction with community agencies. Provide consultation to various members of the treatment team regarding various client activities and treatment issues. Provide intake, neuropsychological, intellectual and personality evaluations on adult and child clients. Generate interpretive reports, give feedback to clients, and present diagnostic data to staff. Track clients' treatment progress using various behavioral indicators. Participate as member of client treatment team.

August 1999-June 2000 — Pre-Intern, Oregon State Hospital - Forensic Unit; Salem, OR.
Supervisors: Dr. Steven Brennan, Ph.D. and Dr. Nat Thomas, Psy.D.
Clinical Population: Inpatient adults and children (chronically mentally ill)
Total Client Contact Hours: 300

Provide therapeutic services to inpatient and forensic clients. Co-facilitate a Symptom Management Group with chronically mentally ill adults, Child Therapy Group with inpatient adolescents. Provide case management services to clients to assist with their transition back into their families and communities. Participate in commitment proceedings with the Psychiatric Review Board Hearings. Provide consultation

to various members of the treatment team regarding various client activities and treatment issues. Provide intake, intellectual and personality evaluations on adult and child clients. Generate interpretive reports, give feedback to clients, and present diagnostic data to staff. Track clients' treatment progress using various behavioral indicators. Participate as member of client treatment team.

January 1999 to June 1999 — Practicum Student, Marion County Mental Health - Child and Adolescent Center; Salem, OR.
Supervisors: Dr. Scott Cook, Psy.D. & Dr. Julia Hall, Ph.D.
Clinical Population: Outpatient children, adolescents, and families
Total Client Contact Hours: 179

Provided individual and family therapy to outpatient clients. Provided family diagnostic evaluations. Conducted neurological, intellectual, and personality assessments with children and adolescents. Generated interpretive reports, gave feedback to clients, and presented diagnostic data to staff. Tracked clients' treatment progress using various behavioral indicators. Participated in treatment team meetings. Provided consultation to other members of the clinical treatment team. Collaborated with social workers and outreach staff in developing discharge plans for shared clients. Participated in Parenting Skills class as part of the continuum of care for clients.

August 1998-January 1999 — Practicum Student, The Confederated Tribes of the Grande Ronde & Chemawa Indian School, Grande Ronde, OR.
Supervisors: Diana Ramey, LCSW & Dr. Loy Ryan, Ph.D.
Clinical Population: Native American children, adolescents, and adults
Total Client Contact Hours: 170

Provided individual and family therapy to Native American clients through the outpatient clinic and school located on reservation site. Incorporated culturally congruent therapeutic techniques and diagnostic information in providing services to children and families. Generated interpretive reports and therapeutic treatment plans, gave feedback to clients, and presented diagnostic data to staff. Tracked clients' treatment progress using various behavioral indicators. Participated in treatment team meetings. Provided consultation to other members of the clinical treatment team. Received ongoing consultation and supervision on working with Native American individuals and families. Collaborated with psychiatrist, social workers, nurses, and other members of the Community Wellness Clinic.

January 1997 to July 1998 — Practicum Student, Lutheran Family Services Violence Intervention Program McMinnville, Or.
Supervisors: John Engelheart, Psy.D. & Susan Means, Ph.D.
Clinical Population: Outpatient adults, adolescents, and families
Total Client Contact Hours: 285

Provided individual, family, and couple therapy to outpatient clients. Provided diagnostic evaluations. Administered brief personality inventory to all clients as part of the intake process. Generated interpretive reports, gave feedback to clients, and presented diagnostic data to staff. Tracked clients' treatment progress using various behavioral indicators. Participated in treatment team meetings. Provided consultation to other members of the clinical treatment team. Collaborated with physicians and psychiatrists in developing discharge plans for shared clients. Co-facilitated an Anger Management Group for court mandated men. Collaborated with court counselors and other members of the judicial system regarding participants progress in therapy.

January 1997 to May 1997 — Practicum Student, George Fox University - University Counseling Center;. Newberg, OR
Supervisor: Wayne Colwell, Ph.D.
Clinical Population: Outpatient adults
Total Client Contact Hours: 18

Provided individual psychotherapy for undergraduate students. Focused on issues of identity formation, problem solving, relationship dynamics, academic failure, and personal integrity. Developed therapeutic goals with clients and monitored their progress throughout the treatment process. Received weekly individual and group supervision. Provided case presentations as ongoing part of training process.

Additional Professional Training:

PTSD Across The Lifespan: Clackamas Community Mental Health, Oregon City, Oregon, January, 2001: Presenter: Barbara Breck, Ph.D.

ADHD Across The Lifespan: A Developmental Perspective: Oregon Psychological Association, Portland, Oregon, December 2000: Presenter: Joseph Biederman, Ph.D.

Psychological Ethics and Clinical Practice: Oregon Psychological Association Conference, Portland, Oregon, October, 2000. Presenter: Harold Koocher, Ph.D., A.B.P.P.

The Clinical Use of the MMPI-A and Jessness in Adolescent Evaluations: Clackamas Community Mental Health, Oregon City, Oregon, August, 2000. Presenter: Glenna Giesick, Ph.D.

Working With Geriatric Patients: Dementia, Delirium and Depression: George Fox University, Newberg, Or. October 1999, Presenter: Cliff Singer, M.D.

Listening to The Body: Institute for CorTexT Research and Development, Salem,Or. May, 1999. Presenter: William Sieber, Ph.D.

Race and Racism in Psychotherapy: George Fox University, Newberg, Oregon, May, 1998. Presenter: Alice F. Chang, Ph.D. and Nelson de Jesus, Ph.D.

Clinical Use of the 16 PF. George Fox University, Newberg, OR. Oct 1998
Presenter: Michael Carson, Ph.D

Therapists in the Courtroom: Ethical, Legal, and Clinical Considerations. George Fox University, Newberg, OR. Oct 1997
Presenter: Eric M. Johnson, Ph.D., ABPP.

Intervention Issues with Latino Clients: George Fox University, Newberg, Oregon, March, 1997. Presenter: Joseph M. Cervantes, Ph.D., A.B.P.P.

Psychological Ethics and Clinical Practice: Oregon Psychological Association Conference, Portland, Oregon, October, 1996. Presenter: Harold Koocher, Ph.D., A.B.P.P.

Rational Emotive Behavior Therapy: George Fox University, Newberg, Oregon, October, 1996
Presenter: Harold B. Robb, Ph.D., A.B.P.P

Emergency Psychological Services & Crisis Intervention: George Fox University, Newberg, Oregon, January, 1997.
Presenter: Dr. Carl Lolyd, Ph.D

Working with Local Hospitals: George Fox University, Newberg, Oregon, February, 1997.
Presenter: Michael Conner, Psy.D

Issues in Intervention With Latino Children Adolescents and Families: George Fox University, Newberg, Oregon, March, 1997. Presenter: Joseph M. Cervantes, Ph.D, A.B.P.P.

The Assessment of Malingering: Oregon Psychological Association Conference, Portland, Oregon, November, 1997. Presenter: Richard Rogers, Ph.D, A.B.P.P

Computer Literacy
Familiar with SPSS, Excel, Access, Word and a variety of other domain specific programs such as those found for patients electronic record (ANASAZI). Currently working on Microsoft MCSE certification.

Test Protocol Experience

Child and Adolescent Measures:

Procedure	Administration	Scoring	Interpretation & Written Evaluation
Achenbach Behavior Checklist (teacher, parent, and youth-report versions)	15	15	15
Children's Depression Inventory	12	12	12
Conner's Scales	8	8	8
Native American Cultural Inventory (informal)	14	14	14
Wechsler Intelligence Scale for Children, Third Edition	27	27	27
Wechsler Individual Achievement Test	10	10	10
Wide Range Achievement Test, Third Edition	12	12	12
Trauma Symptom Checklist	16	16	16

Adult Measures:

Procedure	Administration	Scoring	Interpretation & Written Evaluation
Beck Depression Inventory, Second Edition	35	35	35
Controlled Oral Word Association Test (FAS)	1	1	1

Draw-A-Person	10	-	6
Finger Tapping Test	3	3	3
Folstein Mini-Mental Status Exam	28	28	20
Hooper Visual-Organization Test	1	1	1
House-tree-person	16	-	16
Kinetic Family drawing	12	-	12
Minnesota Multiphasic Personality Inventory Second Edition	40	40	40
Native American Cultural Inventory (informal)	8	8	8
Millon Clinical Multi Axial Inventory –III	10	10	10
Outcome Questionnaire – 45 (OQ-45)	45	45	45
Reitan-Indiana Aphasia Screening Test	1	1	1
Rorschach (exner)	15	15	15
Sentence Completion Scale	12	-	12
Trail Making A & B	16	16	16
Thematic Apperception Test	8	-	8
Wechsler Adult Intelligence Scale, Third Edition	22	22	22
Wechsler Memory Scale, Third Edition	14	14	14

Relevant Graduate Courses

Assessment Focus:

Assessment of Children and Adolescents
Comprehensive Assessment
Intellectual and Cognitive Assessment
Neuropsychological Assessment
Personality Assessment
Projective Assessment

Clinical Focus:

Child and Adolescent Therapy
Child Play Therapy
Cognitive Behavioral Psychotherapy
Cross-Cultural Psychotherapy
Family and Couples Therapy
Group Dynamics
Legal, Professional, and Ethical Issues
Psychotherapy with Women
Psychodynamic Psychotherapy
Systems of Psychotherapy
Treatment of Affective Disorders

Core Psychology Courses:

Abnormal Psychology
Adult Development
Child Development
History and Systems

Human Sexuality
Psychometrics in Assessment
Research Design
Social Psychology
Substance Abuse
Learning and Cognition
Psychopharmacology/Psychoneurology
Research in the Psychology of Religion
Statistical Methods

Conference Presentations and Invited Seminars:

Dietlein, N. ADHD An Overview & Dissertation Results. Presented to Child & Family Program of Clackamas Community Mental Health, Oregon City, Oregon. January, 2001.

Dietlein, N. The Use of Neurospsychologcial Test Instruments in A Community Mental Health Setting. Presented to Child & Family Program of Clackamas Community Mental Health, Oregon City, Oregon, November, 2000.

Publication Experiences:

Dietlein, N. Working Memory and Disinhibition in Children with ADHD. Dissertation project. Defended March 2001. George Fox University, Newberg, OR.

Dietlein, N (1995). Dealing with ADHD gracefully. Unpublished Master's Thesis. George Fox University, Newberg, OR.

Professional Affiliations:

Student Affiliate	American Psychological Association
Student Affiliate	The Society for the Psychological Study of Men and Masculinity, Div 51,
Student Affiliate	Psychologists in Independent Practice, Div 42.
Student Affiliate	Christian Association for Psychological Studies (CAPS)