An Attention-Specific Intervention for Adults with ADHD

Dissertation

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ABSTRACT

Attention deficit-hyperactivity disorder (ADHD) consists of symptoms of both inattention and hyperactivity/impulsivity that cause significant functional impairment (APA, 1994). Approximately 4.7% of adults are diagnosed with ADHD; however, there are few empirically-informed interventions that are specifically designed for adults. Instead, many of the common interventions for adults are derived from work done with children with ADHD and may not be appropriate for their particular needs (Weiss & Weiss, 2004). Given that adults with ADHD typically experience more symptoms of inattention rather than hyperactivity, an investigation of the effectiveness of an intervention that specifically targets their inattentive symptoms is warranted (Weiss & Weiss, 2004; Weiss et al., 2002). Therefore, the goal of this study was to evaluate the efficacy of an attention-specific intervention for adults with ADHD.

The intervention used in this study, Attention Process Training (APT; Sohlberg & Mateer, 1987), has never been applied to adults with ADHD. The underlying assumption behind this intervention is that attentional functioning can be improved through the use of tasks that are designed to re-train various aspects of attention. More specifically, this study addressed sustained, alternating, and selective/divided attention during the intervention. A non-concurrent multiple baseline design was used in order to assess the effectiveness of the APT among a sample of adults with ADHD. A sample of four adults, aged 21-37 years (M = 27.75) participated in this study and demonstrated minimal changes in their attentional ability after the intervention. In addition, the findings suggest that the different components of attention addressed in this intervention are not distinct and likely have a reciprocal affect on one another.

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Introduction

Attention deficit-hyperactivity disorder (ADHD) is characterized as a behavioral disorder that consists of symptoms of inattention, excessive activity, and impulsivity (APA, 1994). ADHD is a remarkably prevalent disorder during childhood and affects approximately 4-12% of all children, with males being three to four times more likely to have a diagnosis of ADHD than females (Campbell, 2000). Of those children, over half continue to evidence symptoms of ADHD into adulthood, and it has been reported that approximately 4.7% of the adult population is affected by ADHD (NIH, 2000; Weiss & Weiss, 2004).

According to Barkley (1997), children with ADHD typically have difficulty persisting with a task (i.e., responding) and/or sustaining attention to a task (i.e., vigilance). In addition, children with ADHD are often described as being impulsive when compared to others their age. Impulsivity is related to a deficiency in inhibiting behavior in relation to situational demands. Some children with ADHD may also exhibit developmentally excessive or inappropriate levels of activity (e.g., fidgeting, restlessness) and are characterized as hyperactive. Symptoms of ADHD in adults are generally similar to those during childhood, but adults typically evidence less overt hyperactive behaviors than children (Weiss, Murray, & Weiss, 2002). More specifically, adults with ADHD report difficulty with following directions, procrastination, sustained attention, losing things, fidgeting, interrupting others, and not listening (Weiss, Hechtman, & Weiss, 1999). However, unlike ADHD in childhood where males are diagnosed more frequently, there are almost no gender differences among adults with ADHD (Campbell, 2000; Weiss et al., 2002).

There is speculation in the literature that hyperactive symptoms of ADHD do persist into adulthood, but may manifest themselves somewhat differently than during childhood. For example, some researchers argue that adults may evidence hyperactivity in terms of subjective feelings of restlessness rather than overt behaviors (Weiss et al., 2002). More commonly, adults with ADHD report difficulty with concentration, organization, completing projects or tasks, and frequently lose things (Goodwin & Corgiat, 1992; Silver, 2000; Weiss & Weiss, 2004). Adults with ADHD appear to have particular difficulty with tasks that require frequent shifting of attention, along with sustaining attention and effort (Weiss et al., 2002). Because of these difficulties, some who are diagnosed with ADHD may try to avoid tasks that require sustained attention, attention to detail, or organizational ability (Weiss et al., 1999). As a result, adults with ADHD are also likely to be functioning at a lower level than those without ADHD, and may have academic and occupational difficulties. For example, approximately 30% of adults with ADHD have not completed high school and only about 5% have college degrees (Goodwin & Corgiat, 1992; Weiss et al., 2002). Overall, it appears as though adults with ADHD generally evidence more behavioral symptoms that could be characterized as inattentive rather than hyperactive.

One of the issues that arises when studying adults with ADHD is the question of effective treatments. The presence of ADHD in adults has been established; however as noted previously, their symptoms may differ from children with ADHD. As such, an intervention should be tailored to their specific symptoms and needs. Commonly, interventions for ADHD focus on improving the correlates of an attention deficit such as poor planning, trouble with organization, and attempt to increase their daily functioning. However, these types of interventions do not address the core disturbance associated with ADHD in adults— inattention itself (Weiss &

Weiss, 2004). Therefore, it is critical to distinguish the core symptoms of ADHD (e.g., poor sustained attention) from the secondary correlates of ADHD such as poor planning and careless mistakes (Williams, 1987). Differentiating between these two types of symptoms may shed light on a more useful intervention for adults with ADHD and may results in more generalizable and stable outcomes (Weiss & Weiss, 2004; Williams, 1987).

The following sequence of the introduction is first an overview of the current empirical research regarding the presence of ADHD in adults along with an analysis of the effectiveness of the treatments that are presently available for that particular population. Next, an analysis of the construct of attention and inattention, and treatment implications, will be addressed. Then, a clinical model of attention developed within the cognitive rehabilitation area based on the view that core attentional processes are hierarchical and treatable as individual components will be discussed. Finally, an associated treatment program that focuses on the core symptoms of inattention will be introduced as a potentially effective approach to treating adults with ADHD, along with a discussion of a factor analytic model of core attentional processes in adult ADHD and the measures that assess them.

Background on ADHD

Descriptions of ADHD-related symptomatology reportedly originated in the early 1900s with the work of George Still (Barkley, 1999). In his work, Still described children with defective "moral control", which resulted from impairment in cognition related to the environment, moral consciousness, and inhibitory control (Barkley, 1999). Following Still's work, ADHD-related symptoms were considered to be a childhood disorder and were called "brain-injured child syndrome" and "minimal brain dysfunction" before being called

"hyperactive child syndrome" (Barkley, 1999, Mancini, Van Ameringen, Oakman, & Figueiredo, 1999).

Implicit in these earlier classifications is the notion that ADHD-related symptoms would be outgrown by children and would not continue into adulthood. In addition, those terms were merely used as descriptions of symptomatology and did not include a consideration of potential underlying processes (Barkley, 1999). However, as researchers realized that approximately 66% of children diagnosed with ADHD continued to have symptoms as adults, newer classifications were created and ADHD began to be conceptualized as a developmental, or lifetime, disorder (Weiss et al., 2002). The third version of the Diagnostic and Statistical Manual of Mental Disorders (DSM-III), published in 1980, was the first to mention the continuation of ADHD symptoms into adulthood. Despite this addition, clinicians were still using the same symptom criteria developed for children with ADHD to diagnose adults with it. There were minor wording changes to make it more applicable to adults (e.g., blurts out answers to questions rather than blurts out answers during class); however, the symptom criteria had not been validated on adult samples (Weiss et al., 2002). The DSM-IV (APA, 1994) was based on field trials that distinguished between inattentive and hyperactive symptoms, which resulted in an increased inclusion rate of adults with ADHD since most do not evidence overt hyperactive behaviors. The newer versions of the DSM have increased the diagnostic sensitivity of ADHD by separating inattentive and hyperactive symptoms into different categories, and clarified the symptom criteria to include more observable behaviors (Weiss et al., 2002).

Diagnosis. Currently, there are four subtypes of ADHD according to the DSM-IV (APA, 1994): ADHD-Inattentive Type (ADHD-I), ADHD-Hyperactive/Impulsive Type (ADHD-H/I), ADHD-Combined Type (ADHD-C), and ADHD-Not Otherwise Specified (ADHD-NOS). In

order to meet diagnostic criteria for ADHD-I or ADHD H/I, an individual must exhibit six symptoms related to either inattention (e.g., makes careless mistakes, difficulty sustaining attention, poor organization, easily distracted) or hyperactivity/ impulsivity (e.g., fidgets, runs about excessively, blurts out responses, trouble waiting for turn, talks frequently). Criteria is met for ADHD-C when there are significant (i.e., six or more) symptoms of inattention and hyperactivity or impulsivity (APA, 1994).

Additionally, in order to be diagnosed with ADHD-I, ADHD-H/I, or ADHD-C, these symptoms must be present prior to age 7 years, have lasted for at least 6 months, be present in two or more settings (e.g., home, school, work), and cause significant impairment in social, academic, or occupational functioning. A diagnosis of ADHD-NOS is warranted when not all criteria are met for the other subtypes of ADHD, but there is a significant degree of impairment (APA, 1994). ADHD-NOS is not typically addressed in the literature, but it is speculated that this diagnosis is primarily given to adults who manifest symptoms of ADHD, but do not meet full criteria (e.g., not present before age 7).

Diagnostic Measures. The primary defining features of ADHD consist of a persistent pattern of inattentive and/or hyperactive-impulsive behaviors that are developmentally-inappropriate (i.e., more frequent and severe when compared to individuals of the same age) and cause impairment in a variety of contexts such as school or work (APA, 1994). Despite the established criteria for diagnosing ADHD, there is still some controversy about the validity of many commonly used diagnostic tools. According to the DSM-IV (APA, 1994), there is no current measure that specifically assesses for the presence of ADHD. However, it was noted that those with ADHD perform in the abnormal range when compared to controls on tests of effortful mental processing (APA, 1994). In addition, the presence of mental retardation, learning

disorders, oppositional behaviors, and other mental disorders such as bipolar disorder or depression need to be considered before diagnosing an individual with ADHD (APA, 1994). As such, it is recommended that a clinician carefully assess for the presence of other disorders or behaviors that may be contributing to one's inability to function properly.

Given that ADHD is considered a developmental disorder, many researchers stress the importance of obtaining information about an individual's developmental history (e.g., social and academic functioning, daily activities) which may yield insight into current symptoms (Weiss et al., 2002). Self-report measures are also commonly used to assess for the presence of ADHD and typically include questions about current and past symptoms, using a Likert scale (e.g., Conners' Adult ADHD Rating Scale; Wender Utah Rating Scale). Overall, research on the validity of adult ADHD self-report measures is mixed, with questions regarding the over or under-reporting of symptoms (Weiss et al., 2002). One common method of overcoming these reservations is by asking family members to also provide information. Many researchers also emphasize the utility of clinical interviews (e.g., Conner's Adult ADHD Interview or CAADID) and report that they allow for a more comprehensive picture of an individuals' functioning (Murphy & Gordon, 1998; Weiss et al., 2002). In addition, computerized measures such as the continuous performance test (CPT) and the Paced Auditory Serial Attention Test (PASAT) are thought to assess for certain features of ADHD (e.g., poor inhibition); however, if used in isolation, these tests may not adequately represent an individual's complete symptom picture (Murphy & Gordon, 1998; Weiss et al., 2002).

Taken together, an assessment of ADHD needs to include multiple measures that address a variety of behavioral symptoms, along with providing measures that screen out the presence of other disorders. In general, an assessment of ADHD should be sensitive to the multifaceted

nature of the disorder and include measures that assess each domain of functioning (e.g., academic, occupational, daily, social). For example, an assessment of one's developmental history and current level of functioning and impairment in addition to measures of sustained and focused attention and inhibition may yield a more comprehensive, and criterion-based, symptom picture (Murphy & Gordon, 1998).

Comorbidity and Gender Differences. ADHD is also a highly comorbid disorder, frequently co-occurring with both externalizing and internalizing disorders in adults (Biederman, Faraone, Monuteaux, Bober, & Cadogen, 2004; Campbell, 2000). It has been reported that approximately half of those with a diagnosis of ADHD also have at least one other comorbid disorder (Biederman et al., 2004; Campbell, 2000). Comorbidity rates, however, vary according to gender, with approximately 34% of females and 50% of males diagnosed with ADHD evidencing at least one comorbid disorder. Moreover, the type of comorbid disorder also varies by gender and there appears to be a trend for males to exhibit more externalizing symptoms (e.g., antisocial personality disorder, substance use disorders), while females typically exhibit more internalizing symptoms such as anxiety or depression. In addition, females are more likely to have the inattentive subtype of ADHD and lack overt behavioral symptoms such as hyperactivity when compared to males. There is also speculation that the onset for ADHD in females is later than in males, which in conjunction with less obvious behavioral symptoms, may help explain why there are fewer females diagnosed with ADHD during childhood (Biederman et al., 2004; Taylor & Keltner, 2002).

Impaired Functioning. Adults diagnosed with ADHD generally experience impairment in a variety of contexts. In particular, it has been reported that adults with ADHD frequently have strained relationships, poor employment and academic records, along with higher rates of

accidents (Biederman et al., 2004; Weiss et al., 2002). In addition, numerous employment changes, lower job status, speech and language disorders, lower academic achievement, and higher rates of comorbid disorders (e.g., depression, substance use, conduct disorder) are reportedly associated with symptoms of ADHD and may vary by gender (Faraone et al., 2000; Taylor & Keltner, 2002; Weiss et al., 1999). More specifically, adult males with ADHD are more likely to have repeated a grade or attended a special class and received prior treatment for symptoms of ADHD. Females with ADHD, on the other hand, are more likely to experience symptoms of depression and anxiety (Taylor & Keltner, 2002). It should be noted that there is a lot of variability in terms of impairment for those diagnosed with ADHD, and it may be a function of the particular situation they are in or period of their life. The presence of comorbid disorders, along with the amount and severity of symptoms present may also affect one's degree of impairment and should be taken into account (Weiss et al., 1999).

Treatment of ADHD in Adults

Given the prevalence rates of ADHD in adulthood, it is surprising that there is little research that specifically addresses empirically-informed treatments for this population. The majority of the treatments that are available for adults are typically adopted from work done with children with ADHD and may not be specific to them as adults more commonly experience symptoms of inattention rather than hyperactivity (Weiss & Weiss, 2004). For example, clinicians who work with children commonly focus on increasing their compliance to classroom or house rules through contingency management strategies and parent training, along with implementing reward-based strategies for improving day-to-day functioning (e.g., organization, completing tasks and homework). In addition, many children with ADHD are also prescribed stimulant medication to abate their symptoms of inattention and hyperactivity; however, no long-

term studies on the impact of stimulant medication have been conducted and there are discrepancies in the literature about whether stimulant use may increase the chances of drug abuse (NIH, 2000).

Researchers have, on the other hand, demonstrated that medicated children who are systematically monitored have more successful short-term outcomes than children who receive behavioral modification strategies alone (e.g., Greene & Ablon, 2001; MTA, 1999; NIH, 2000; Spencer et al., 1996). As such, one of the more common methods of treating adults with ADHD involves stimulant medication. However, when compared to children, adults are more likely to stop treatments that result in uncomfortable side effects (e.g., decreased appetite, insomnia), which may occur if they are prescribed certain medications. It has been reported that approximately 20-50% of adults with ADHD who are medicated are "non-responders" due to inadequate symptom reduction or because they stop taking the medication due to adverse side effects. Not surprisingly, adults with ADHD who also have comorbid sleep, appetite, and impulse control problems may have difficulty complying with or tolerating medication (Weiss & Weiss, 2004). Among those who are considered medication "responders", they typically only demonstrate a 50% improvement in their core symptoms of ADHD and researchers have recommended that psychopharmacological interventions be supplemented with behavioral training (Wilens, Spencer, & Biederman, 2002).

As mentioned previously, another common treatment approach involves the use of behavioral modification and environmental restructuring strategies (e.g., using a planner or calendar, reducing distracters), with the goal being to control the impact of ADHD symptoms on a day-to-day basis. A new approach in the treatment of adults with ADHD has been developed utilizing cognitive-behavioral principles (Safren, Otto, Sprich, Winett, Wilens, & Biederman,

2005; Safren, Sprich, Chulvick, & Otto, 2004). The primary goal of this treatment approach is to provide compensatory strategies that can be used to offset the core neuropsychological difficulties associated with ADHD. According to Safren and colleagues (2004), this treatment was designed to be used with individuals who are concurrently being treated with medications and it is assumed that the medication addresses the core symptoms of ADHD (e.g., inattention, impulsivity) while the cognitive-behavioral strategies address the secondary deficits of ADHD (e.g., functional impairment in daily activities).

The cognitive-behavioral components of this treatment consist of three main modules. The first module targets organization and planning skills and incorporates the use of a notebook system and problem-solving skills training. The second module builds upon the problem-solving skills that were introduced in the first module and addresses distractibility through the use of self-monitoring and cue control procedures (e.g., using an alarm, scheduling breaks). Finally, the third module is designed to reduce maladaptive thought patterns associated with symptoms of ADHD and includes tracking maladaptive thoughts and evaluating them in a systematic manner. It is hypothesized that a history of academic, job, and relationship failure experiences may have resulted in cognitive distortions and function to exacerbate procrastination and avoidance behaviors, which serve to maintain symptoms of ADHD over time. As such, it is argued that the inclusion of cognitive restructuring will result in more adaptive coping behaviors and would limit avoidance behaviors (Safren et al., 2004; Safren et al., 2005).

Overall, preliminary analyses of this treatment approach have yielded positive results. It was reported that those who received the cognitive-behavioral intervention evidenced fewer ADHD symptoms at post-treatment than those who were in a control group who only received psychopharmacological treatment. Specifically, it was reported that 56% of those who were in

the cognitive-behavioral group were considered treatment responders compared to 13% of those in the psychopharmacological group (Safren et al., 2005). Although these results are promising, the fact that only about half of those who received the cognitive-behavioral treatment along with medication significantly improved warrants further consideration. In particular, it could be speculated that the lack of improvement among the rest of the participants could be due to the fact that adults with ADHD have difficulty implementing behavioral treatments because they are ultimately the ones who have to monitor their own progress (Weiss & Weiss, 2004). Another issue is that those who cannot tolerate psychopharmalogical treatment may not benefit from this treatment approach as it is intended to supplement the effects of medications and was designed to be used in conjunction with psychopharmacological treatment.

It could also be argued that the behavioral symptoms such as poor planning, procrastination and organization that are addressed in this treatment are the correlates or secondary behaviors of an attention deficit and that the core behaviors associated with inattention (e.g., poor sustained attention) are not specifically targeted. In addition, a psychopharmalogical intervention may not be effective for everyone with ADHD as previously discussed. In other words, a correlate of inattention is considered to be a by-product of a core attention deficit. For example, poor sustained attention is considered a core feature of inattention and difficulty with sustaining one's focus may result in a secondary problem with making careless errors or not following through on a task. According to Williams (1987), treating the behavioral correlates of ADHD is limited in that core difficulties may not be completely eliminated. As such, the core symptoms of ADHD may persist and continue to cause impairment in other situations which are not directly addressed during treatments that are focused more on the correlates of inattention. Additionally, the more overt behavioral symptoms of ADHD may reflect reactions to feelings of

frustration that are associated with processing difficulties. Treatment that is limited to overt behavioral symptoms, or what can be characterized as attention deficit correlates, typically lack generalizability because the more specific functional impairments associated with an attention deficit (i.e., poor sustained attention) are not addressed (Williams, 1987).

Therefore, an evaluation of a treatment program that is specifically designed to address the core behavioral symptoms of inattention is warranted. It is hypothesized that a treatment approach that targets core behaviors and conceptualizes attention in terms of hierarchical processes could result in more generalizable and stable outcomes for adults with ADHD and will be the focus of this study (Sohlberg, & Mateer, 2001a; Williams, 1987). However, before such an intervention is described, an analysis of the construct of attention and its significance for the field of clinical psychology will be addressed. Subsequently, a treatment model will be proposed that incorporates findings that are consistent with an empirical model for the construct of attention.

The Constructs of Attention and Inattention

As indicated above, the phenomenon of interest for this study will be adult ADHD and the overall goal is to evaluate a treatment for adults with ADHD that directly addresses the core behaviors of inattention (e.g., poor sustained attention) rather than the behavioral correlates of an attention deficit such as poor planning and organization. Before an integrated treatment plan for ADHD is introduced, attention and inattention as constructs must first be established.

It is useful to consider attention not as a unitary phenomenon, but rather as a relationship between an environmental event and one's behavioral response to it (Barkley, 1996). More specifically, Barkley (1996) refers to attention as a functional relationship between certain contexts (e.g., objects, actions) and the responses to them, which can be observed in terms of

focusing, inhibiting, and/or shifting. Another prevalent view of attention is that it can also be conceptualized as a complex and dynamic set of adaptive functions that depend on a variety of underlying processes such as the selection of a target, state of engagement, and control or maintenance of attention (Ruff & Rothbart, 1996).

Ruff and Rothbart (1996) have an established, three-part definition of attention that includes the notions of selectivity, arousal state, and control. Another aspect of their conceptualization of attention is that it primarily develops as an orienting or investigative system and then becomes a more integrated and controlled system (Ruff & Rothbart, 1996). In other words, attention initially emerges in terms of more basic abilities (e.g., focusing, selectivity) and then develops hierarchically into more integrated and controlled skills such as the ability to sustain focus or effort over long periods of time across a variety of contexts. Research in the area of infant visual development suggests that infants who can smoothly integrate many different aspects of attention function more effectively and perform better on tasks requiring visual recognition (Colombo et al., 2001; Frick et al., 1999; Ruff & Rothbart, 1996).

Based on an understanding of the development of attention as the product of the interaction and integration of several hierarchical processes (e.g., arousal, selectivity, control), it follows that inattention manifests itself when there is a lack of integration and organization between these various processes or when there is a maladaptive relationship between an environmental event and one's behavioral response to it (Barkley, 1996; Rothbart et al., 1994; Ruff & Rothbart, 1996). For example, if an individual has not coherently developed and integrated these processes, his/her performance in situations requiring the use of attentional and self-regulatory skills may be greatly hindered and may be qualitatively described as inattentive. More specifically, it has been reported that individuals with attention deficits (i.e., inattention)

typically exhibit difficulty with organizing and maintaining focus or effort, inhibiting responses, modulating arousal in order to meet task or situational demands, task-switching, and demonstrate a preference for immediate reward (Campbell, 2000; Douglas, 1984; Douglas, 1999). Overall, there is a lack of empirical research that specifically addresses inattention as a construct. Instead, inattention is often conceptualized as part of a disorder or outcome. One common correlate or pathological outcome of inattention is ADHD, with inattention being a central aspect in the diagnosis of ADHD (Campbell, 2000).

Cognitive and Affective Neuroscience Findings. Since ADHD is also associated with difficulties in cognitive control and affective lability, it is critical to understand how one's physiology, cognitions, behaviors are dynamically interrelated and result in symptoms of inattention (Nigg & Casey, 2005). One of the consistent findings is that children with ADHD, regardless of comorbid conditions, evidence variability in their behavior as a function of context. Specifically, Nigg and Casey (2005) illustrate the importance of distinguishing between contexts when describing the behavioral inconsistencies observed among individuals with ADHD. In particular, they report that those with ADHD typically respond more quickly and are less accurate in a slower context. On the other hand, a faster context is associated with slower and more incorrect responses, which is consistent with Oosterlann, Logan, and Sergeant's (1998) notions about the role of lower arousal levels among those with ADHD. In a context that requires fast decision-making or complex organization, those with ADHD usually respond in a manner that is characteristic of poor executive response inhibition— meaning that they have difficulty inhibiting a previously rewarding response instead of engaging in a more careful decision-making process. Finally, in a setting that consists of reward cues or requires the use of temporal information processing, those with ADHD have difficulty delaying an immediate

reward and also demonstrate an inability to accurately estimate time intervals (i.e., overestimation).

Considering that there is variability as a function of context, an argument could be made that treating the core deficits of inattention rather than the correlates of inattention would yield more generalizable outcomes. The compensatory skills provided by a cognitive-behavioral treatment program may not be effective or applicable for every type of environmental condition. In addition, it is unlikely that such a treatment model could incorporate training exercises for each type of environmental condition as described in the previous paragraph. Therefore, if attentional processing were addressed on a more global level (i.e., at the core attention level), an individual with ADHD would be able to negotiate the challenges of different environmental contexts more effectively.

Treatment Implications

Interestingly, the field of cognitive rehabilitation exclusively focuses on the remediation of core attention behaviors and has been suggested as a potentially useful framework for the treatment of adults with ADHD (Sohlberg & Mateer, 2001a). The field of cognitive rehabilitation is generally focused on the treatment of individuals who have sustained traumatic brain injuries, with the ultimate goal being to improve an individual's daily functioning by increasing his/her capacity to process and utilize information (Sohlberg & Mateer, 1989). Individuals with mild traumatic brain injuries (MTBI's) typically experience difficulty with concentration, distractibility, forgetfulness, and multi-tasking (Mateer, 2000). In addition, individuals with MTBI's frequently report that it takes them longer to complete tasks, have trouble concentrating in the presence of environmental distracters (e.g., loud noises), and often forget what they were about to say or do (Mateer, 2000). More specifically, these individuals

demonstrate impairment in five specific aspects of attention: focused, sustained, selective, alternating, and divided. Sohlberg and Mateer (1987; 1989; 2001b) have developed a treatment program (Attention Process Training, APT) for individuals with brain injuries that specifically addresses these aspects of attention in a hierarchically-arranged fashion, which is ostensibly similar to how typical attention development proceeds and will be discussed in detail in the following section (e.g., Ruff & Rothbart, 1996).

To date, Sohlberg and Mateer's Attention Process Training (APT) program has not been administered to adults with ADHD, although there is speculation that it would be particularly beneficial to this population as they typically evidence more symptoms of inattention than do children. However, this treatment plan has been applied to children diagnosed with ADHD and researchers have reported varying degrees of success (e.g., Kerns, Eso, & Thomson, 1999; Semrud-Clikeman et al., 1999; Williams, 1987). For example, one study reported that four out of six male participants, aged 6-13 years, evidenced significant and stable improvements in the area of selective attention, while the improvements in alternating attention were the least stable over time (Williams, 1987). Williams (1987) also reported that the findings may have been age-related as the younger children evidenced a greater loss of skill retention over time. As such, this age-related finding may have implications for treating adults since they are closer in age to adolescents, which implies that they may have more successful outcomes following the APT program than children.

Cognitive Rehabilitation of Attention

The field of cognitive rehabilitation generally views attention as the capacity to focus on certain stimuli over time and to manipulate information in a flexible and adaptive manner. Attention is also conceptualized as the ability to selectively respond to a specific stimulus or

event, along with being able to inhibit responses to irrelevant, concurrent events. Furthermore, attention as a construct is seen as wide-ranging and consists of many functioning levels, which is consistent with Ruff and Rothbart's (1996) model of attention. The overall foundation for this field of work is a synthesis of models of attention from the areas of experimental psychology, cognitive neuropsychology, electrophysical studies, and psychometrics. More specifically, Sohlberg and Mateer's (1987; 2001a) clinical model of attention is based on the experimental attention literature, along with information obtained via clinical observation and clients' subjective reporting of symptoms. Their goal in developing this model was to provide a theoretically-driven and empirically-based program for the remediation of attention deficits in individuals who have sustained traumatic brain injuries; however, they suggest that the APT may be beneficial for treating ADHD as well (Sohlberg & Mateer, 2001a).

Central to Sohlberg & Mateer's (2001a) notions about the remediation of attentional processes is the idea that the human brain is plastic. In other words, the human brain is considered to be malleable and its structure and functioning may be altered as a consequence of changes in behavior and/or environment (Cicchetti, 1993; Cicchetti & Dawson, 2002; Nelson, 1999). The term, brain plasticity, can be conceptualized as the capacity for the brain to continually change its structure and functioning throughout the lifespan in response to behavioral changes, environmental changes, or changes that are intrinsic to the organism (Kolb, 1995; Nelson, 1999). Consequently, the brain is capable of reorganization as a result of trauma or injury in adulthood. Although not all functions may be recovered, some brain-behavior skills that have been lost may be compensated for. For example, gains in attentional processing have been demonstrated at both the behavioral and electrophysiological level following the implementation of a structured attention training program (Mateer & Kerns, 2000).

It has also been proposed that skills can be recovered through the reorganization of dendritic connections and synaptic changes (e.g., increased dendrite density and length; increased synapse size) which are thought to compensate for a loss in functioning as a result of changes in the environments of dendrites and synapses (Kolb, 1995; Mateer & Kerns, 2000). Moreover, recent work has demonstrated that change can even occur in a more mature adult brain, which previously had been considered unfeasible (Greenough & Black, 1992; Huttenlocher, 2002). These findings suggest that adult brain-behavior processes are flexible and reciprocal. In other words, brain-behavior processes are not static and may change and reorganize as a function of an environmental intervention. As such, the underlying assumption of the present study is that the administration of an attention-specific treatment to adults with ADHD will increase their core attentional functioning by altering brain-behavior processes.

Sohlberg and Mateer's Clinical Model of Attention

According to Sohlberg and Mateer (2001a), the basis for their model of attention stems from analyzing task performance, errors, and subjective reports by individuals with brain injuries. They conceptualize attention as hierarchical and consisting of five components, with each level seen as more complex and demanding more effective functioning than the previous level (Mateer, 2000). As such, their treatment plan is comprised of hierarchical tasks that exercise each discrete component of attention by gradually increasing demands on specific attentional abilities. Since this treatment program views attention as hierarchically arranged, the attentional components in their intervention are targeted in a specific order. Their assumption is that focused attention is the most basic form, followed by sustained, alternating, selective, and divided attention. In other words, each component is thought to build upon the previous one and the therapist does not introduce the next series of tasks until the participant has successfully

mastered the previous component's tasks. In addition, treatment decisions are based on the individual client's performance and allows the clinician to modify the treatment sessions according to the client's particular needs (Sohlberg & Mateer 2001a, 2001b). An overview of Sohlberg and Mateer's (1987; 2001a; 2001b) APT program is presented below. It should be noted that a newer version of their APT program, the APT-II, was developed for use with individuals who have not sustained severe brain injuries and will be used in this study (Sohlberg, Johnson, Paule, Raskin, & Mateer, 2001).

Focused attention. The first component is focused attention and is described as the ability to selectively respond to visual, auditory, or tactile stimuli. This component of attention is considered to be more basic (i.e., lowest on their hierarchy) and parallels Ruff and Rothbart's (1996) notions of the orienting and investigative system of attention, which is the first to develop. Measures that are included in their treatment protocol for focused attention include simple orienting and tracking of auditory or visual stimuli. Since this component of attention is thought to be impaired mostly among individuals who are emerging from a coma (i.e., beginning to respond to external stimulation), it is not included as part of their APT-II treatment protocol and will not be addressed in the present study (Sohlberg et al., 2001).

Sustained attention. The second component is sustained attention, or the ability to maintain a consistent behavioral response during continuous or repetitive activity. Sustained attention is also divided into two separate subcomponents: *working memory* (i.e., storing information in memory so that it can be manipulated) and *vigilance*, which is described as the amount of time spent focused on a task or response. Sohlberg and Mateer's (2001a) description of sustained attention is generally consistent with how researchers studying the development of attention views it. More specifically, Ruff (1990) characterizes sustained attention as a state that

enables one to voluntarily engage in effortful activity. In other words, information processing (e.g., encoding, storing, planning, problem-solving) occurs when an individual is in state of sustained attention (Choudhury & Gorman, 2000). Exercises for sustained attention consist of listening to and responding to target words/sequences, listening comprehension, mental math exercises, and sequencing verbally-presented number sequences in ascending or descending order. (Sohlberg et al., 2001; Sohlberg & Mateer, 2001a). Sohlberg and Mateer (2001a) recommend using the Digit Symbol Coding subtest of the WAIS-III to assess sustained attention. This task requires individuals to scan a series of symbols and indicate whether certain ones are present (Wechsler, 1997).

Alternating attention. The third component, alternating attention, is the ability to shift one's focus of attention and flexibly switch back and forth between tasks that have different demands (Sohlberg et al., 2001). In order to be successful on tasks requiring alternating attention, one must be able to readily shift, disengage, and re-engage one's focus depending on situational demands. It could be argued that individuals with ADHD have difficulty shifting in an efficient manner from one task to another. Tasks designed to address alternating attention include listening for one type of target word/sequence and then switching to another type of word/sequence. Another task involves serial number activities that require an individual to switch between adding and subtracting certain numbers. The Trail Making Test, Part B (Reitan, 1958; Reitan & Wolfson, 1995), is a timed task which requires participants to sequentially connect circles by alternating between numbers and letters, and has been recommended by Sohlberg and Mateer (2001a) in order to assess alternating attention.

Selective attention. Selective attention is the fourth component and is construed as the capacity to maintain a behavioral or cognitive set in the presence of competing or distracting

stimuli (Sohlberg & Mateer 1989). This component of attention appears to require an adaptive, or moderate, level of effortful control in order to achieve successful task performance. More specifically, effortful control is described as a temperament factor that allows one to suppress a dominant response in order to accomplish a subdominant response, along with regulating temperamental reactivity (Murray & Kochanska, 2002). Simply stated, those with moderate levels of effortful control are more effective at suppressing initial behavioral responses, or responses to novelty/competing stimuli, in order to meet situational demands when compared to those with lower levels of effortful control (Ruff & Rothbart, 1996). Exercises for selective attention typically consist of tasks that are used for sustained attention, but include background distractions (e.g., noise, movement) (Sohlberg et al., 2001). Sohlberg and Mateer (2001a) suggest utilizing the Map Search and Telephone Search subtests of the Test of Everyday Attention (Robertson, Ward, Ridgeway, & Nimmo-Smith, 1996) which are thought to reflect selective attention and require participants to search for targets in the face of irrelevant and competing stimuli.

Divided attention. Finally, the fifth component is divided attention, or the ability to simultaneously respond to many tasks or multiple task demands (Sohlberg & Mateer, 1989). In other words, two or more behavioral responses may be necessary in a given situation such as driving a car while speaking to another person. This component of attention is consistent with Ruff and Rothbart's (1996) notion of the control system of attention, which is a product of the integration and reciprocal interaction between self-regulation, language, and maturation. The control system of attention enables an individual to perform more complex tasks through increases in planning, task persistence, organization, and self-regulation (Ruff & Rothbart, 1996). Examples of tasks for this component of attention consist of reading paragraphs that

includes both comprehension and the scanning of target words (e.g., reading and counting the occurrence of certain words) (Sohlberg et al., 2001). Sohlberg and Mateer (2001a) recommend using the Letter-Number Sequencing subtest of the WAIS-III, which requires individuals to recall numbers and letters presented orally by the examiner and then rearrange them so that the numbers were recalled first, followed by the letters, to assess divided attention (Wechsler, 1997).

Empirical Support for APT

Since Sohlberg and Mateer's (2001a; 2001b) APT program was initially developed for work with adults who had sustained traumatic brain injuries, the majority of the empirical studies done are with that particular population. Some studies have been conducted on children diagnosed with ADHD (e.g., Semrud-Clikeman et al., 1999; Williams, 1987), and have generally found that the APT program was successful. On the other hand, no studies have been conducted using the APT program on adults with ADHD, although Sohlberg and Mateer (2001a) suggest that their program would be useful for this population— especially considering that the protocol was created using adult samples, which is not common for most adult ADHD treatments.

When developing their APT program, Sohlberg and Mateer (1987) utilized a multiple baseline approach to assess treatment effectiveness in a sample of four individuals who had sustained brain injuries. In general, they reported that all participants evidenced improvements (e.g., significantly above baseline scores) which were maintained through the 8-month follow up (Sohlberg & Mateer, 1987). More specifically, improvements were obtained in the areas of sustained attention, visual search accuracy and speech, along with improvements in overall functioning (e.g., independent living and returning to work, reading ability, driving, everyday memory ability) which was not specifically targeted. It was, therefore, argued that an intervention that targets core behaviors may also yield benefits to behavioral correlates of a core

deficit (Sohlberg & Mateer, 2001a; Kerns et al., 1999). In their study, Sohlberg and Mateer (1987) utilized the Pased Auditory Serial Addition Task (PASAT) as their outcome measure and did not specifically evaluate the effectiveness of each component of attention. It should be noted that they also found some improvements in attentional functioning during the baseline phase, which suggests that the PASAT may have had an impact on attentional processing or that the improvements may have been partly due to practice effects (Sohlberg & Mateer, 1987).

Several studies have been conducted that evaluated the effectiveness of the APT program on adults with brain injuries whose impairment ranged from mild to severe. Although some of the findings are mixed, many do report increased functioning as a result of the APT program. For example, Gray and Robertson (1989) found that adults who had been administered a core attention intervention evidenced increases in attentional functioning. In particular, they suggested that the participants' improved performance may have also been a function of increases in verbal self-regulation strategies, along with improvements in visual-motor integration (Gray & Robertson, 1989). Additionally, Park, Proulx, and Towers (1999) found significant results when comparing a group of adults who received the APT program to a control group on a task that required participants to retain a series of letters and numbers while also filtering out distracting information. Finally, Strum, Willmes, Orgass, and Hartje (1997) also reported significant improvements on measures that specifically addressed different types of attention among participants who received the APT program. In addition, they also reported that participants with higher levels of vigilance abilities evidenced more improvements and may respond better to the APT than individuals with lower levels of vigilance. In other words, it seems as though the APT program may yield more successful results in individuals who are functioning at a higher level, which may have implications for its application to adults with

ADHD, who are generally functioning at a higher level than individuals who have sustained traumatic head injuries.

Another study conducted by Sohlberg, McLaughlin, Pavese, Heidrich, and Posner (2000) utilized the APT and assessed participants in terms of several executive functioning measures such as the Stroop, PASAT, Trail Making Test, and Controlled Oral Word Association Test (COWAT). The results of this study were also mixed, but the treatment group did evidence some improvements relative to the control group who only received brain injury education. Specifically, they found an interaction between baseline vigilance levels (as assessed using the PASAT) and improvements during the intervention. Those with lower vigilance levels at baseline benefited more from the intervention when compared to participants who only received the brain injury education; the results were non-significant when comparing those with higher vigilance levels and those in the education-only condition. The results of the other domains that were assessed were non-significant and the group that received the APT intervention only showed modest improvements that could have been due to repeated testing (i.e., practice effects). Subjective reports from the participants, however, were significant and suggest that the participants in the intervention condition evidenced more perceived improvements in terms of their daily cognitive functioning— especially in the areas of executive control and working memory (Sohlberg et al., 2000).

Thomson (as cited in Kerns et al., 1999) administered the APT program to adolescents who had sustained moderate to severe brain injuries and reported significant improvements on measures of sustained attention and processing speed. However, there were no improvements in general intellectual functioning or visual-perceptual tasks. Studies using the APT program on children and adolescents with ADHD have also yielded successful results, particularly in the

areas of visual, auditory, and selective attention (Semrud-Clikeman et al., 1999; Williams, 1987). It was also reported that children who received direct training of core behaviors, along with receiving immediate feedback demonstrated more significant improvements than children who were in the control group. More specifically, children who were administered the APT program evidenced increases in task persistence and completion (Semrud-Clikeman et al., 1999). It should be noted, however, that treatment effects may vary as a function of a child's age and it has been reported that younger children (i.e., ages 7-8 years) evidenced less retention of treatment effects (Williams, 1987). Again, it seems likely that adults with ADHD, who are closer in age to adolescents, would benefit from the APT program since its effectiveness appears to increase as a function of age.

Taken together, the current treatments for ADHD in adults are limited in that they only address the secondary correlates of inattention such as poor planning and difficulty with organization. Medication is commonly used along with these types of interventions and is assumed to target the core symptoms of inattention; however, medication does not "cure" one from having ADHD and does not provide a long-term solution. Although approximately half of those who are treated with such an intervention report improvements, the core attention deficit remains untreated. An intervention such as the APT, which is designed to address core attentional deficits, may be beneficial for adults with ADHD and should be evaluated as an alternative or supplement to the currently available treatments for ADHD in adults.

The Present Study

Based on empirical evidence derived from studies using the APT program on adults with traumatic brain injuries and children, it is hypothesized that the APT program would be successful when implemented in a sample of adults diagnosed with ADHD. In this case, a

different version of the APT will be used (i.e., APT-II) since it was intended for individuals who are functioning at a higher level than those who have sustained traumatic brain injuries (Sohlberg et al., 2001). It is predicted that the APT-II program will yield generalizable and stable outcomes in terms of core attention behaviors (Sohlberg et al., 2001). Specifically, improvements in the areas of sustained, selective, alternating, and divided attention are predicted, along with secondary improvements in behaviors described as attention correlates (e.g., planning, organization). As indicated earlier, the APT-II does not address focused attention since it is considered to be impaired primarily among individuals who have been in a coma. In addition, measures that assess correlates of inattention will be included at the end of each treatment phase in order to determine whether this intervention has an impact on the participants' daily functioning. It is expected that there will be improvements among the correlates of inattention as a function of treating the participants' core attentional abilities; however, the improvements are only predicted to be observed following the completion of the entire treatment program.

These predictions are consistent with Sohlberg and Mateer's (1987; 1989; 2001a; 2001b) model of attention and subsequently-derived treatment plan. However, it should be noted that the measures Sohlberg and Mateer (2001a) recommend for assessing the effectiveness of their APT-II program may not be applicable among a sample of adults with ADHD as they were initially evaluated using a sample of adults with traumatic brain injuries. Moreover, the measures may not be specific to the deficits associated with ADHD and may not be sensitive enough to detect performance changes as a function of the APT-II treatment. As such, a clinical neuropsychological model of attention that has been validated on a sample of children and adults

with ADHD will be utilized as it provides a useful method of assessing the various components of attention provided by Sohlberg and Mateer's (2001a) treatment program.

Framework for Assessing Components of Attention

In order to evaluate the effectiveness of the APT-II program, particularly as it relates to improvements in terms of the different components of attention, Mirsky's neuropsychological model of attention was used to determine which attentional processes and assessment measures would be used in this study (Mirsky, 1989; Mirsky, Anthony, Duncan, Ahearn, & Kellam, 1991; Mirsky, Pascualvaca, Duncan, & French, 1999). Mirsky's model was chosen because it is contains factors that are similar to the ones in Sohlberg and Mateer's clinical model of attention and the factors are also consistent with other theoretical models of attention (Barkley, 1994). Like Sohlberg and Mateer (2001a; 2001b), Mirsky's model asserts that attention is not a unitary construct; instead, attentional functioning is described as a product of the integration of several components or stages that have limited resources (Mirsky, 1989; Mirsky et al., 1991). However, unlike Sohlberg and Mateer, Mirsky's model does not assert that attention is hierarchically organized. Instead, his model is based on empirical studies of children and adults using factor analysis. Mirsky and colleagues (1991; 1999) have categorized attention into four categories: focus/execute, sustain, encode, and shift. Each of these factors are associated with different regions of the brain and have been empirically assessed in terms of varying performance on laboratory measures of attention using samples of children and adults with and without ADHD. However, Mirsky's model does not include a divided attention factor and there is some speculation that divided attention may be a subcomponent of selective attention (Barkley, 1994; Cooley and Morris, 1990).

Focus/execute. The focus/execute factor consists of the capacity to direct attentional resources to a task while also being able to filter out extraneous or distracting stimuli. According to Mirsky (1991), the superior temporal gyrus, inferior parietal cortex, and corpus striatum are associated with this factor of attention. Based on their factor analytic studies of attention, the Stroop Test (Stroop, 1935), Trail Making Test— Parts A and B (Reitan & Davidson, 1974), and the Talland Letter Cancellation Test (Talland, 1965) have significantly loaded onto the focus/execute component of attention (Mirsky et al., 1999). Moreover, Mirsky and colleagues (1999) compared a sample of children with ADHD and a control group and reported that the ADHD group performed significantly worse on the Stroop, Trail Making Test, and Talland Letter Cancellation Test. The focus/execute factor is conceptually similar to Sohlberg and Mateer's (1989) selective attention component of attention, which is defined as the ability to maintain a behavioral or cognitive set while also managing competing or distracting stimuli. In addition, this factor is analogous to Sohlberg and Mateer's (1989) divided attention component, and is conceptualized as the capacity to respond to many tasks or multiple task demands at the same time. Since Mirsky's model does not include a divided attention factor, the APT-II exercises for divided attention were included along with the selective attention exercises in order to be consistent with Mirsky's model and will be discussed in a subsequent section of this paper.

Sustain. The sustain factor of attention is characterized as the ability to consistently maintain one's vigilance, or alertness, across a period of time. More specifically, the sustain factor is associated with remaining on task, responding appropriately and quickly to designated stimuli, and inhibiting responses to non-targeted stimuli. It is assumed that over time, one's ability to sustain his/her focus will decline and there is more variance in maintaining a consistent response over time— particularly among those with ADHD. This factor is also consistent with

Sohlberg and Mateer's (1989) sustained attention component, which is construed as the capacity to uphold a consistent behavioral response during uninterrupted or repetitive activity. According to Mirsky (1989), the sustain factor is linked to the rostral midbrain structures (i.e., mesopontine reticular formation, tectum) and the midline and reticular thalamic nuclei areas of the brain. Generally, these areas are related to arousal regulation and the maintenance of alertness and responsiveness over time. However, it should be noted that these findings are primarily derived from animal studies and there are mixed findings regarding the possibility that the prefrontal cortex is also associated with the sustain factor (Mirsky et al., 1991; Mirsky et al., 1999).

The Connors' Continuous Performance Test (CPT) is frequently used as a measure of sustained attention (Murphy & Gordon, 1998; Weiss et al., 2002). Mirsky and colleagues (1991; 1999) found that the CPT significantly loaded onto their sustain factor during their factor analytic studies. In particular, it was reported that omission and commission error scores, along with mean reaction time scores were associated with the sustain factor (Mirsky, 1989; Mirsky et al., 1991; Mirsky et al., 1999). A study comparing children with ADHD and a control group reported significant differences between the groups on omission and commission errors on the CPT (Mirsky et al., 1999).

Encode. The factor labeled encode is described as a mnemonic capacity to briefly retain information while utilizing it to perform either a task or cognitive operation using that information. In addition, the encode factor is thought to be associated with the amygdala and hippocampal regions of the brain, which are responsible for memory (Mirsky et al., 1991). The encode factor was not part of the original a priori hypotheses regarding the components of attention and has been less effective in distinguishing between children with and without ADHD. Although both the Digit Span and Arithmetic subtests of the Wechsler Intelligence Scale for

Children (WISC) and Wechsler Adult Intelligence Scale (WAIS) significantly loaded onto the encode factor, only the Digit Span subtest yielded significantly different scores between children with ADHD and a control group (Mirsky et al., 1991; Mirsky et al., 1999). As such, given the mixed findings regarding this factor and considering that it was not a part of the original hypotheses regarding the components of attention, it was not included in the present study.

Shift. The final factor, shift, is the ability to adaptively alternate one's focus or attention between one task/stimulus and another in a flexible manner (Mirsky et al., 1999). This factor is conceptually similar to Sohlberg and colleagues' (2001) alternating attention component, which is defined as an individual's capacity to shift his/her focus of attention and flexibly shift between tasks with different demands. Empirical studies using both humans and animals have linked the anterior portion of the brain, specifically the dorsolateral prefrontal cortex and the anterior cingulate gyrus with the ability to flexibly shift one's attentional focus between more than one stimulus or task (Mirsky et al., 1991).

The Wisconsin Card Sorting Test (WCST) loaded significantly onto the shift factor during Mirsky and colleagues' (1991) factor analytic study of the components of attention. Specifically, it was reported that the percentage of errors and number of categories attained on the WCST were associated with the shift factor of attention in samples of adults and children (Mirsky et al., 1991). Additionally, when children with ADHD were compared to a control group, there were significant differences in terms of the number of categories they completed during the WCST and they also differed on the perseverative errors score (Mirsky et al., 1999).

Summary of Present Study

Taken together, this study will incorporate an attention-specific intervention (APT-II) for adults with ADHD and will utilize Mirsky and colleagues' (1991; 1999) clinical model of

attention in order to evaluate the effectiveness of the intervention. Based on empirical findings, and as discussed previously, three components of attention will be treated using the APT-II program and will be assessed according to Mirsky's clinical model as part of this study. The three components chosen for this study include: sustained, alternating, and selective/divided attention. These three factors represent an attempt to reduce the number of components so that the more parsimonious components are included and the redundant components were either eliminated or were subsumed into another component as determined by empirical findings (see Table 1 and Figure 1 for an overview of the attentional models used in this study). Again, as noted by Sohlberg and Mateer (2001a), their component, focused attention, was not part of their APT-II program because the type of attentional exercises for that component (e.g., orienting to simple visual stimuli) are only relevant for individuals emerging from a coma and would not be appropriate for adults with ADHD. In addition, their selective attention component is conceptually similar to Mirsky and colleagues' (1991; 1999) focused/execute attention factor, and as a result, the selective and divided attention treatment tasks were integrated into one phase of this study. Given that the encode factor as described by Mirsky and colleagues (1999) did not consistently differentiate individuals with ADHD from a control group, it was not included in this study. Finally, sustained attention appears to be the most consistently described component of attention and was included in this study because of its relevance for the treatment of adults with ADHD.

Method

Participants

Participants were recruited through two methods, the first consisted of contacting adults who had been assessed through the Adult Assessment Clinic of the Psychological Services

Center (PSC) of Virginia Tech during the past two years and who met criteria for either ADHD-I or ADHD-C. The second method was the posting of a flyer advertising the study at the PSC and at Virginia Tech's Cook Counseling Center. The final sample consisted of four adults, 21-37 years of age (M = 27.75), who met diagnostic criteria for either ADHD-I or ADHD-C (see Table 2 for sample characteristics). Each participant provided his/her informed consent to participant in this study and were notified that they could withdraw at any time (see Appendix A). Given that this was the first study that administered the APT-II program to adults, efforts were made to include participants who met a primary diagnosis of ADHD-I or ADHD-C and who had only one or two comorbid disorders to ensure a smaller number of confounds. Participants who had bipolar disorder, a psychotic disorder, or a current substance use disorder were not eligible for this study; however this was not as issue as none of the participants who were interested in this study met criteria for either of those disorders. It should be noted that two of the participants in the study (Participants 3 and 4) were taking stimulant medications on an "as needed" basis and both agreed to not take their medication on the days they were participating in the study.

Participant 1 was a 37-year-old, single, African American female who pursuing a master's degree at Virginia Tech. She reported that she is highly distractible, especially when reading. In addition, she indicated that she has difficulty recalling verbal information. Finally, she reported that she has trouble with organization her writing and has difficulty integrating multiple sources of information. Participant 1 was diagnosed with ADHD— Not Otherwise Specified by the PSC during the fall of 2004. However, it should be noted that when the CAADID was re-administered as part of this study, it revealed that Participant 1 met criteria for ADHD— Combined Type. Specifically, she endorsed six symptoms of inattention during childhood and adulthood, eight symptoms of hyperactivity/impulsivity during childhood and six

as an adult. She also reported that her symptoms of inattention and hyperactivity/impulsivity began when she was approximately 7 years old and that they cause her impairment in terms of her academic and occupational functioning. Participant 1 did not endorse any clinically significant symptoms on the SCID-I, but did report a past history of substance abuse (i.e., daily marijuana use). She indicated that she her substance abuse ended approximately one year before she began this study.

It should be noted that Participant 1 moved shortly after she completed the treatment program, and as a result, her follow-up data was collected approximately three months after her last treatment session. In addition, since Participant 1 was unable to return to the area for the follow-up assessment and the session was conducted in a different setting, she was not administered the CPT-II, but was administered all of the other measures.

Participant 2 was a 30-year-old, married, Caucasian female who was employed part-time. She reported that it takes her longer than most to complete tasks, will randomly shift from one task to another, and as a result, often forgets what she had intended to accomplish. Participant 2 also indicated that she has difficulty with organization and does better when she has a specific routine to follow. She was assessed by the PSC during the fall of 2004 and was diagnosed with ADHD— Inattentive Type. When she was administered the CAADID for the present study, she endorsed seven symptoms of inattention during adulthood and childhood, six symptoms of hyperactivity/impulsivity during childhood and five symptoms currently. In addition, she indicated that her she did not recall when her symptoms began, but noted that she has "always been this way". She also reported that her symptoms of ADHD cause impairment at home, work, and school. On the SCID-I, Participant 2 endorsed some symptoms of Generalized Anxiety Disorder, but they were not clinically significant. Finally, Participant 2 said that she

tried to take stimulant medications following the diagnosis, but indicated that the side effects made it difficult for her take the medication and she discontinued it after only a few months.

Participant 3 was a 21-year-old, single, Asian-Hispanic male who was a full-time student at Virginia Tech and also worked part-time. Participant 3 indicated that he has always had difficulty with concentration and that his parents had to monitor him while he was living with them to make sure he completed his chores and homework. He also reported that he has difficulty with reading and said that it is hard for him to focus on and retain the information he is reading. He also indicated that it takes longer for him than most to complete tasks and that he has difficulty with procrastination. Finally, Participant 3 reported that he is easily distracted and has trouble focusing for long periods of time. Participant 3 was assessed by Virginia Tech's Cook Counseling Center during the spring of 2005 and was diagnosed with ADHD— Inattentive Type.

When Participant 3 was administered the CAADID for this study, he reported nine inattentive symptoms during childhood and adulthood, three symptoms of hyperactivity and restlessness during childhood, and two current symptoms of hyperactivity/restlessness. He also indicated that his symptoms of inattention began when he was approximately seven and that they cause him significant impairment at home, school, and work. Participant 3 did not endorse any clinically significant symptoms on the SCID-I. In addition, it should be noted that Participant 3 was prescribed a stimulant medication and has been taking it on an "as needed" basis since he was diagnosed. He agreed to stop taking his medication during the baseline and treatment phases of this study. During the follow-up session, he reported that he felt like he needed to take his medication less often as a result of being a part of this study.

Participant 4 was a 23-year-old, single, Caucasian female who was enrolled full-time at Virginia Tech and was also employed part-time. Participant 4 reported a long history of symptoms of ADHD and said that she has always had trouble with organization and completing tasks on time. In addition, she indicated that she has difficulty concentrating for long periods of time and is easily distracted. Participant 4 was assessed through her school system during the fall of 2000 and was diagnosed with ADHD— Combined Type. On the CAADID, Participant 4 endorsed nine symptoms of inattention during childhood and adulthood, eight current symptoms of hyperactivity/impulsivity, and nine symptoms of hyperactivity/restlessness as a child. In addition, she reported that she was approximately six when her symptoms of ADHD began and noted that they cause her significant impairment at home and school. Participant 4 did not endorse any clinically significant symptoms on the SCID-I. She was prescribed a stimulant medication and takes them on an "as needed basis". Participant 4 agreed to stop taking her stimulant medication during the baseline and treatment phases of this study. It should be noted that Participant 4 missed two scheduled follow-up sessions and was difficult to contact. As a result, her follow-up assessment was conducted approximately four months after her final treatment session.

Measures

Study Eligibility Measures. Although all of the participants in the study had been previously diagnosed with ADHD and had accompanying documentation, the presence of ADHD was assessed again in order to confirm the diagnosis and subtype. The Conners' Adult ADHD Diagnostic Interview for DSM-IV (CAADID, see Appendix B) was used to determine the participants' ADHD status. The CAADID (Epstein, Johnson, & Conners, 2001) is a structured clinical interview that asks participants to indicate whether symptoms of inattention

and hyperactivity/impulsivity were present during childhood and whether they are currently experiencing them now. In addition, the CAADID assesses whether these symptoms are present in a variety of settings (e.g., home, work) and asks the participant to indicate how much impairment he/she is experiencing as a result of these symptoms relative to those of the same age.

All participants were also administered sections of the Structured Clinical Interview for DSM-IV, or SCID-I (First, Spitzer, Gibbon, & Williams, 1996; Spitzer, Williams, Gibbon, & First, 1992), in order to rule upon the presence of other comorbid disorders as indicated above. The SCID-I is a structured clinical interview that was designed to assess for the presence of Axis I disorders such as Major Depressive Disorder and Generalized Anxiety Disorder (First et al., 1996; Spitzer et al., 1992). For the purposes of this study, only certain sections of the SCID-I were administered to the participants (Major Depressive Disorder, Dysthymic Disorder, Alcohol and Substance Use, Bipolar Disorder, Schizophrenia, Panic Disorder, Social Phobia, Obsessive-Compulsive Disorder, Generalized Anxiety Disorder, and Post-Traumatic Stress Disorder). The SCID-I reportedly has adequate reliability, with coefficient alphas from recent studies that range from 0.63 to 1.0 for the various subsections (e.g., Zanarini et al., 2000).

Once the participants' ADHD status was confirmed and the presence of other disorders was assessed, the two participants who did not have intelligence and achievement testing data from the PSC were administered the Wechsler Abbreviated Scale of Intelligence or WASI (Psychological Corporation, 1998) to determine that their IQ was above 90. The WASI is an individually-administered clinical measure of intelligence that is similar in format to the Wechsler Adult Intelligence Scale, 3rd Edition (Wechsler, 1997). More specifically, the WASI contains four subtests (Vocabulary, Block Design, Similarities, and Matrix Reasoning) that yield

three IQ scores (M = 100, SD = 15): Verbal, Performance, and Full-Scale. The reliability coefficients for the Verbal IQ score ranges from 0.92 to 0.98, 0.94 to 0.97 for the Performance IQ score, and 0.96 to 0.98 for the Full-Scale IQ score. These reliability coefficients are consistent with those of the WAIS-III (The Psychological Corporation, 1998).

Baseline and Core Attention Measures. All participants were administered a developmental history form (see Appendix C), which was used for qualitative information about the participants, along with providing information about current medications. Since three different aspects of attention were targeted during the intervention, measures were administered at baseline and throughout the intervention that assess for change over time. Each participant was administered the three core attention measures at the end of each session. As done in previous studies, measures that assess for treatment effectiveness were different from the tasks used during the intervention to ensure that the findings to do not reflect practice effects. Moreover, the following measures were selected based on prior research done which indicated that these measures adequately assessed the three components of attention that will be included in this study (Mirsky et al., 1991; Mirsky et al., 1999; Sohlberg & Mateer, 2001a, 2001b, 1989; Sohlberg et al., 2001; Williams, 1987).

As indicated previously, the CPT significantly loaded onto the sustain factor of attention and was used to assess the effectiveness of the sustained attention portion of the treatment program. A newer version of the CPT, the CPT-II (Conners, 2000), was used in this study and consisted of a series of letters that are displayed in the computer screen at varying intervals and speeds. During this 14-minute test, participants were required to press the space bar when any letter but "X" was presented. When an "X" was displayed on the screen, participants were instructed to do nothing and wait for another letter to appear. Based on the findings of Mirsky

and colleagues (1991), omission errors t-score (i.e., not responding when a letter other than "X" appeared), commission errors t-score (i.e., responding to an "X"), and mean reaction time (hit rate) t-score were used in this study since they significantly loaded on to the sustain factor of attention.

In addition, Mirsky and colleagues' (1991; 1999) findings revealed that the WCST loaded onto the shift factor of attention, which is consistent with Sohlberg and Mateer's alternating attention portion of the APT-II. A computerized version of the WCST (Heaton, 2003) was used in this study and required participants to match a response card to one of four stimulus cards based on one of three sorting rules (e.g., color, number, form). The four stimulus cards consisted of one red triangle, two green stars, three yellow crosses, and four blue circles which were located on the top third of the computer screen. The response card appeared in the center of the bottom half of the computer screen and the participants matched them according to the rule they thought was in effect. The sorting rule changed following the presentation of 10 cards and each participant responded to 128 cards. Participants were given visual and auditory feedback regarding whether or not their response was correct or incorrect (i.e., the word "incorrect" or "correct" was displayed on the screen). Based on that feedback, the participants had to decide how to proceed with the following response cards. The norms for this program were developed using the standard version of the WCST and it has been reported that the computerized version of the WCST is generally equivalent to the standard version (Artiola Fortuny, & Heaton, 1996; Heaton, Chelune, Talley, Kay, & Curtiss, 1993).

Since Mirsky and colleagues (1991; 1999) found that the perseverative errors t-score significantly loaded onto the shifting attention factor and distinguished an ADHD group from a control group, that was the only score from the WCST that was used in this study. Again, this

factor is consistent with Sohlberg and Mateer's (2001a) alternating attention component and was used to assess that portion of the treatment program. It should be noted that Mirsky and colleagues (1991; 1999) reported that the number of categories completed on the WCST also loaded onto the shift factor; however, the computerized version of the WCST requires the completion of every category, and as such, comparisons based on the number of categories achieved were not possible in this study.

Finally, the Stroop (Stroop, 1935) has been repeatedly associated with Mirsky and colleagues' (1991; 1999) focus/execute factor of attention, which is described as the capacity to direct one's attentional resources to a task while also filtering out extraneous or distracting stimuli. Given that this factor is similar to the selective and divided components of attention of the APT-II, the treatment exercises for those two components of attention were combined into one treatment phase and a computerized color-word version Stroop was utilized in order to assess the effectiveness of that phase of the treatment. The Stroop was administered on a computer and consisted of a series of words printed in red, blue, yellow, or green. The words were "red", "blue", "yellow", "green", and "000000". The keyboard contained labels for each color and the participants were told to ignore what the words said and identify what color they saw as quickly as possible by pressing the key that corresponded to the color they saw. Thirty-five of the trials were incongruent, meaning that the word displayed was different from the color it was printed in. Seven of the trials were congruent and the word displayed was identical to the color it was printed in. The reaction times for each condition (i.e., congruent, incongruent), along with the total errors were used to assess the effectiveness of this phase of the treatment program. It should be noted that none of the participants in this study reported being color blind.

Inattention Correlates Measures. The Conners Adult ADHD Rating Scales or CAARS (Self and Other; see Appendix D) was administered to each participant at baseline and once he/she completed each phase of the treatment program in order to assess improvements among the behavioral correlates of inattention (Conners, Erhardt, & Sparrow, 1998). The CAARS is a 66-item self-report measure that assesses a variety of symptoms associated with correlates of inattention (e.g., inattention/memory problems, impulsivity/emotional lability) according to a 4-point Likert scale ("not at all, never" to "very much, very frequently"). Both the participant and a close acquaintance completed the measures in an effort to increase the reliability of reported treatment outcomes. A higher score (e.g., t-score above 65) on this measure is considered to reflect impairment in the various domains that are assessed. According to Conners and colleagues (1998), the CAARS has a coefficient alpha that ranged from 0.64 to 0.91 in males and 0.49 to 0.90 for females, and a test-retest reliability that ranged from .88 to .91 (CAARS-Self-Report) and .85 to .95 (CAARS-Other).

The participants and their close acquaintances were also administered the APT-II Attention Questionnaire (see Appendix E) at baseline and once he/she completed each phase of the treatment program to assess the generalizability of the treatment program. The APT-II Attention Questionnaire (AQ) is a 14-item self-report measure that objectively assesses for everyday attentional functioning using a 5-point Likert scale that ranges from "not a problem or no change from before" to "is a problem all the time" (Sohlberg et al., 2001). Again, a higher score on the AQ indicates difficulty with attentional functioning. The APT-II Attention Questionnaire was based on Ponsford and Kinsella's Rating Scale of Attentional Behavior (1991), which has a coefficient alpha of 0.92. The APT-II Attention Questionnaire is very similar to the Rating Scale of Attentional Behavior, but has an added subsection that is more

individualized and asks participants to identify and rate their most frequent attentional problems (Sohlberg et al., 2001).

APT-II Treatment

The basic premise behind the APT program is that direct retraining of core attention behaviors will yield improvement in core attentional functioning, along with demonstrating improvements in terms of secondary attention behaviors (Sohlberg & Mateer, 1989). More specifically, this program is designed to stimulate and activate core attention behaviors (e.g., sustained attention) in order to reorganize how they function, which is also thought to generalize to secondary attention behaviors such as planning and organization (Sohlberg & Mateer, 1989). Treatment success is determined by reaching and maintaining a criterion (e.g., 95% accuracy) over the course of three consecutive trials (Sohlberg & Mateer, 1989). An example of Sohlberg and colleagues (2001) attention retraining tasks is provided below.

Sustained Attention. Tasks designed for sustained attention retraining generally require the participant to consistently respond to either auditory or visual stimuli. One of the tasks used for sustained attention required the participants to listen to CDs and press a buzzer every time a target word or number was heard (e.g., "press the buzzer every time you hear two objects in a row that are rectangles or squares"). Another task that was used for sustained attention consisted of having the participants listen to a series of numbers (ranging from three to five numbers at one time) and then verbally arranging them in either ascending or decending order. In addition, the participants also had to listen to sentences that had three, four, five, or six words and then arrange the words according to either alphabetical order or the number of letters in each word. Scoring for these tasks was done in terms of response accuracy, processing speed, number of omissions, and number of commissions, along with a record of error patterns, if applicable

(Sohlberg et al., 2001; Sohlberg & Mateer, 1989). It should also be noted that each participant began at the most basic level and then the tasks became increasingly more difficult as the participants mastered the initial tasks. For example, each participant began the number sequencing task with three numbers at a time and once they demonstrated improvement on that task (e.g., faster reaction time, no errors), they were provided with four and five numbers at a time.

Alternating Attention. The purpose behind the alternating attention tasks is to have the participant flexibly redirect and re-allocate his/her attention depending on the demands of the task (Sohlberg & Mateer, 1989). One of the alternating attention tasks used in this study required the participant to listen for one type of target word or sequence, and then switch to a different type of word or sequence (Sohlberg & Mateer, 2001a). For example, the participants were listing to CDs and were told to press the buzzer every time they heard an even number. When the CD said "switch", then the participants had to only press the buzzer when they hear an odd number. The CD would switch several times during one task and required that the participants remember the rule and pay attention to when they heard the word "switch". Another task that was used had the participant start with a certain number and then alternate between adding and subtracting selected numbers. The number and sentence sequencing tasks that were used for sustained attention were also used again in this section; however, the participants were required to switch between arranging the numbers in either ascending and descending order and arranging the sentences in either alphabetical order or according to the number of letters in each word. Scoring for these tasks consist of calculating the participants' error rate, along with including subjective information regarding their performance (e.g., whether visual cues or verbal recall strategies were needed) (Sohlberg & Mateer, 2001a).

Selective Attention. The tasks that addressed selective attention were similar to those for sustained attention, but had added environmental distractions such a background noise (Sohlberg et al., 2001; Sohlberg & Mateer, 2001a). The participants listened to CDs that contained background noise and had to respond to certain target words while ignoring the background noise. For example, one task required the participants to listen for two words in a row that were opposites while ignoring a background distractor story at the same time. Another task required the participants to complete addition and subtraction problems while listening to the sounds of traffic noises. The scoring process for these tasks is similar to those for sustained attention and also includes the participants' subjective reactions to the distracting stimuli (e.g., "noise was really irritating").

Divided Attention. Divided attention retraining tasks consisted of simultaneously attending to multiple types of information or engaging in two or more tasks simultaneously. One of the tasks required the participants to read a paragraph for comprehension, while at the same time, scan that same paragraph for a target word (e.g., counting the number of "and's" in the paragraph). Another task required the participants to complete a worksheet and identify which words did not fit in certain category while also listening to and responding to CDs that required them to press a buzzer when they heard a certain word. Scoring for these tasks included assessing response accuracy, number of omissions, and number of commissions, along with a record of error patterns (Sohlberg et al., 2001; Sohlberg & Mateer, 1989). Again, it should be noted that in order to remain consistent with Mirsky and colleagues' (1991; 1999) clinical model of attention, the exercises for the selective and divided components of attention of the APT-II were combined into one treatment phase, with the first session of that phase consisting of

selective attention tasks, the second session of that phase consisted of a combination of selective and divided tasks, and the third session consisted of only divided attention tasks.

Procedures

After each participant was administered the study eligibility measures and provided consent for being in this study, they were randomly assigned to different pre-determined baseline periods that varied from one to four sessions. The participants in this study were administered the APT-II in terms of a non-concurrent multiple baseline design, which meant that each participant had a different number of baseline sessions, but completed the treatment program in the same manner. Based on the guidelines provided by Watson and Workman (1981), each participant was randomly assigned to different baseline lengths in order to rule out history effects. This design also allows for the assessment of a causal relationship between the intervention and outcomes, and it is predicted that the outcomes will change as a function of the intervention (i.e., no change during baseline). More specifically, a causal relationship between an intervention and outcome can be established if the outcome matches the particular phase of treatment. In this study, it was predicted that behaviors specific to the type of attention that is targeted during that phase of treatment (e.g., sustained attention) will change while the other behaviors (e.g., divided attention) will remain the same. In addition, it was not expected that there would be any improvements during the baseline phase (Kazdin, 1998).

This study consisted of a baseline phase, three treatment phases (sustained, alternating, and selective/divided), and a follow-up base. As mentioned previously, each baseline phase was different for each participant, but the manner in which the treatment was administered was consistent across participants. More specifically, pilot testing conducted prior to the beginning of this study revealed that the participants would be able to complete all of the tasks for each

phase of attention and attain a 95% accuracy rate after three sessions. As such, each treatment phase consisted of three sessions that were administered twice a week, and every participant received nine treatment sessions. Each treatment session lasted approximately an hour and a half— one hour of which was devoted to the treatment exercises and a half hour consisted of the administration of the assessment measures.

After each participant completed the baseline phase, they were administered the APT-II program. According to the APT-II protocol and the conceptualization of attention as hierarchical, the sustained attention phase was administered first, then the alternating phase, and finally, the participants completed the selective/divided phase (Sohlberg et al., 2001). Measures of core attentional functioning were administered to each participant during every session as indicated above and measures that assessed the correlates of inattention (e.g., CAARS, AQ) were given after the completion of each phase of the APT-II program. Finally, each participant attended a follow-up session approximately two months after the completion of the last treatment phase and were administered the core attentional measures and the correlates of inattention measures in order to assess the long-term effectiveness of this intervention. In addition, upon completing the follow-up portion of the study, each participant was given $50 for their participation in this study.

Results

One of the common methods for evaluating outcomes in multiple baseline studies is through visual inspection (Gliner, Morgan, & Harmon, 2000; Kazdin, 1982; Kazdin, 1998, Yin, 1994). In general, noting whether gains were made during the intervention phases rather than the baseline phase is the simplest form of visual inspection. However, differences between the different treatment phases can also be assessed in terms of the *mean* (e.g., average rate of

performance) and *level*, or whether the change was stable (e.g., remained up). In addition, changes in the *trend*, or slope, of the data can be assessed. For example, changing from no trend during baseline to a trend (either increase or decrease) during the treatment phase is considered a change in trend (Kazdin, 1998). Finally, *latency* of change can be assessed in terms of how quickly treatment gains are observed. Intervention effects are believed to be more clear (i.e., fewer extraneous influences) if the change in behavior occurs close in time to the beginning of the new treatment phase (Kazdin, 1998).

Sustained Attention

An examination of the results of CPT-II scores suggests that the participants' sustained attention ability did not significantly improve following the administration of the APT-II program (see Table 3 for CPT-II means and standard deviations). Overall, there were only slight point-by-point variations in omission, commission, and hit rate scores (see Figure 2). However, some of the observed changes were in the wrong direction (e.g., an increase in omission errors rather than a decrease) and they were not consistent across participants. See Figure 3 for the means of all the CPT-II scores across all treatment phases— this was included in order to demonstrate the overall effects of the intervention across participants. It should also be noted that among those participants whose baselines were relatively longer (i.e., Participants 3 and 4), their CPT-II scores evidenced some improvement during the baseline phase, which could indicate the presence of practice effects and will be considered further in the discussion section.

In addition, it was observed that the CPT-II scores did not change in a consistent manner across participants. Participant 1's hit rate score increased slightly during the first phase and decreased during the second phase; however it increased slightly during the end of the second phase and continued to increase again during the third phase. On the other hand, her omission

and commission scores remained relatively stable during the first, second, and third phases (with the exception of her omission score during the beginning of the third phase).

For Participant 2, there were no noticeable changes in her performance on the CPT-II. Her scores during the treatment phases remained near her baseline scores and did not fluctuate significantly as a result of the APT-II. In addition, her follow-up scores were similar to her baseline scores, further suggesting a lack of improvement.

Participant 3's omissions and commissions scores decreased somewhat during the baseline phase and that trend continued during the first phase and remained relatively stable throughout phases 2 and 3. In addition, Participant 3's hit rate score was fairly stable throughout all three phases, indicating that there were no significant changes in terms of his hit rate score. A comparision of his baseline and follow-up scores suggest some minor improvements occurred as a function of being in this study.

Finally, Participant 4's scores on the CPT-II evidenced considerable variability—especially her omissions score, which increased during two sessions and then leveled off. Her commissions and hit rate scores did not evidence significant changes as a function of this study. In addition, her baseline and follow-up scores were somewhat similar, which suggests that she did not demonstrate significant improvements as a result of the APT-II treatment.

Alternating Attention

Gains in alternating attention, as indexed by an increase in the perseverative errors t-score of the WCST, were predicted to occur during the second treatment phase (see Table 4 for WCST means and standard deviations). As such, there should have been little improvement on the perseverative errors score until the second phase of treatment. Although the participants' perseverative errors scores were somewhat higher during the second phase relative to the

baseline phase, that trend appears to be a continuation of the improvements evidenced during the first treatment phase and the changes appear to have been maintained throughout the second and third treatment phases (see Figure 4). See Figure 5 for the mean perseverative scores across all of the treatment phases.

In addition, the changes observed across participants were not consistent and did not include significant changes between baseline and follow-up. For example, Participant 1's perseverative errors score increased during one session in the middle of the second phase, but then decreased back down to a level that was similar to her baseline level. Participant 2's perseverative errors score showed a gradual increase beginning during the first phase and it continued to increase through the rest of the phases. Participant 3's perseverative errors score gradually increased during the baseline phase and that trend was observed to continue during the first phase and was stable during the second and third phases. Participant 4's perseverative errors score was relatively stable throughout all of the phases of this study. Overall, given the lack of consistent and pronouced improvements on the WCST, the participants' alternating attention did not appear to improve as a function of this intervention.

Selective/Divided Attention

The participants' Stroop reaction time scores and error rate were predicted to decrease during the third phase, which was when the selective/divided attention tasks were introduced (see Table 5 for Stroop means and standard deviations). Upon reviewing the participants' overall performance during the treatment phases, it eas observed that some of their scores decreased slightly; however, this was not a pronounced trend across all participants (see Figure 6). See Figure 7 for the mean Stroop scores across all of the treatment phases. Again, given the lack of

expected improvements during the third treatment phase, the question of practice effects will be addressed during the discussion section.

With the exception of Participant 3, all of the other participants' scores on the Stroop did not demonstrate a marked decrease during the treatment phases. Instead, some of the participants' scores evidenced modest improvements during certain sessions, but they were not maintained. Again, these findings suggest that the participants' reaction times did not significantly change as a result of the APT-II treatment.

The participants' total errors were also evaluated in order to assess changes in their selective/divided attention abilities (see Figure 8). It was expected that their total errors would only decrease during the third treatment phase, which corresponds to the selective/divided attention portion of the treatment program. Overall, the participants' total errors appeared to decrease somewhat during the baseline phase; however, some participants made some errors during the other phases and there was no consistent pattern of improvement as expected.

Inattention Correlates Results

The CAARS and AQ were administered to each participant after they completed each treatment phase. These measures were included in order to assess for improvements in correlates of inattention such as changes in daily functioning. It was expected that each participants' score on the CAARS and AQ would decrease following the completion of the entire treatment and improvements were not expected to occur as a result of any of the specific treatment phases.

Since Participant 1 did not provide consent for an acquaintance to complete inattention correlate measures on her behalf and Participant 4 moved out of her apartment due to an altercation with her roommate (who had been completing measures on her behalf), only the results from the self-report versions of the CAARS and AQ are presented. See Figure 9 for each

participants' CAARS scores and Figure 10 for the mean CAARS scores at baseline and follow-up (note that only the DSM-IV subscales were included in order to simplify the figure). See Figure 11 for each participants' AQ scores and Figure 12 for the mean AQ scores at baseline and follow-up. Participant 1's CAARS scores generally decreased as a result of this study and were maintained during the follow-up session; however, it should be noted that only her Hyperactivity/Restlessness score was in the clinically elevated range during the baseline phase and evidenced a decline during the rest of the treatment phases. Participant 1's AQ also demonstrated a marked decline during all three treatment phases, but increased during the follow-up session.

Participant 2's DSM-IV Inattentive Symptoms and DSM-IV ADHD Symptom Total scores on the CAARS were in the clinically elevated range at baseline and both scores decreased to the non-clinical range during the treatment phases. In addition, the changes were maintained during the follow-up session. Her AQ score decreased at the end of the first phase and that change was maintained during the rest of the phases of the study.

Participant 3's DSM-IV Inattentive Symptoms score of the CAARS was in the clinical range during baseline and increased at the end of the first phase. Following the increase during the first phase, his Inattentive Symptoms score demonstrated a decline during the second and third phases of this study, which was also maintained during the follow-up session. His AQ score also showed a similar pattern, with an increase during the first phase and then decreasing during the rest of the phases of the study.

Nearly all of Participant 4's CAARS scores were in the clinically significant range during baseline and remained elevated until the third phase where some of her scores began to decline. By the end of the third phase, only her Hyperactivity/Restless score had decreased to below the

clinically significant level and her Impulsivity score was almost below the clinically significantrange. These results were also maintained during the follow-up session. Finally, her AQ score demonstrated a decline during the third phase, but increased during the follow-up session.

Exploratory Analyses

The following exploratory analyses were conducted in order to determine whether there were performance differences as a function of the phases of the treatment. It should be noted that the design of this study violates the main assumptions of analysis of variance (ANOVA) and the results should be interpreted with caution. Since the four participants in this study were repeatedly observed using the same measures, serial dependency of the data cannot be ruled out. In addition, given the small sample size, statistical power is reduced. However, ANOVAs have been recommended as supplemental analyses for multiple baseline designs and are presented below for exploratory purposes (Kazdin, 1982; Kazdin, 1998; Richards, Taylor, Ramasamy, & Richards, 1999).

In order to determine if there was an effect for the different phases of this study, a one-way repeated measures within subjects ANOVA was conducted for each of the core attention measures used in this study. The participants' mean scores for each phase were computed and were used during the analysis. Planned post-hoc comparisons were also conducted in order to determine when the effect was significant. Since each phase was supposed to affect one component of attention, it was hypothesized that depending on which component of attention was targeted, there would be an effect for that phase, but that the other phases would not be significant. For example, since sustained attention was targeted during the first phase, it was

expected that the participants' CPT-II performance would be significantly different between the baseline and the first phase, but no significant effects for the other phases.

Sustained Attention. Overall, the results for the CPT-II were non-significant. More specifically, there were non-significant effects for omission errors ($F(3, 4) = .085$, $p < .966$), commission errors ($F(3, 4) = .527$, $p < .675$), and hit rate scores ($F(3, 4) = .784$, $p < .532$) when they were entered in separate ANOVAs, which suggests that the participants' sustained attention ability did not significantly differ between each treatment phase. In addition, ANOVAs were run comparing the baseline mean and the follow-up scores for each of the CPT-II measures used in this study. Again, neither of them showed a significant difference and suggests that the participants' scores on the CPT-II did not significantly change from baseline to follow-up.

Alternating Attention. There was a significant effect for the perseverative errors score on the WCST ($F(3, 4) = 7.333$, $p < .009$). The post-hoc analyses revealed that there was a significant effect between the baseline and second phase ($F(1, 4) = 24.989$, $p < .015$), between baseline and the third phase ($F(1, 4) = 15.182$, $p < .030$), and between phase 1 and phase 2 ($F(1, 4) = 11.187$, $p < .044$). Since alternating attention was targeted during the second phase, the results support the notion that change occurred as a function of that phase. However, since there were also differences between baseline and phase 3, along with differences between the first and second phase, it can be argued that the participants' alternating attention ability may have begun to improve during the first phase and continued to improve after the second phase as well. An additional ANOVA was run in order to compare the participants' baseline mean perseverative errors score to their follow-up score. The result was non-significant ($F(1,4) = .750$, $p < .450$) and suggests that the participants' perseverative errors score did not significantly change from baseline to the follow-up session.

Selective/Divided Attention. Each of the three Stroop scores that were evaluated in this study was entered into separate ANOVAs and analyzed separately. When Stroop incongruent reaction time was entered, there was a significant effect ($F(3, 4) = 5.838$, $p < .017$). Selective/divided attention was targeted during the third phase and it was hypothesized that there would be a difference between baseline and phase 3 only. However, post-hoc comparisons revealed that there was only a significant difference between phase 1 and phase 2 ($F(1, 4) = 14.024$, $p < .033$), suggesting that the participants incongruent reaction time improved during the second phase and not during the third phase as expected. In addition, an ANOVA was run that compared the incongruent reaction time baseline mean to the follow-up score and was non-significant ($F(1,4) = 2.753$, $p < .196$).

Another ANOVA was run using Stroop congruent reaction time and there was a significant effect ($F(3, 4) = 5.509$, $p < .020$). Again, post-hoc comparisons were conducted to test for simple effects and revealed a significant difference between phase 1 and phase 3 ($F(1, 4) = 26.593$, $p < .014$) and phase 1 and phase 2 ($F(1, 4) = 10.756$, $p < .046$). These results indicate that the Stroop congruent reaction time changed significantly following the first phase, but that it was not specific to the third phase as predicted. An ANOVA that compared the participants' baseline congruent reaction time mean with their follow-up score was also non-significant ($F(1,4) = 1.726$, $p < .280$).

Finally, Stroop total errors were entered into another ANOVA and there was a significant effect ($F(3, 4) = 10.151$, $p < .003$). Post-hoc comparisons were also significant for baseline and phase 1 ($F(1, 4) = 51.021$, $p < .006$), baseline and phase 2 ($F(1, 4) = 20.056$, $p < .021$), and baseline and phase 3 ($F(1, 4) = 10.091$, $p < .050$). These results indicate that the participants' total errors changed during all of the phases and that the change was not specific to phase 3 as

expected. Another ANOVA was run that compared the participants' baseline mean and follow-up errors and was significant ($F(1,4) = 14.846$, $p < .031$), which suggests that there was a significant change in the participants total errors between baseline and follow-up. Taken together, the results of these three Stroop results demonstrate that the participants' selective/divided attention significantly changed as a result of the intervention; however, the improvements were not a function of the third phase of the treatment as had been predicted.

Inattention Correlates Results

In order to determine whether the intervention had an effect on the participants' secondary symptoms of inattention, ANOVAs were run that compared the particpants' baseline and follow-up scores on the AQ and CAARS. The results for the AQ were non-significant ($F(1,4) = 25.00$, $p < .126$) and suggest that there was not a significant difference in the participants' AQ score from baseline to follow-up. On the CAARS, the participants' DSM-IV Inattention Score was significant ($F(1,4) = 96.571$, $p < .010$) and indicates that their symptoms of inattention did significantly change from baseline to follow-up. However, none of the other CAARS scores was significantly different between baseline and follow-up.

Discussion

This was the first study that utilized Sohlberg and Mateer's APT-II as an intervention for adults with ADHD (Sohlberg et al., 2001). Overall, the results of this study did not provide support for the efficacy of an attention-specific intervention for adults with ADHD. Although there were some changes from one session to another, there were no clearly discernable changes as a result of this intervention. In addition, there were no pronounced treatment gains as a function of the specific treatment phases as had been expected. Specifically, it had been predicted that only the component of attention that was directly targeted during one of the three

treatment phases would improve and that the other components would not change. However, it was observed that the participants in this study demonstrated slight improvements during the baseline and/or first phase and that those minor changes were maintained during the other treatment phases and through the follow-up session.

Overall, the participants' sustained attention ability, as assessed using the CPT-II, did not significantly improve as a result of the intervention (see Figures 2 and 3). Although there were only some point-by-point changes, but there was no marked or consistent changes during the first phase as had been expected. The participants' CPT-II tended to remain in the same range, with only minor changes that were not maintained. In addition, given the lack of substantial changes between the participants' baseline and follow-up scores, there is no support for the efficacy of this intervention in terms of improving sustained attention functioning. Moreover, the participants' omission errors score, which according to Conners (1994) is more reflective of problems with inattention, did not consistently decrease as a function of this intervention as had been expected. Additionally, the participants' alternating attention ability did not evidence a significant improvement as a result of this intervention. In particular, there was a trend for the participants' WCST perseverative errors score to increase by a few points (which was not significant) during the first phase and that trend continued during the rest of the treatment phases, but decreased again during the follow-up session (see Figures 4 and 5). In addition, the participants' selective/divided attention ability also did not demonstrate a substantial improvement as a function of this intervention as had been expected. The results from the Stroop show that modest, point-by-point, improvements occurred either during the baseline period or the first phase and were maintained through the rest of the phases and the follow-up session (see Figures 6 and 7).

In terms of the inattention correlates, which were assessed at the end of each phase using the CAARS and AQ, improvements (i.e., lower scores) were noted during the second phase for most participants (see Figures 9 and 11). The observed changes in the participants' performance on the measures of inattention correlates were also not consistent with what had been expected. Instead, it had been predicted that improvements on the correlates of inattention measures would be evidenced following the completion of the entire treatment program, which is consistent with the notion that only after all of the core attention components were treated would there be gains in terms of the secondary attentional functioning. However, this was not the case and suggests that addressing at least one of the core components of attention (in this case, sustained attention) yields improvements in the correlates of inattention as well. According to Hayes (1981), a multiple baseline design that targets one aspect of behavior may also have an impact on other aspects of behavior. In other words, it may be difficult to control for the interdependence between the behaviors addressed in this type of design.

The overall lack of specificity for the different phases of attention also warrants further consideration. Although it was expected that treatment gains would be specific to the treatment phase, this was not observed during this study. In general, the modest treatment gains observed appeared to be a function of the first attentional phase, and for some, the baseline phase. This brings up two issues— the first is that of practice effects since the participants were administered the same measures repeatedly, ranging from 10 to 14 times each. In addition, given that there were some improvements during the baseline phase, an argument could be made that the gains evidenced during baseline were maintained throughout the intervention and that the improvements observed may have even been independent of the treatment phases themselves.

The second issue is regarding the components of attention. Namely, the components utilized in this study may not have been as distinct as they were conceptualized to be.

One way to empirically address the issue of practice would have been to include a control group who only receives the assessment measures and compare their results to those of the participants who received the intervention. Specifically, the control group would be analogous to a placebo condition where the participants receive educational information regarding attention and are administered the assessment measures the same number of times as the treatment group. By incorporating a control group, we could potentially rule out demand characteristics and determine the extent to which practice effects may have impacted the participants performance on the measures used in the study. Moreover, the addition of a control group would allow us to determine whether an attention-specific intervention produces reliable improvements in attentional functioning above and beyond practice effects. In addition, a replication of Sohlberg and Mateer's previous studies using a control group is warranted given the discrepancies regarding the magnitude of findings and the question of practice effects.

In general, studies examining the role of practice effects on executive functioning measures such as the ones used in this study have been mixed. For example, Conners (1994) argues that the CPT is mostly impervious to practice effects. His argument is that there are two factors that counterbalance each other in terms of practice effects. In particular, Conners (1994) states that if practice or learning effects do occur to some degree, they are offset by an increase in boredom that occurs when the task is repeatedly administered. In other words, repeated administrations of the CPT results in more boredom, which increases task difficulty. However, it should be noted that there is a lack of clear empirical data to support this argument. In terms of the WCST, there are also mixed findings regarding practice effects. A study comparing WCST

performance at baseline and at 12-months reported that almost all of the subscale scores improved upon re-testing. Specifically, they found that the number of perseverative errors and perseverative responses decreased by about half during re-testing (Basso, Bornstein, & Lang, 1999). The Stroop has also been examined in terms of practice effects and the findings suggest that repeated administrations do yield improvements; however, the improvements are typically seen during the first two sessions and then are stabilized (Davidson, Zacks, Williams, 2003; Beglinger et al., 2005). Overall, there are recommendations to use alternate forms of these tests, when possible, in order to control for practice effects (Beglinger et al., 2005).

Another interesting issue that arises from the results of this study is the nature of the assessment measures themselves. Considering that they are designed to evaluate the different constructs of attention (e.g., CPT and sustained attention) and require activation of those components of attention, the possibility that administering the assessment measures may have been therapeutic cannot be ruled out. For example, taking the CPT requires active attentional processing and the participants' sustained attention may have improved as a function of that task rather than the intervention itself. Given that the participants were required to attend to the tasks and respond according to different demands, this may have yielded improvements on the attentional processes that were being assessed. Although the question of practice effects is important for this type of study, the notion that the measures themselves may have been therapeutic is an alternative way of interpreting the results of this study. A future study that looks at these assessment measures as potential intervention tools would be informative.

Given the lack of consistent findings regarding the efficacy of attention-specific training in the traumatic brain injury literature, it is not surprising that the results from this study were not clear-cut. Previous research using the APT demonstrated that it was effective in increasing

working memory capacity and vigilance; however, the question of practice effects was consistently mentioned by researchers as a potential confound (e.g., Park et al., 1999; Sohlberg et al., 2000). In addition, the issue of whether this type of treatment is ideal for individuals with more impairment or those with less severe impairment needs to be clarified (Park & Ingles, 2001). Considering that this type of intervention was designed for individuals with more impairment in terms of everyday functioning, it is possible that the lack of substantial findings could be due to the fact that the participants in this study were relatively higher functioning and had not sustained any head injuries.

It had been hypothesized that the treatment phases would yield distinct and specific improvements in each of the attentional components that were addressed. However, this was not the case as slight variations were generally noted by the end of the first phase in all three of the components. Therefore, it is plausible that the different treatment phases were not mutually exclusive, but rather, had a reciprocal effect on all aspects of attention. For instance, since the first phase targeted sustained attention, the skills the participants gained from that phase could have had a reciprocal effect on their ability to switch focus and manage multiple task demands. A possible way of addressing this issue would have been to vary when the phases are introduced (i.e., complete the selective/divided tasks first rather than last) to determine whether there is an order effect or whether the fact that the participants are practicing some type of attentional training will yield improvements in their general attentional functioning. In other words, the notion that the participants were actively exercising one component of attention may have had a reciprocal effect on their overall ability to manage their attention.

Instead of conceptualizing attention as hierarchically organized (e.g., Sohlberg and Mateer, 1987; Sohlberg et al., 2000), it might be more practical to view attention as a functional

and dynamic system comprised of several factors that reciprocally affect one another (Cicchetti, 1993; Moore, 2001). For example, Ruff and Rothbart's (1996) definition of attention is that of an adaptive and dynamic system that is comprised of individual differences in selectivity, arousal state, and control. Although their conceptualization of the development of attention assumes that it hierarchically develops from a more basic orienting system into a complex control system, the end result is an integrated and organized functional system.

As previously discussed, attention can be characterized in terms of an individual's response to an environmental event (Barkley, 1996). For example, one's focus may shift to a new stimulus immediately after it appears. Again, it is also assumed that attention is dependent on the properties of the stimulus (e.g., complex versus simple), one's arousal level, and the ability to control/maintain attentional focus (Ruff & Rothbart, 1996). Moreover, according to Douglas (1984), ADHD can be described in terms of how attention is maintained over time, whether attention is self-directed and organized, and how much effort is expended. In addition, Nigg and Casey's (2005) notions about the importance of context are also critical for our understanding of attention as a dynamic process. Specifically, they argue that an individual's performance varies as a function of the demands of the current context and that it is artificial to assume that one's performance will be the same across contexts. These conceptualizations of attention and ADHD attempt to account for the complexity that is inherent in attempting to explain a process that is reliant upon a variety of other factors. Although the present study utilized a multifaceted approach to the construct of attention, the intervention itself may have been limited in that it did not address the dynamic and reciprocal relationships between the different constructs of attention, and instead, artificially assumed that they were distinct and hierarchically organized.

Perhaps Sohlberg and Mateer's conceptualization of attention as hierarchical and their subsequent development of an attention-specific intervention based on that notion was limited in that attention is too dynamic a construct to be intervened upon in a linear, hierarchical fashion. It would be difficult to create an intervention that accounts for the dynamic interrelationship between the various components of attention; instead, this intervention may have been more effective if it had taught the participants to integrate how their attentional processes function rather than addressing each component separately. In addition, although the treatment modules used in this study were designed to be generalizable to everyday tasks, the question of whether they were too structured remains. For example, one sustained attention task had the participants listen to auditory CDs that provided a series of words, letters, or numbers and they were required to respond to certain stimuli (e.g., press the buzzer for every round object). In their everyday lives, the participants would not have to deal with this type of task and it may be too basic for their needs. In other words, had the tasks been more difficult or more consistent with what they experience on a daily basis, the results may have been more robust.

Limitations of Design and Future Directions

Some limitations of this study include the nature of the design and sampling procedures used. A non-concurrent multiple baseline design lacks control over history effects and limits generalizability (Gliner et al., 2000). The sample included in this study was selected based on the criteria of having been diagnosed with ADHD and were not randomly selected from a larger population of individuals. The participants were only randomly assigned to the different baseline lengths and since they were administered the treatment at different times, the question of history effects cannot be ruled out. For example, two of the participants participated in this study during the academic year and their performance could have been affected by the demands of the

semester (e.g., midterms); however, it is difficult to control for that using a non-concurrent baseline design.

The lack of a control group makes it hard to determine the extent to which practice effects may have confounded the results as a function of repeatedly using the same assessment measures with each participant. Instead of using laboratory tasks that could have been affected by practice effects, simple observational or self-monitoring measures could have been used as well (Gliner et al., 2000; Hayes, 1981). In addition, as mentioned previously, the inclusion of a control group who only received educational information about attention and were also repeatedly administered the assessment measures would have provided more insight into the role of practice effects. Moreover, given the amount of feedback the participants obtained regarding their performance, it may have had an effect on their response to this intervention (Hayes, 1981). For example, some participants were keeping track of how many errors they made and would comment about it as they were being assessed. It appeared as though some may have been motivated to perform better on the assessment measures because they wanted this study to be successful. As such, being more careful regarding demand characteristics and including a control group would have reduced the confounds of this study and made the interpretation of the findings more straight-forward.

One of the other issues is that not all of the participants were in the clinically significant range on all of the measures during baseline. For example, Participants 1 and 2 were in the non-significant range during baseline for both omission and commission errors on the CPT. As such, it was difficult to assess any improvements since they were already in the normative range for that task. It could also be argued that the sample used in this study was relatively higher functioning as most of them were in college or had attended college at some point. In addition,

two of the participants (Participants 3 and 4) were concurrently taking stimulant medications as needed while they were in the study. Although they reportedly did not take their medication on the days they participated in the study, the effects of their medication may have confounded the results nonetheless.

The need to supplement the available treatments for adults with ADHD is clear as not all adults benefit from stimulant medications or treatments that are cognitive-behavioral in orientation (e.g., Safren et al., 2004; Weiss & Weiss, 2004). However, the findings of this study were not clear-cut and the question of whether an intervention such as the APT-II is effective for adults with ADHD remains. Once the issue of practice effects has been addressed, perhaps through the addition of a control group, a study addressing which underlying mechanisms of the APT-II are most effective (e.g., practice with the treatment tasks, time spent focusing on a stimulus) should be undertaken. In other words, if the APT-II is found to be more effective than a control condition, another study could break down the components of the APT-II in order to determine which tasks or aspects of this treatment are most beneficial for adults with ADHD. Finally, a study that combined aspects of a cognitive-behavioral intervention with attention-specific training would likely augment the effectiveness of both types of interventions and yield more robust improvements. Ideally, this type of study would be most effective once the question of the order, or lack thereof, of attention-specific training and/or if the training of a specific attentional process was more or less critical was empirically determined. In addition, educating the participants about attentional functioning and ADHD may also increase their insight into their limitations, and when combined with an individually-tailored intervention, may result in significant improvements not only in terms of their attentional ability, but also in the managing of daily demands.

References

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

Artiola i Fortuny, L. & Heaton, R.K. (1996). Standard versus computerized administration of the Wisconsin Card Sorting Test. *The Clinical Neuropsychologist, 10*(4), 419-424.

Barkley, R.A. (1994). *The assessment of attention in children*. In G.R. Lyon (Ed.), Frames of Reference for the Assessment of Learning Disabilities: New Views on Measurement Issues, (pp. 69-96). Baltimore: Brookes Publishing Company.

Barkley, R.A. (1996). *Linkages between attention and executive functions*. In G.R. Lyon & N. Krasnegor (Eds.), Attention, Memory, and Executive Functions, (pp. 307-325). Baltimore: Brookes Publishing Company.

Barkley, R.A. (1997). *ADHD and the nature of self-control*. New York: Guilford Press.

Barkley, R.A. (1999). *Theories of attention-deficit/hyperactivity disorder*. In H.C. Quay & A.E. Hogan (Eds.), Handbook of Disruptive Behavior Disorders, (pp. 295-316). New York: Plenum Publishers.

Basso, M.R., Bornstein, R.A., & Lang, J.M. (1999). Practice effects on commonly used measures of executive function across twelve months. *The Clinical Neuropsychologist, 13*(3), 283-292.

Beglinger, L.J., Gaydos, B., Tangphao-Daniels, O., Duff, K., Dareken, D.A., Crawford, J., et al. (2005). Practice effects and the use of alternate forms in serial neuropsychological testing. *Archives of Clinical Neuropsychology, 20*(4), 517-529.

Biederman, J., Faraone, S.V., Monuteaux, M.C., Bober, M., & Cadogen, E. (2004). Gender effects on ADHD in adults, revisited. *Biological Psychiatry, 55,* 692-700.

Campbell, S.B. (2000). *Attention-deficit/hyperactivity disorder*. In A.J. Sameroff, M. Lewis, & S.M. Miller (Eds.), Handbook of Developmental Psychopathology 2nd Edition, (pp. 383-401). New York: Plenum Press.

Choudhury, N. & Gorman, K.S. (2000). The relationship between sustained attention and cognitive performance in 17-24-month old toddlers. *Infant and Child Development, 9*, 127-146.

Cicchetti, D. (1993). Review: Developmental psychopathology: Reactions, reflections, projections. *Developmental Review, 13*, 471-502.

Cicchetti, D. & Dawson, G. (2002). Editorial: Multiple levels of analysis. *Development and Psychopathology, 14*, 417-420.

Colombo, J., Richman, W.A, Shaddy, D.J., Greenhoot, A.F., & Maikranz, J.M. (2001). Heart-rate defined phases of attention, look duration, and infant performance in the paired-comparison paradigm. *Child Development, 72*(6), 1605-1616.

Conners, C.K. (2000). *The Conners Continuous Performance Test, Version II user's manual*. Toronto, Canada: Multi-Health Systems.

Conners, C.K. (1994). *The Conners Continuous Performance Test Computer Program 3.0 User's Manual*. Toronto, Canada: Multi-Health Systems.

Conners, C.K., Erhardt, D., & Sparrow, E.P. (1998). *CAARS: Conners Adult ADHD Rating Scales*. NY: Multi-Health Systems, Inc.

Cooley, E.L. & Morris, R.D. (1990). Attention in children: A neuropsychologically based model for assessment. *Developmental Neuropsychology, 6*(3), 239-274.

Davidson, D.J., Zacks, R.T., & Williams, C.C. (2003). Stroop interference, practice, and aging. *Aging Neuropsychology, and Cognition, 10*(2), 85-98.

Douglas, V.I. (1984). *Can Skinnerian theory explain attention deficit disorder? A reply to Barkley*. In L.M. Bloomingdale & J.M. Swanson (Eds.), Attention Deficit Disorder, Volume IV: Current Concepts and Emerging Trends in Attentional and Behavioral Disorders of Childhood, (pp. 235-255). New York: Pergamon Press.

Douglas, V.I. (1999). *Cognitive control processes in ADHD*. In H.C. Quay & A.E. Hogan (Eds.), Handbook of Disruptive Behavioral Disorders, (pp. 105-138). New York: Kluwer Academic.

Epstein, J., Johnson, D.E., & Conners, C.K. (2001). *CAADID: Conners' Adult ADHD Diagnostic Interview for DSM-IV*. North Tonawanda, NY: Multi-Health Systems Inc.

First, M., Spitzer, R.L., Gibbon, M., & Williams, J.B.W. (1996). *Structured Clinical Interview for DSM-IV Axis I Disorders: Clinician Version (SCID-CV)*. Washington, D.C.: American Psychiatric Press, Inc.

Frick, J.E., Colombo, J., & Saxon, T.F. (1999). Individual and developmental differences in disengagement of fixation in early infancy. *Child Development, 70*(3), 537-548.

Gliner, J.A., Morgan, G.A., & Harmon, R.J. (2000). Clinicians guide to research methods and statistics: Single-subject designs. *J. Am. Acad. Child Adolesc. Psychiatry*, 39(10), 1327-1329.

Goodwin, R.E. & Corgiat, M.D. (1992, September/October). Cognitive rehabilitation of adult attention deficit disorder: A case study. *Journal of Cognitive Rehabilitation*, 28-35.

Gray, J.M. & Robertson, I. (1989). Remediation of attentional difficulties following brain injury: Three experimental single case studies. *Brain Injury, 3*(2), 163-170.

Greene, R.W. & Ablon, J.S. (2001). What does the MTA study tell us about effective psychosocial treatment for ADHD? *Journal of Clinical Child Psychology, 30*(1), 114-121.

Greenough, W.T. & Black, J.E. (1992). *Induction of brain structure by experience: Substrates for cognitive development*. In M.R. Gunnar, C.A. Nelson (Eds.), Developmental Behavioral Neuroscience, (pp. 155-200). Hillsdale, NJ: Lawrence Erlbaum Associates.

Hayes, S.C. (1981). Single case experimental design and empirical clinical practice. *Journal of Consulting and Clinical Psychology, 49*(2), 193-211.

Heaton, R.K., Chelune, G.J., Talley, J.L., Kay, G.G., & Curtiss, G. (1993). *Wisconsin Card Sorting Test manual: Revised and expanded*. Odessa, FL: Psychological Assessment Resources.

Heaton, R.K. & PAR Staff (2003). *Wisconsin Card Sorting Test, Computer Version 4*. Lutz, FL: Psychological Assessment Resources Inc.

Huttenlocher, P.R. (2002). *Neural plasticity: The effects of environment on the development of cerebral cortex*. Cambridge, MA: Harvard University Press.

Kazdin, A.E. (1982). *Single-case research designs: Methods for clinical and applied settings.* New York: Oxford University Press.

Kazdin, A.E. (1998). *Research design in clinical psychology* (3rd ed.). Boston: Allyn and Bacon.

Kerns, K.A., Eso, K., & Thomson, J. (1999). Investigation of a direct intervention for improving attention in young children with ADHD. *Developmental Neuropsychology, 16*(2), 273-295.

Kolb, B. (1995). *Brain plasticity and behavior*. New Jersey: Lawrence Erlbaum Associates.

Mancini, C., Van Ameringen, M., Oakman, J.M., & Figueirdo, D. (1999). Childhood ADHD in adults with anxiety disorders. *Psychological Medicine, 29*, 515-525.

Mateer, C.A. (2000). *Attention*. In S.A. Raskin & C.A. Mateer (Eds.), Neuropsychological Management of Mild Traumatic Brain Injury, (pp. 73-92). New York: Oxford University Press.

Mateer, C.A. & Kerns, K.A. (1999). Capitalizing on neuroplasticity. *Brain and Cognition, 42*, 106-109.

Mirsky, A.F. (1989). *The neuropsychology of attention: Elements of a complex behavior*. In E. Perecman (Ed.), Integrating Theory and Practice in Clinical Neuropsychology, (pp. 75-91). Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Mirsky, A.F., Anthony, B.J., Duncan, C.C., Ahearn, M.B., & Kellam, S.G. (1991). Analysis of the elements of attention: A neuropsychological approach. *Neuropsychology Review, 2* (2), 109-145.

Mirsky, A.F., Pascualvaca, D.M., Duncan, C.C., & French, L.M. (1999). A model of attention and its relation to ADHD. *Mental Retardation and Developmental Disabilities Research Reviews, 5*, 169-176.

Moore, D.S. (2001). *The Dependent Gene*. New York: Times Books.

MTA Cooperative Group (1999). A 14-month randomized clinical trail of treatment strategies for attention-deficit/hyperactivity disorder. *Archives of General Psychiatry, 56*, 1073-1086.

Murphy, K.R. & Gordon, M. (1998). *Assessment of adults with ADHD*. In R.A. Barkley (Ed.), Attention Deficit-Hyperactivity Disorder: A Handbook for Diagnosis and Treatment, (pp. 345-369). New York: Guilford Press.

Murray, K.T. & Kochanska, G. Effortful control: Factor structure and relation to externalizing and internalizing behaviors. *Journal of Abnormal Child Psychology, 30*(5), 503-514.

Nelson, C.A. (1999). Neural plasticity and human development. *Current Directions in Psychological Science, 8*(2), 42-45.

Nigg, J.T. & Casey, B.J. (2005). An integrative theory of attention-deficit/hyperactivity disorder based on the cognitive and affective neurosciences. *Development and Psychopathology, 17*, 785-806.

NIH Consensus Development Panel (2000). NIH consensus development conference statement: Diagnosis and treatment of ADHD. *Journal of the American Academy of Child and Adolescent Psychiatry, 39*(2), 182-193.

Oosterlaan, J., Logan, G.D., & Sergeant, J.A. (1998). Response inhibition in AD/HD, CD, comorbid AD/HD + CD, anxious, and control children: A meta-analysis of studies with the stop task. *Journal of Child Psychology and Psychiatry, 39*, 411-425.

Park, N.W. & Ingles, J.L. (2001). Effectiveness of attention rehabilitation after an acquired brain injury: A meta-analysis. *Neuropsychology*, *15*(2), 199-210.

Park, N., Proulx, G.B., & Towers, W.M. (1999). Evaluation of the Attention Process Training programme. *Neuropsychological Rehabilitation, 9*(2), 135-154.

The Psychological Corporation (1998). *Examiner's Manual, The Wechsler Abbreviated Scale of Intelligence*. San Antonio: Author.

Ponsford, J. & Kinsella, G. (1991). The use of a rating scale of attentional behavior. *Neuropsychological Rehabilitation, 1*(4), 241-257.

Reitan, R.M. (1958). The validity of the Trail Making Test as an indicator of organic brain damage. *Perceptual and Motor Skills, 9*, 127-130.

Reitan, R.M. & Davidson, L.A. (1974). *Clinical neuropsychology: Current status and applications*. Washington, DC: V.H. Winston and Sons.

Reitan, R.M. & Wolfson, D. (1995). Category Test and Trail Making Test as measures of frontal lobe functions. *The Clinical Neuropsychologist, 9*, 50-55.

Richards, S.B., Taylor, R.L., Ramasamy, R., Richards, R.Y. (1999). *Single subject research: Applications in educational and clinical settings*. San Diego: Singular Publishing.

Robertson, I.H., Ward, T., Ridgeway, V., & Nimmo-Smith, I. (1996). The structure of human attention: The Test of Everyday Attention. *Journal of the International Neuropsychological Society, 2*, 525-534.

Rothbart, M.K., Posner, M.I., Rosicky, J. (1994). Orienting in normal and pathological development. *Development and Psychopathology, 6*, 635-652.

Ruff, H.A. (1990). *Individual differences in sustained attention during infancy*. In J. Colombo & J. Fagen (Eds.), Individual Differences in Infancy: Reliability, Stability, & Prediction, (pp. 247-270). Hillsdale, NJ: Erlbaum.

Ruff, H.A. & Rothbart, M.K. (1996). *Attention in early development: Themes and variations*. New York: Oxford University Press.

Safren, S.A., Otto, M.W., Sprich, S., Winett, C.L., Wilens, T.E., & Biederman, J. (2005). Cognitive-behavioral therapy for ADHD in medication-treated adults with continued symptoms. *Behaviour Research and Therapy, 43*(7), 831-842.

Safren, S.A., Sprich, S., Chulvick, S., & Otto, M. (2004). Psychosocial treatments for adults with attention-deficit/hyperactivity disorder. *Psychiatric Clinics of North America, 27*(2), 349-360.

Semrud-Clikeman, M., Nielson, K.H., Clinton, A., Sylvester, L., Parle, N., & Connor, R.T. (1999). An intervention approach for children with teacher- and parent-identified attentional difficulties. *Journal of Learning Disabilities, 32*(6), 581-590.

Silver, L.B. (2000). Attention-deficit/hyperactivity disorder in adult life. *Child and Adolescent Psychiatric Clinics of North America, 9*(3), 511-523.

Sohlberg, M.M., Johnson, L., Paule, L., Raskin, S.A., & Mateer, C.A. (2001). APT-II: A program to address attentional deficits for persons with mild cognitive dysfunction (An upper extension of the APT-I). Wake Forest, NC: Lash & Associates Publishing/ Training Inc.

Sohlberg, M.M. & Mateer, C.A. (1987). Effectiveness of an Attention-Training Program. *Journal of Clinical and Experimental Neuropsychology, 9*(2), 117-130.

Sohlberg, M.M. & Mateer, C.A. (1989). *Cognitive rehabilitation: Introduction to theory and practice*. New York: Guilford Press.

Sohlberg, M.M. & Mateer, C.A. (2001a). Improving attention and managing attentional problems: *Adapting rehabilitation techniques to adults with ADD*. In J. Wasserstein, L.E. Wolf, & F.F. LeFever, (Eds.), Adult Attention Deficit Disorder: Brain Mechanisms and Life Outcomes. Annals of the New York Academy of Sciences, 931, (pp. 359-375). New York: New York Academy of Sciences.

Sohlberg, M.M. & Mateer, C.A. (2001b). *Cognitive rehabilitation: An integrative neuropsychological approach*. New York: Guilford Press.

Sohlberg, M.M., McLaughlin, K.A., Pavese, A., Heidrich, A., & Posner, M.I. (2000). Evaluation of attention process training and brain injury education in persons with acquired brain injury. *Journal of Clinical and Experimental Neuropsychology, 22*(5), 656-676.

Spencer, T., Biederman, J., Wilens, T., Harding, M., O'Donnell, D., & Griffin, S. (1996). Pharmacotherapy of attention-deficit hyperactivity disorder across the life cycle. *J Am Acad Child Adolesc Psychiatry, 35*(4), 409-432.

Spitzer, R.L., Williams, J.B.W., Gibbon, M., & First, M.B. (1992). The Structured Clinical Interview for DSM-III-R: History, rationale and description. *Archives of General Psychiatry, 49*, 624-629.

Stroop, J.R. (1935). Studies of interference in serial verbal reactions. *Journal of Experimental Psychology, 18*, 643-662.

Sturm, W., Willmes, K., Orgass, B., & Hartje, W. (1997). Do specific attention deficits need specific training? *Neuropsychological Rehabilitation, 7*(2), 81-103.

Talland, G.A. (1965). *Deranged memory*. New York: Academic Press.

Taylor, E.W. & Keltner, N.L. (2002). Messy purse girls: Adult females and ADHD. *Perspectives in Psychiatric Care, 38*(2), 69-71.

Watson, P.J. & Workman, E.A. (1981). The non-concurrent multiple baseline across-individuals design: An extension of the traditional multiple baseline design. *Journal of Behavioral Therapy and Experimental Psychiatry, 12*(3), 257-259.

Wechsler, D. (1997). *Examiner's Manual, Wechsler Adult Intelligence Scale, 3rd Edition*. San Antonio, TX: The Psychological Corporation.

Weiss, M., Hechtman, L., & Weiss, G. (1999). *ADHD in adulthood: A guide to current theory, diagnosis, and treatment*. Baltimore: Johns Hopkins University Press.

Weiss, M., Murray, C., & Weiss, G. (2002). *Adults with ADHD: Current concepts*. Journal of Psychiatric Practice, 8(2), 99-111.

Weiss, M.D. & Weiss, J.R. (2004). A guide to the treatment of adults with ADHD. *Journal of Clinical Psychiatry, 65*, suppl 3, 27-37.

Wilens, T.E., Biederman, J., & Spencer, T.J. (2002). A review of the pharmacotherapy of adults with attention-deficit/hyperactivity disorder. *Journal of Attention Disorders, 5*, 189-202.

Williams, D.J. (1987). *A process-specific training program in the treatment of attention deficits in children*. Unpublished doctoral dissertation, University of Washington.

Yin, R.K. (1994). *Case study research: Design and methods* (2nd ed.). California: Sage Publications.

Zanarini, M.C., Skodol, A.E., Bender, D., Dolan, R., Sanislow, C., Schaefer, E., et al. (2000). The collaborative longitudinal personality disorders study: Reliability of Axis I and II diagnoses. *Journal of Personality Disorders, 14*(4), 291-299.

Table 1

Summary of Attentional Models

	Construct	Definition	Measures	Treatment Tasks
Sohlberg and Mateer	Focused	responding to stimuli, impaired in those recovering from a coma	tracking visual/auditory stimuli, simple orienting	not part of APT-II protocol
	Sustained	maintain consistent response during continuous activity	Digit Symbol Coding subtest of WAIS-III	listening for and responding to targets; mental math tasks
	Alternating	shift focus and switch between tasks with different demands	Trail Making Test, Part B	listening to one type of sequence, then switching to another type
	Selective	maintain cognitive/behavioral set despite competing stimuli	Map and Telephone Search subtests of Test of Everyday Attention	listening for and responding to targets with distracters
	Divided	simultaneously respond to many different task demands	Letter-Number Sequencing subtest of WAIS-III	reading paragraphs for comprehension while also counting target words
Mirsky and colleagues	Focus/ execute	focus on task while ignoring distractions or extraneous stimuli	Stroop; Trail Making Test, Parts A and B; Talland Letter Cancellation Test	model does not include treatment tasks
	Sustained	consistently maintain appropriate response over period of time	Omission errors, commission errors, and hit rate scores of CPT	

Table 1, continued

Summary of Attentional Models

	Construct	Definition	Measures	Treatment Tasks
Mirsky and colleagues, continued	Encode	retain information while also using it to carry out another task	Digit Span and Arithmetic subtests of WAIS-III	
	Shifting	alternative focus between one task and another, also includes tasks with different demands	Perseverative errors, number of categories completed on Wisconsin Card Sorting Test	
Integrated Model Used in Present Study	Sustained	maintain consistent and appropriate response over time	Omission errors, errors of commission, and hit rate scores of CPT	listening for and responding to certain targets, mental math exercises
	Alternating	shift focus to different tasks or between tasks with different demands	Perseverative errors score on Wisconsin Card Sorting Test	listening to and responding to one type of stimuli, then switching to another rule
	Selective/ Divided	focus on task and respond while ignoring extraneous stimuli	Stroop (reaction time and errors)	listening for and responding to targets with distractions

Table 2

Participant Characteristics

	Age	Gender	Ethnicity	Diagnosis
Participant 1	37	Female	African-American	ADHD- Combined
Participant 2	30	Female	Caucasian	ADHD- Inattentive
Participant 3	21	Male	Asian	ADHD- Inattentive
Participant 4	23	Female	Caucasian	ADHD- Combined

Table 3

Means and Standard Deviations for Connors Continuous Performance Test (CPT-II)

	Baseline M (SD)	Phase 1 M (SD)	Phase 2 M (SD)	Phase 3 M (SD)
Participant 1				
Omission Errors	42.82	44.09 (2.21)	40.54 (2.88)	51.72 (15.41)
Commission Errors	39.25	34.8 (2.20)	32.94 (1.49)	34.17 (2.20)
Hit Rate	46.62	52.52 (9.52)	41.17 (5.51)	54.56 (4.69)
Participant 2				
Omission Errors	50.79 (4.91)	53.84 (7.48)	48.12 (1.41)	62.01 (12.72)
Commission Errors	41.78 (3.57)	42.33 (2.40)	41.93 (5.63)	42.76 (5.58)
Hit Rate	60.03 (2.99)	59.13 (3.22)	60.58 (6.78)	58.97 (4.84)
Participant 3				
Omission Errors	46.88 (6.03)	45.88 (8.69)	41.86 (1.74)	41.86 (1.74)
Commission Errors	66.73 (4.87)	59.71 (5.15)	46.17 (.74)	36.32 (5.20)
Hit Rate	28.41 (.42)	32.38 (2.13)	37.83 (1.64)	40.29 (2.32)
Participant 4				
Omission Errors	76.74 (11.10)	73.42 (20.40)	90.54 (26.89)	70.14 (3.75)
Commission Errors	66.83 (3.26)	62.07 (2.83)	75.54 (11.27)	72.98 (5.33)
Hit Rate	45.73 (.93)	47.19 (6.49)	48.24 (2.78)	45.03 (3.31)
Overall Scores				
Omission Errors	54.31 (15.30)	54.31 (13.43)	55.27 (23.75)	56.43 (12.30)
Commission Errors	53.65 (15.20)	49.73 (13.29)	49.15 (18.44)	46.55 (17.99)
Hit Rate	45.20 (12.96)	47.81 (11.38)	46.95 (10.07)	49.71 (8.56)

Table 4

Means and Standard Deviations for Wisconsin Card Sorting Test

	Baseline M (SD)	Phase 1 M (SD)	Phase 2 M (SD)	Phase 3 M (SD)
Participant 1				
Perseverative Errors	42	45.33 (.58)	49.67 (6.35)	50.33 (5.77)
Participant 2				
Perseverative Errors	54.5 (4.95)	56 (6.24)	66 (5.57)	77.33 (4.62)
Participant 3				
Perseverative Errors	40.67 (7.37)	51 (7.21)	57.33 (2.89)	55.67 (2.89)
Participant 4				
Perseverative Errors	48.25 (1.89)	53.67 (4.04)	55.67 (2.89)	56.33 (2.52)
Overall Scores				
Perseverative Errors	46.36 (6.36)	51.50 (4.59)	57.17 (6.75)	59.50 (12.71)

Table 5

Means and Standard Deviations for Stroop

	Baseline M (SD)	Phase 1 M (SD)	Phase 2 M (SD)	Phase 3 M (SD)
Participant 1				
Incongruent	33975	35606 (6109)	33651.67 (1759)	34734.67 (2029)
Congruent	6229	7396.67(2838)	6783 (1289)	6406.33 (467)
Total errors	1	.33 (.58)	0 (0)	0 (0)
Participant 2				
Incongruent	46681 (1381)	35683 (1902)	34002.33 (1813)	36305.67 (2528)
Congruent	8828.5 (1182)	7365.33 (656)	5715.67 (653)	6385.33 (1218)
Total errors	1.5 (.71)	.33 (.58)	0 (0)	.67 (1.15)
Participant 3				
Incongruent	44590.67 (7714)	29961.67 (3104)	24962.33 (2584)	23352 (1878)
Congruent	7388 (1161)	6104.33 (766)	4682.67 (343)	4433.67 (306)
Total errors	1.33 (1.15)	0 (0)	0 (0)	.33 (.58)
Participant 4				
Incongruent	41594.25 (5092)	34097 (2682)	31436.67 (6791)	28803.67 (2459)
Congruent	8641.5 (1894)	6459 (915)	6089.67 (1075)	5778.67 (436)
Total errors	4 (1.41)	2.67 (2.08)	1.33 (.58)	1.33 (1.53)
Overall Scores				
Incongruent	41710. 23 (5563)	33836.91 (2684)	31013.25 (4190)	30799.00 (5923)
Congruent	7771.75 (1211)	6831.33 (651)	5817.75 (876)	5751.00 (925)
Total errors	1.95 (1.37)	.833 (1.23)	.333 (.667)	.583 (.569)

Figure 1. Overview of Attentional Models

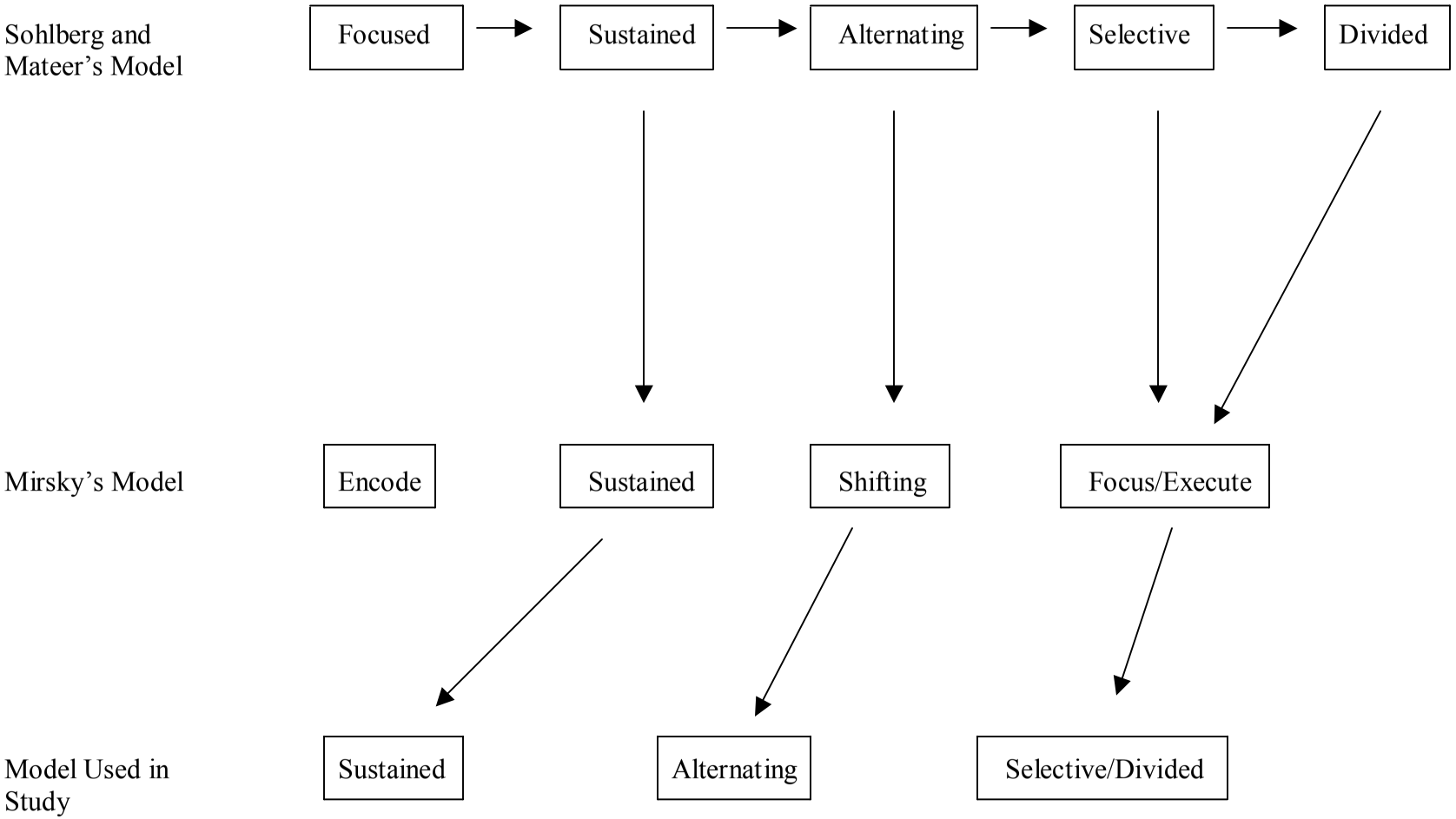
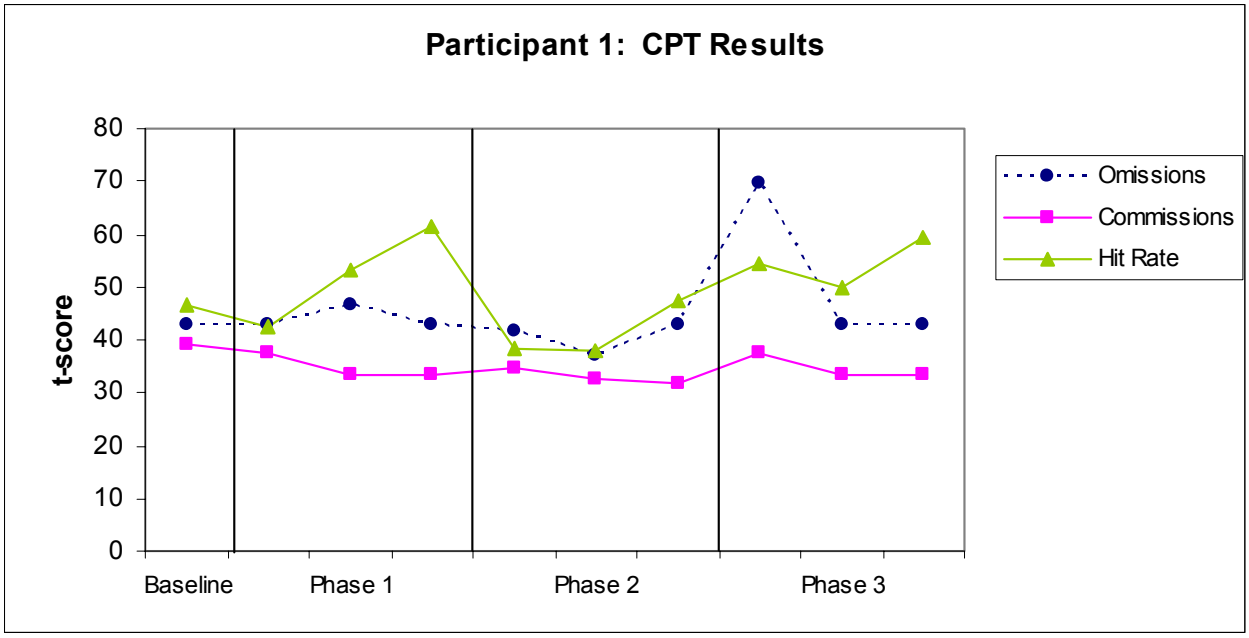
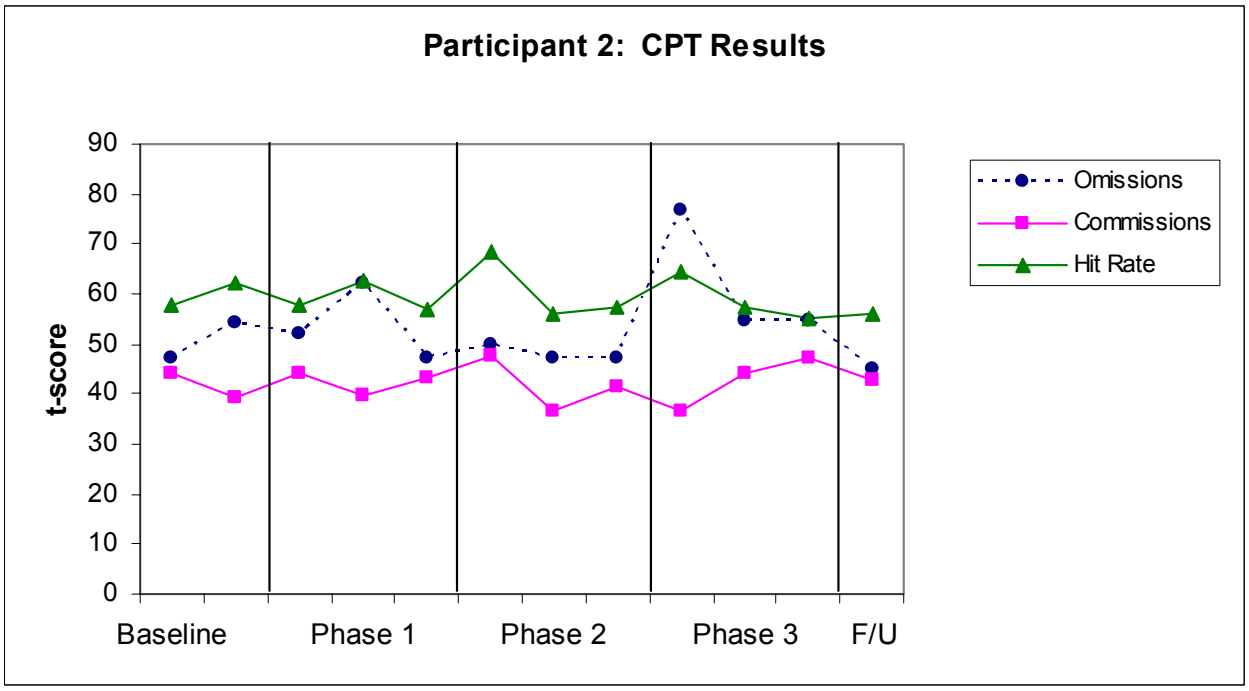
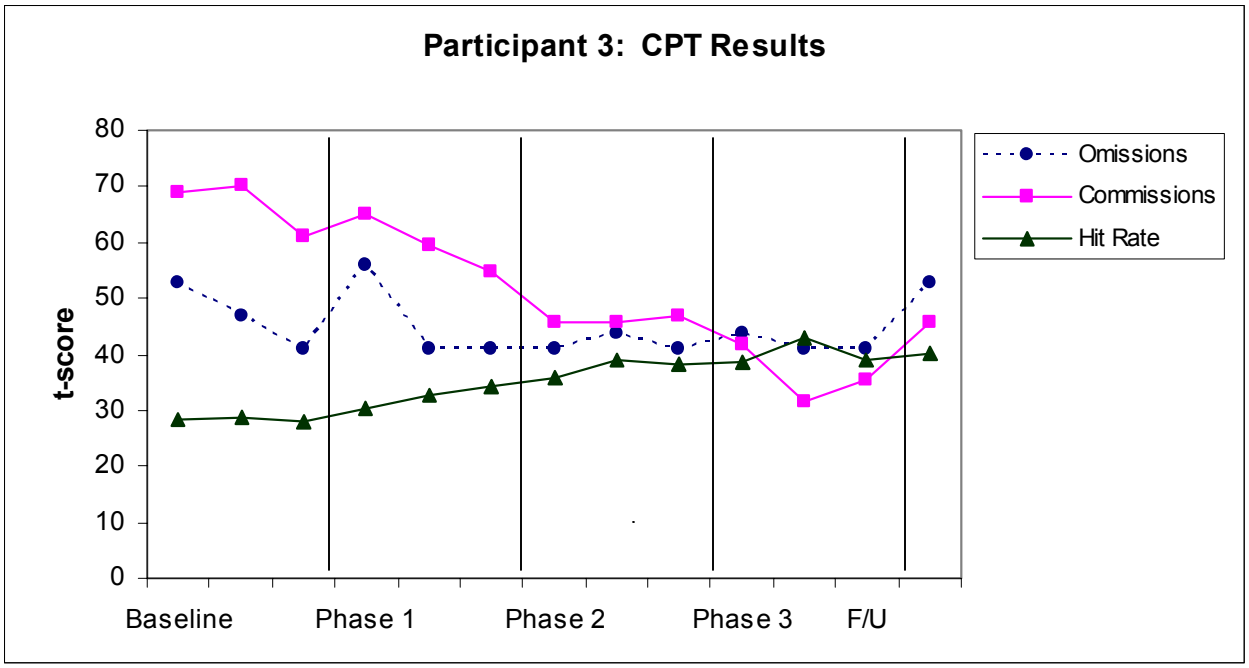


Figure 2. CPT Results for Each Participant






Participant 3: CPT Results
t-score
80
70
60
50
40
30
20
10
0
Baseline
Phase 1
Phase 2
Phase 3
F/U
Omissions
Commissions
Hit Rate

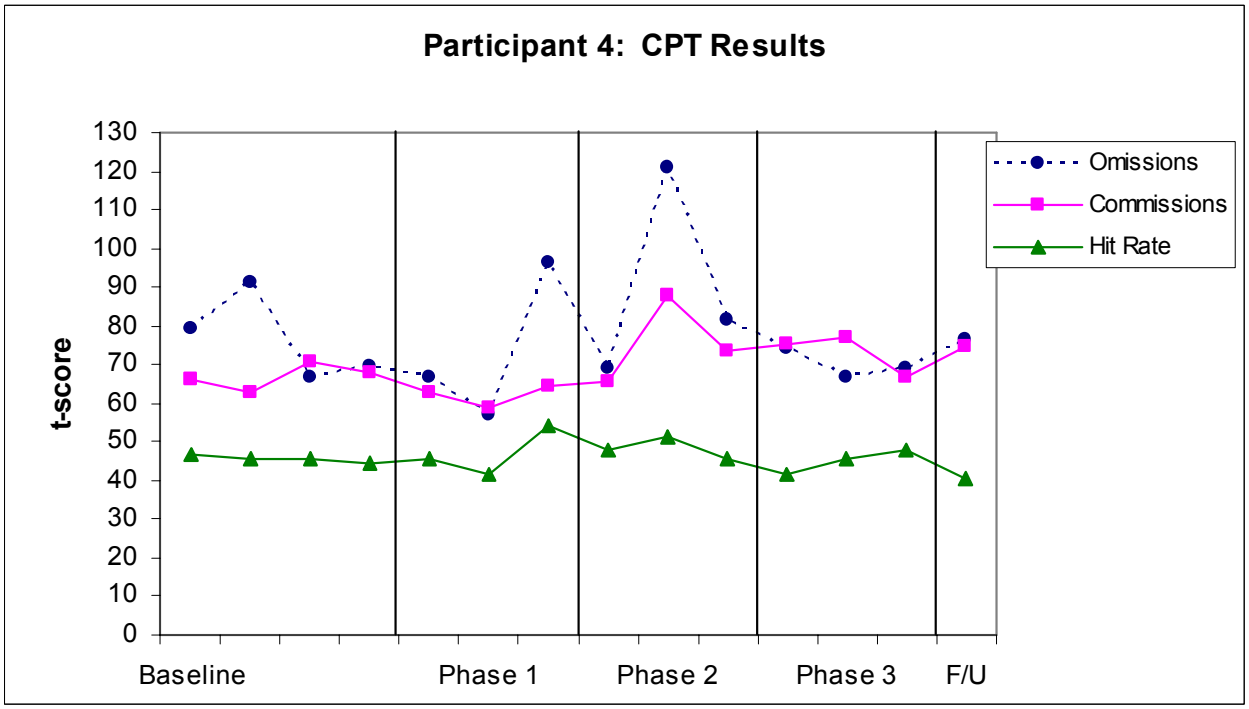

Participant 4: CPT Results
t-score
130
120
110
100
90
80
70
60
50
40
30
20
10
0
Baseline
Phase 1
Phase 2
Phase 3
F/U
Omissions
Commissions
Hit Rate

Figure 3. Mean CPT Results for Each Treatment Phase

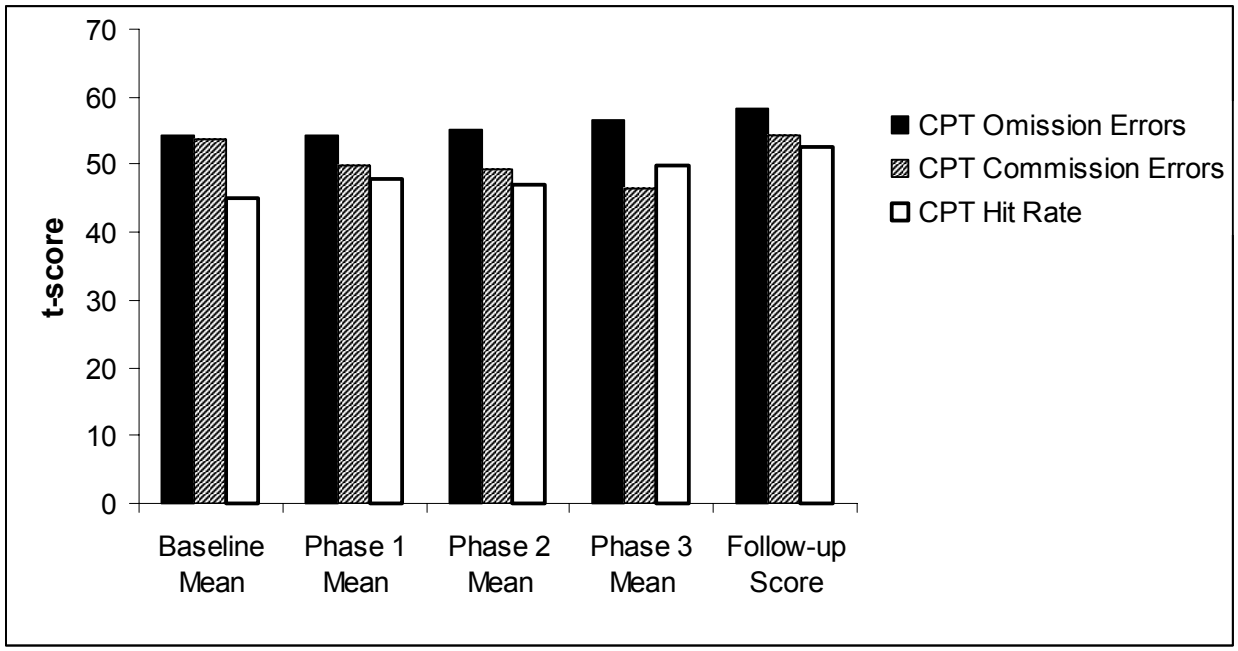
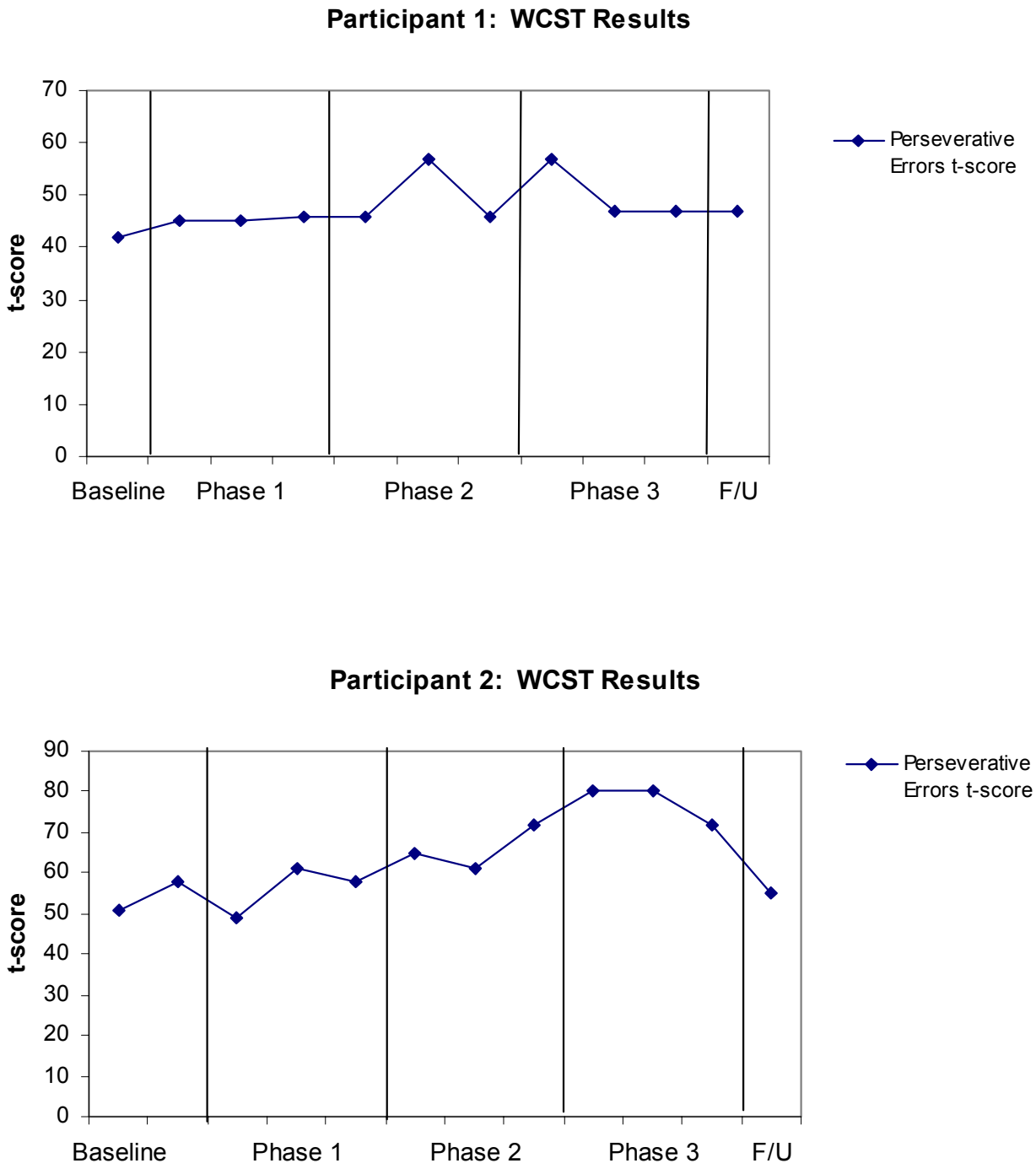
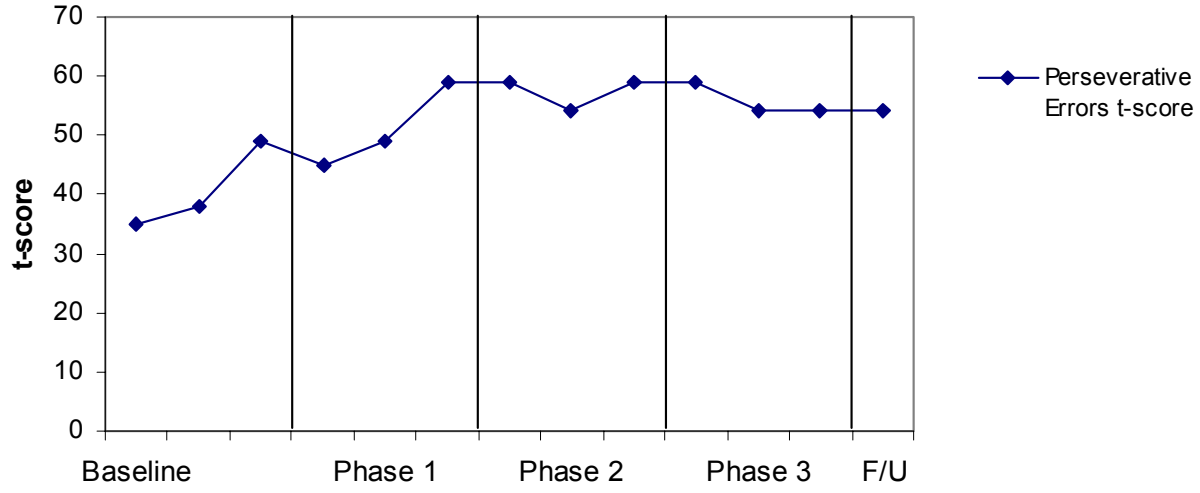


Figure 4. Wisconsin Card Sorting Test Results for Each Participant



Participant 3: WCST Results



Participant 4: WCST Results

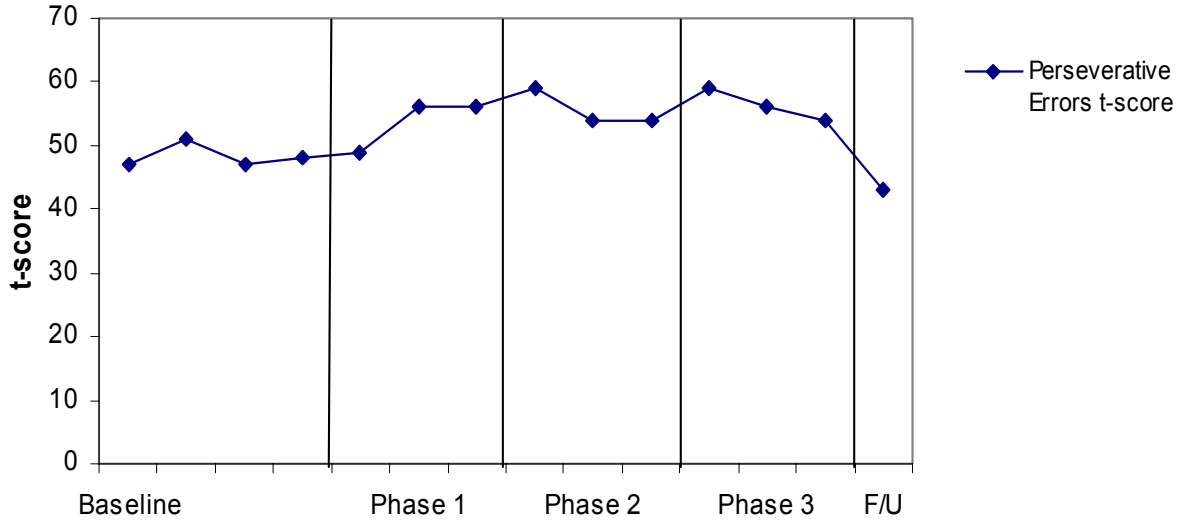


Figure 5. Mean Wisconsin Card Sorting Test Results for Each Treatment Phase

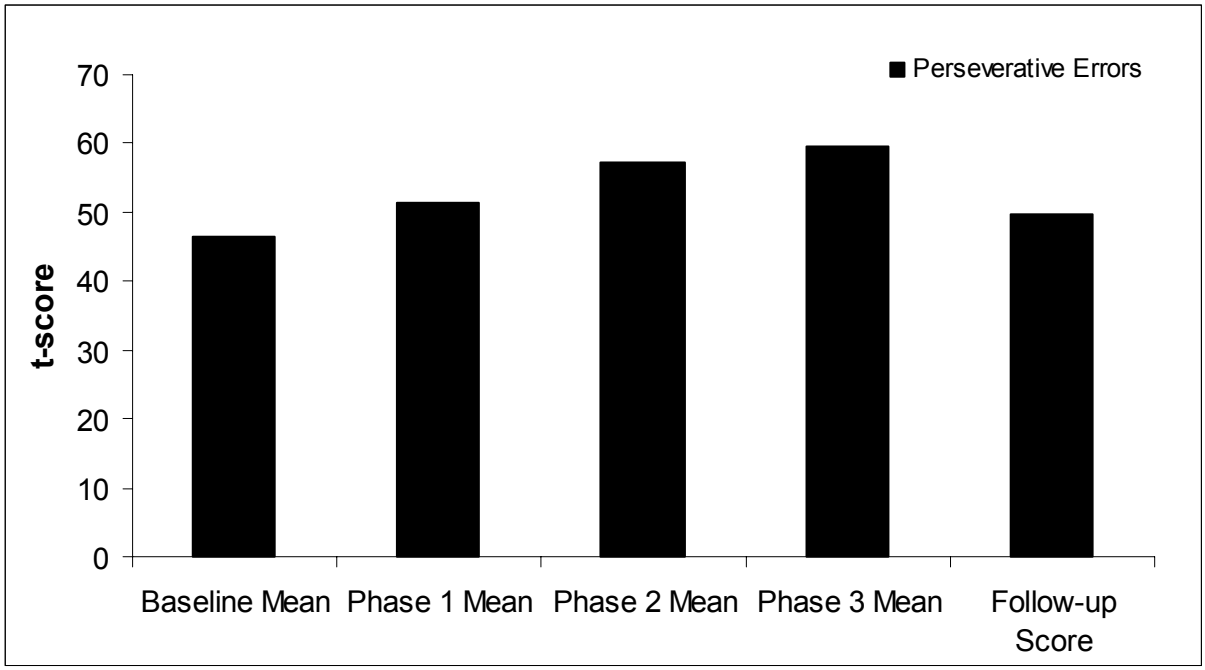
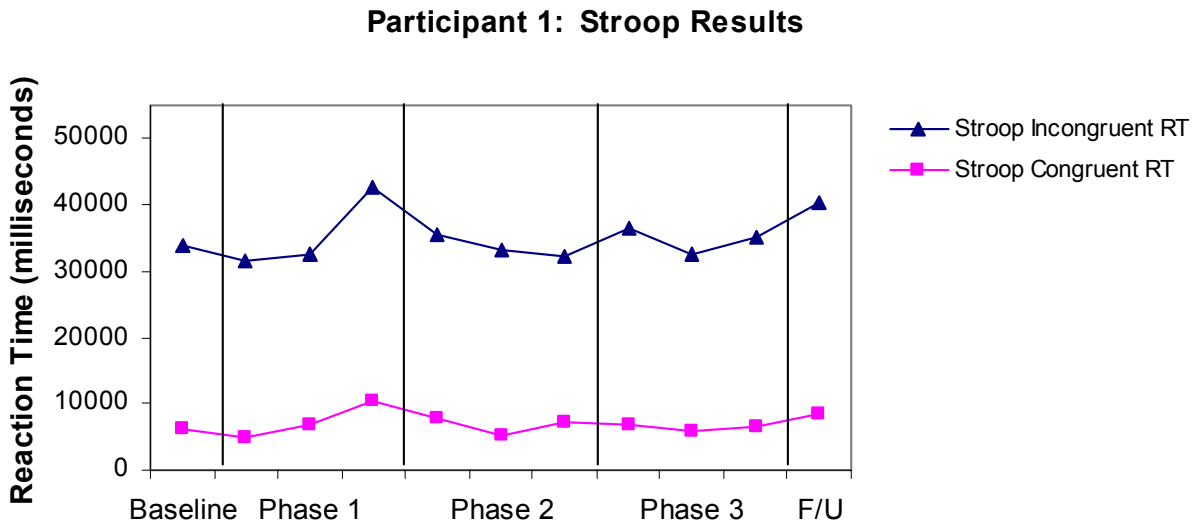
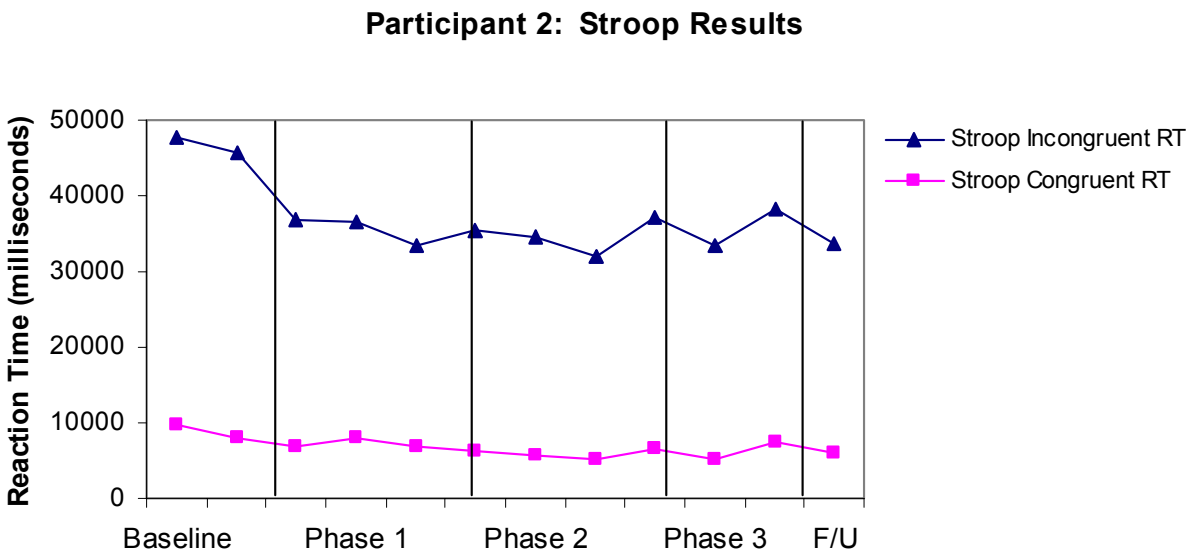
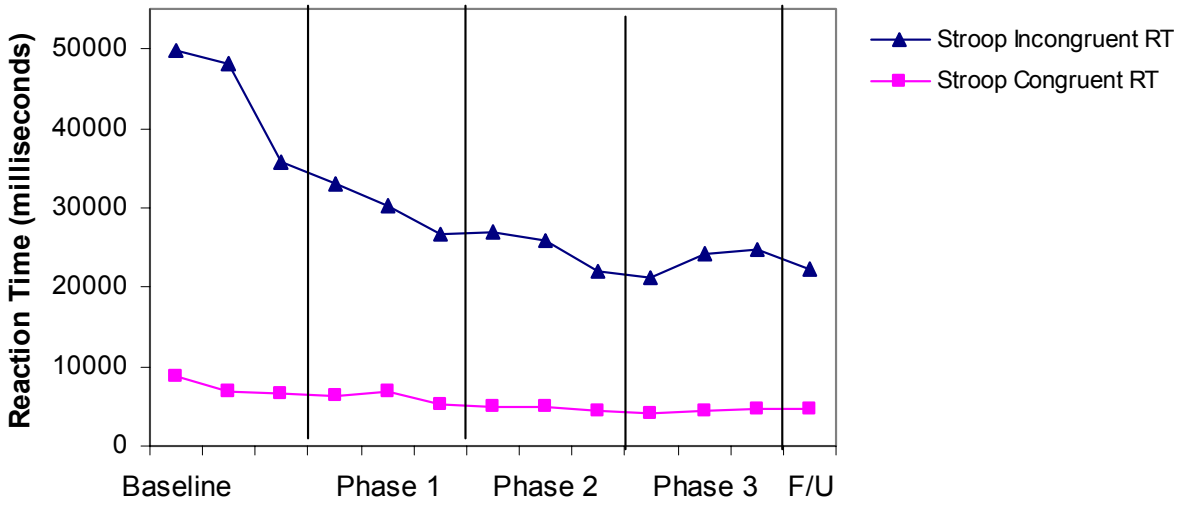


Figure 6. Stroop Incongruent and Congruent Results for Each Participant





Participant 3: Stroop Results



Participant 4: Stroop Results

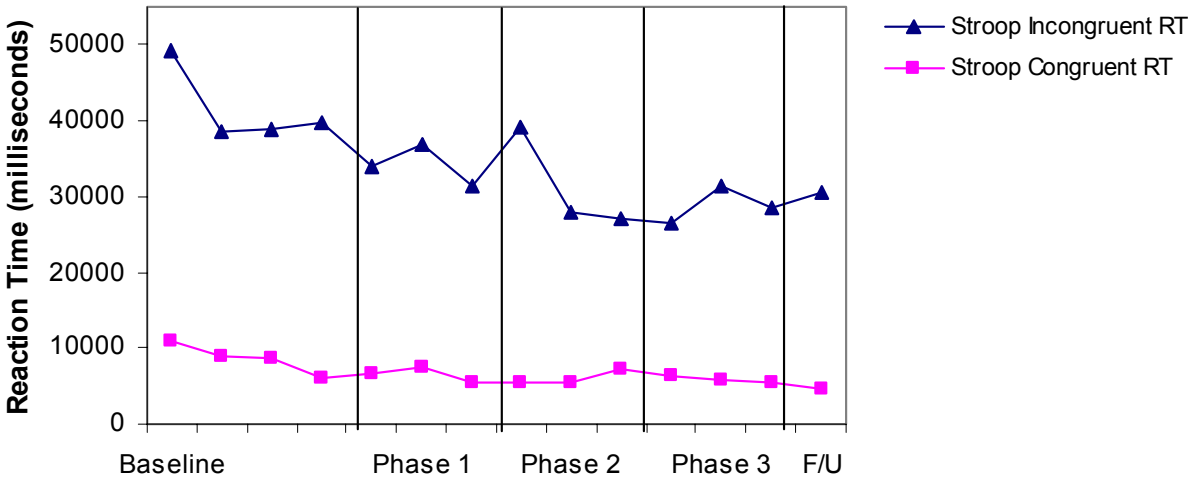


Figure 7. Mean Stroop Results for Each Treatment Phase

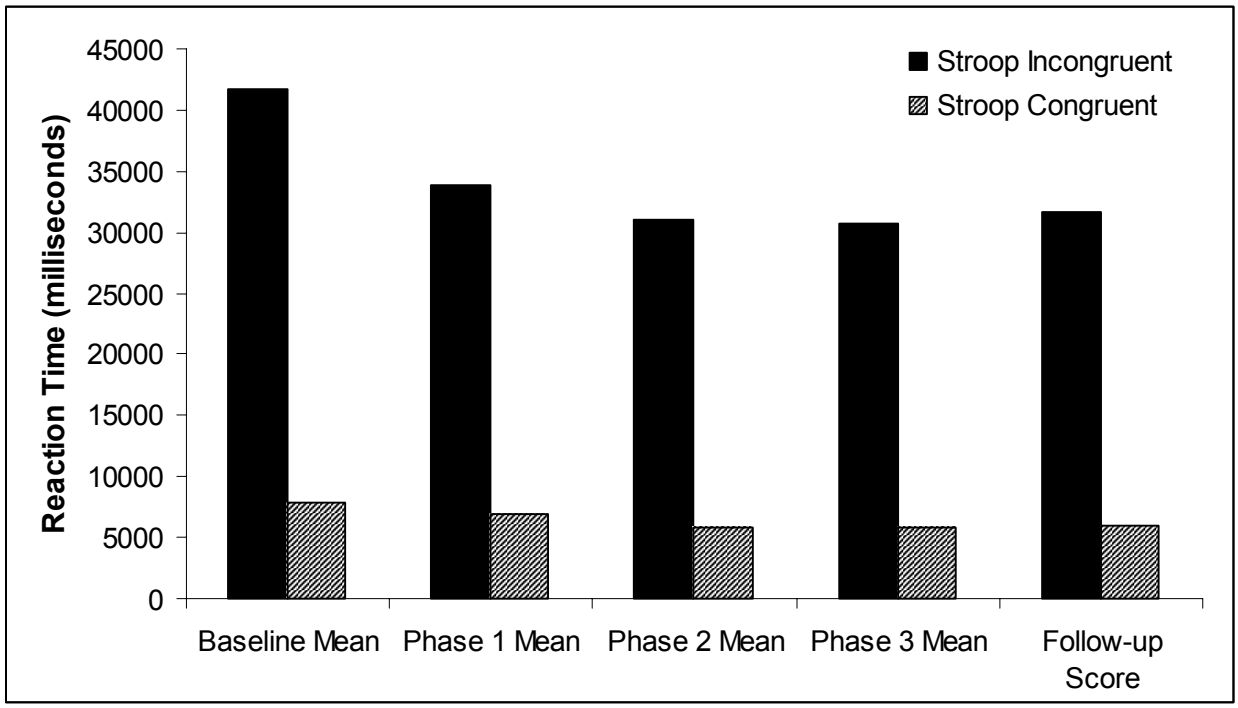
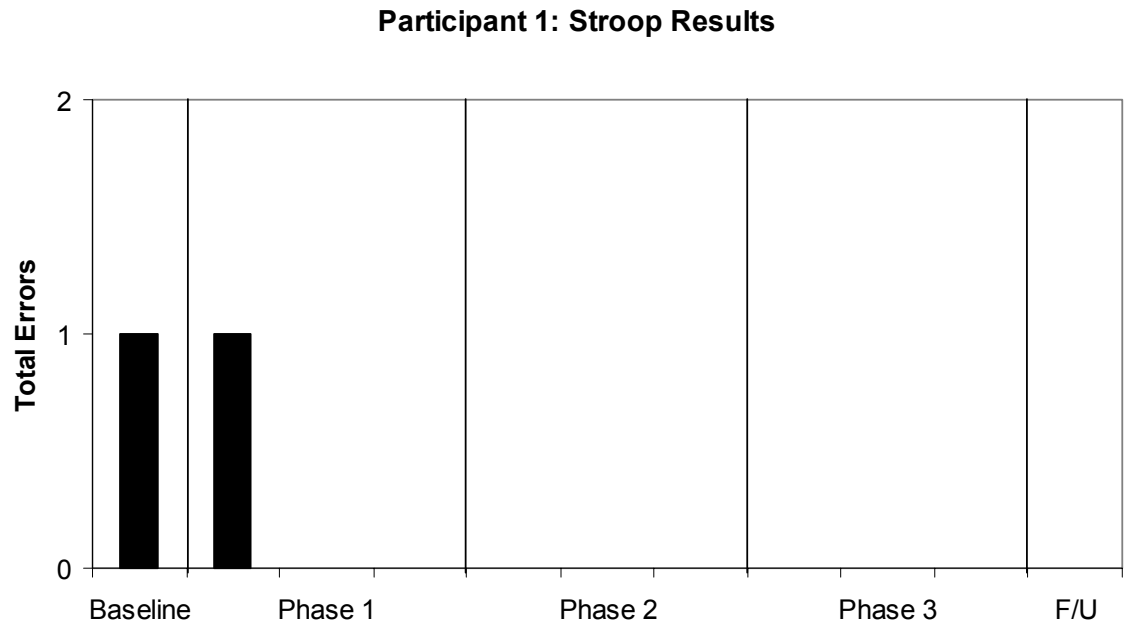
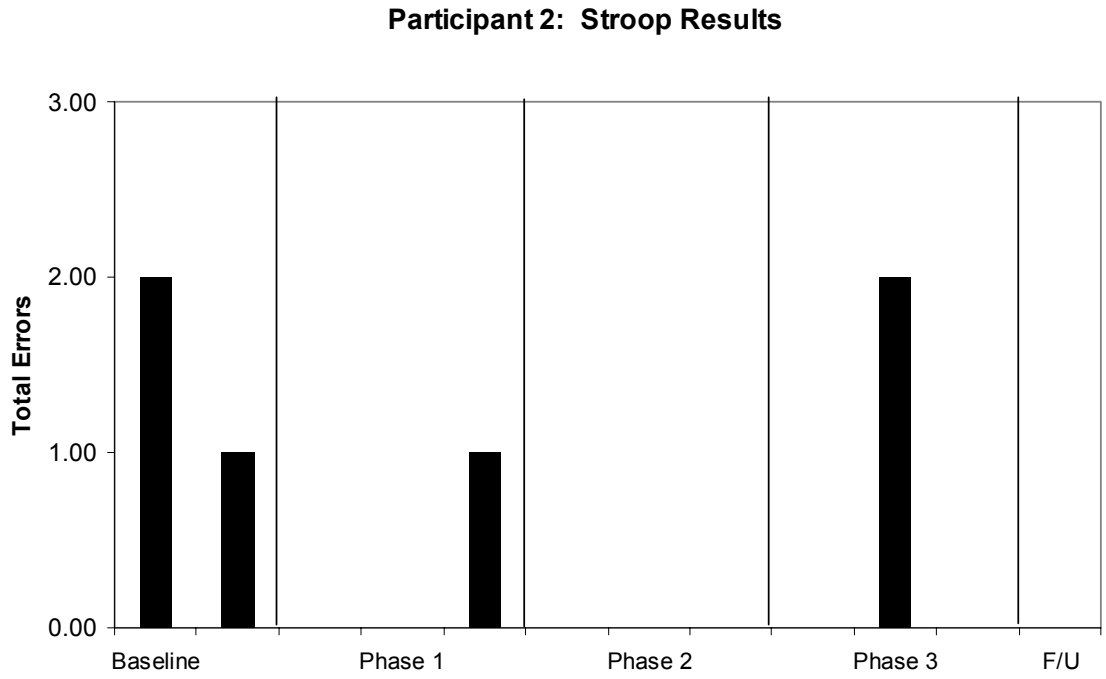
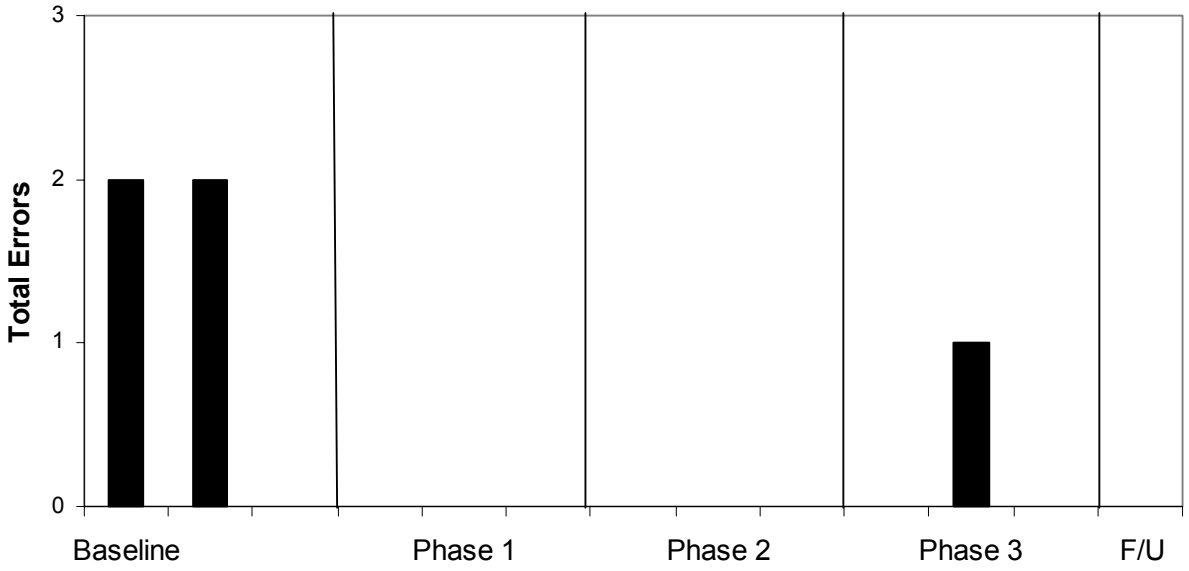


Figure 8. Stroop Total Errors for Each Participant





Participant 3: Stroop Results



Participant 4: Stroop Results

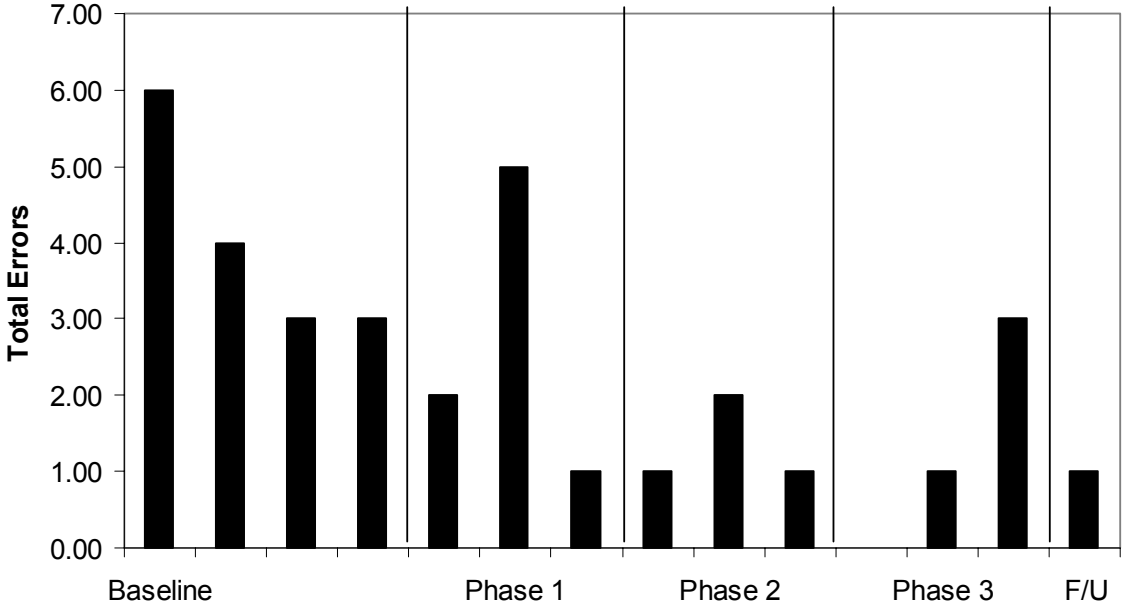
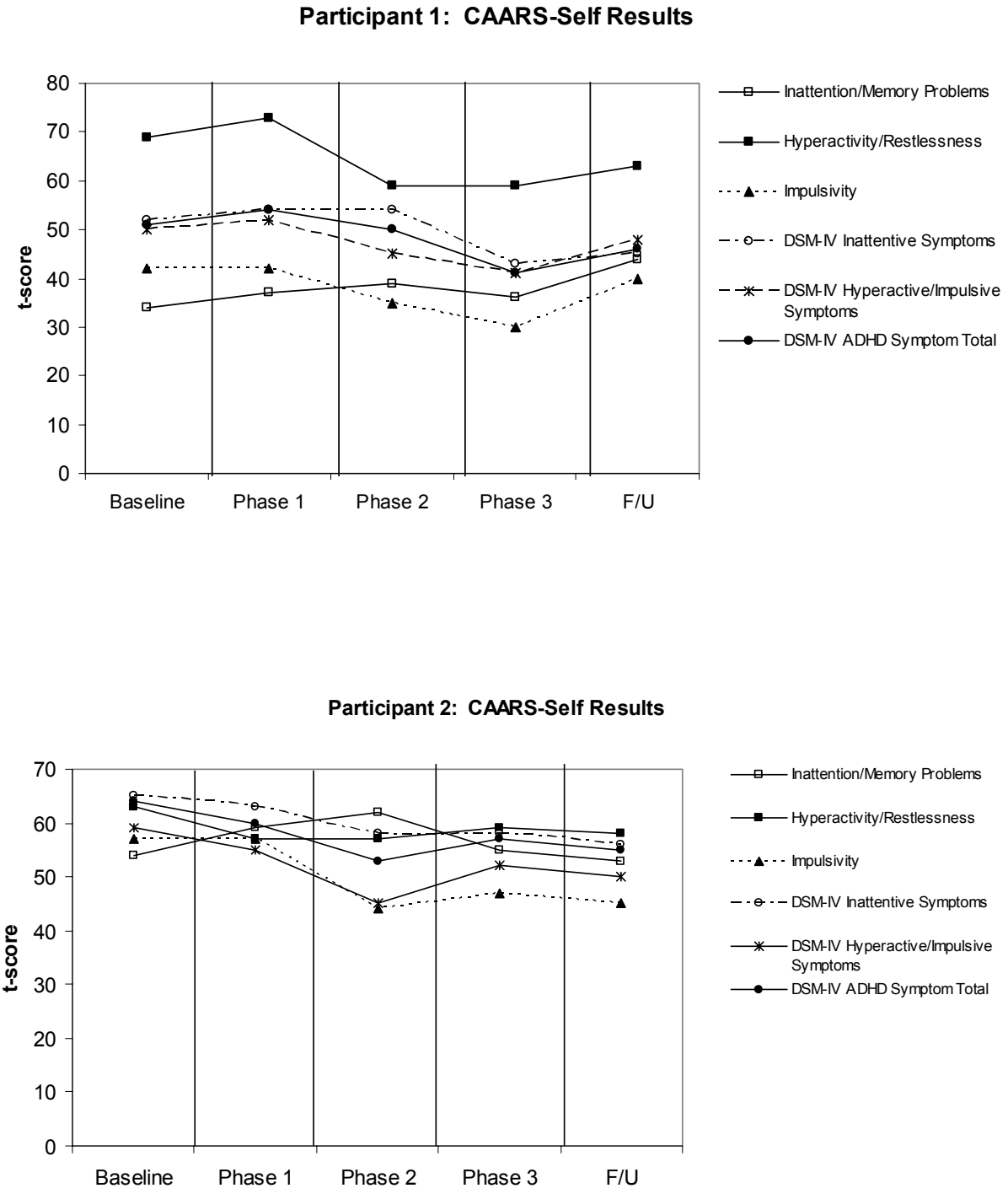
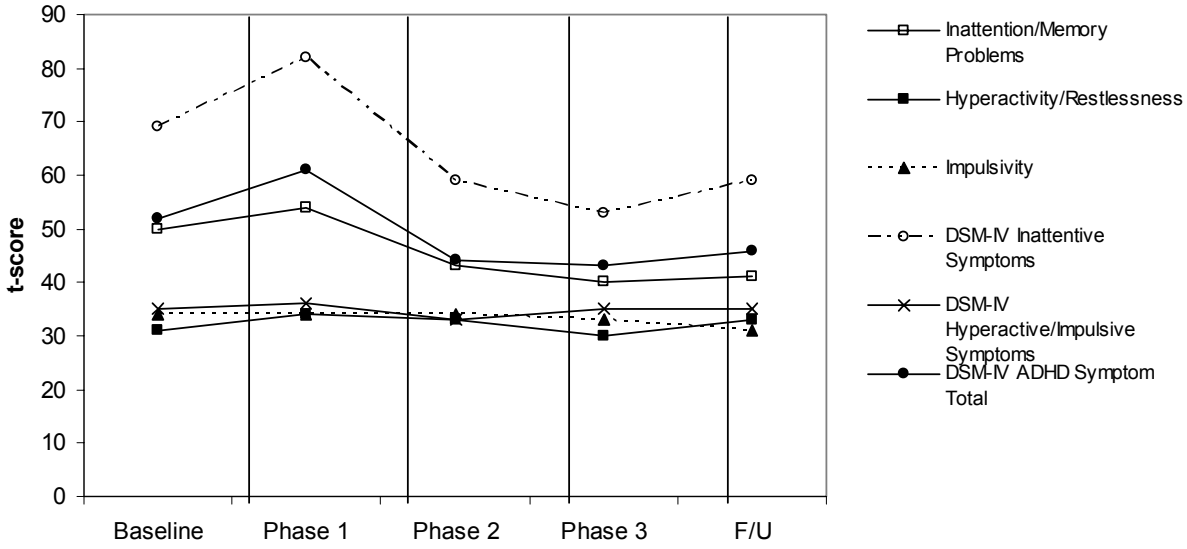


Figure 9. CAARS-Self Results for Each Participant



Participant 3: CAARS Self Results



Participant 4: CAARS-Self Results

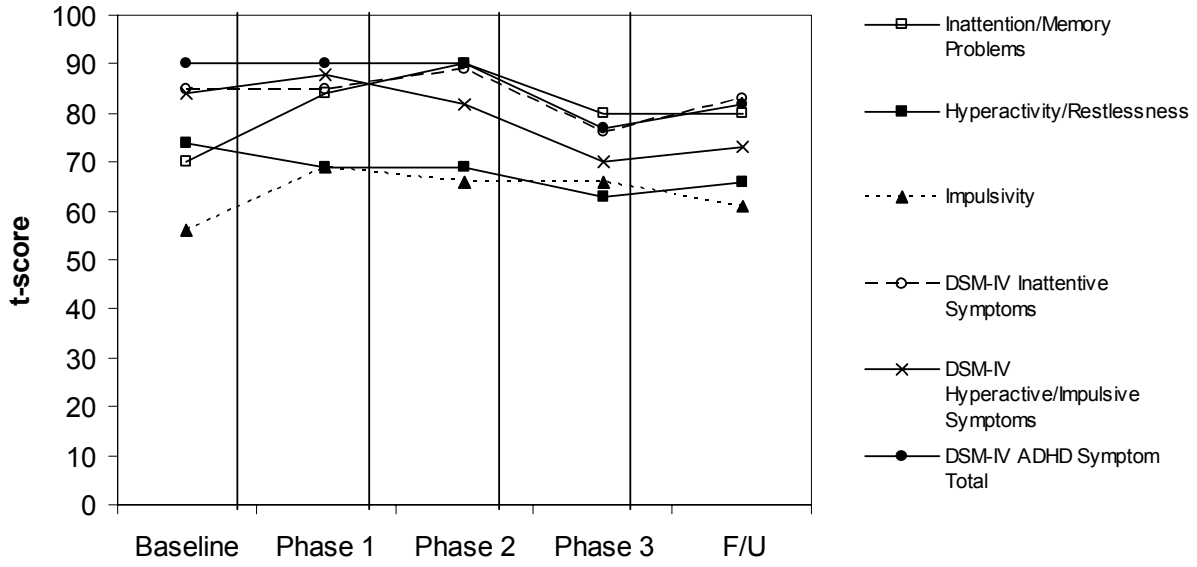


Figure 10. Mean CAARS-Self Scores at Baseline and Follow-up

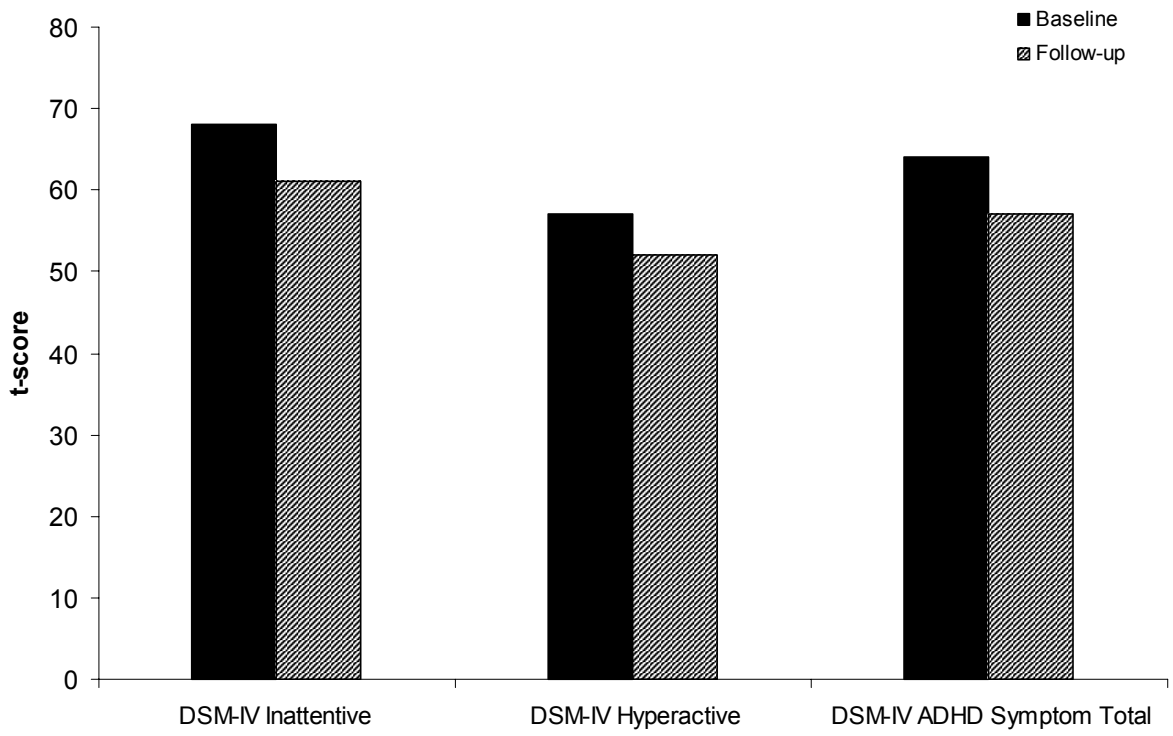
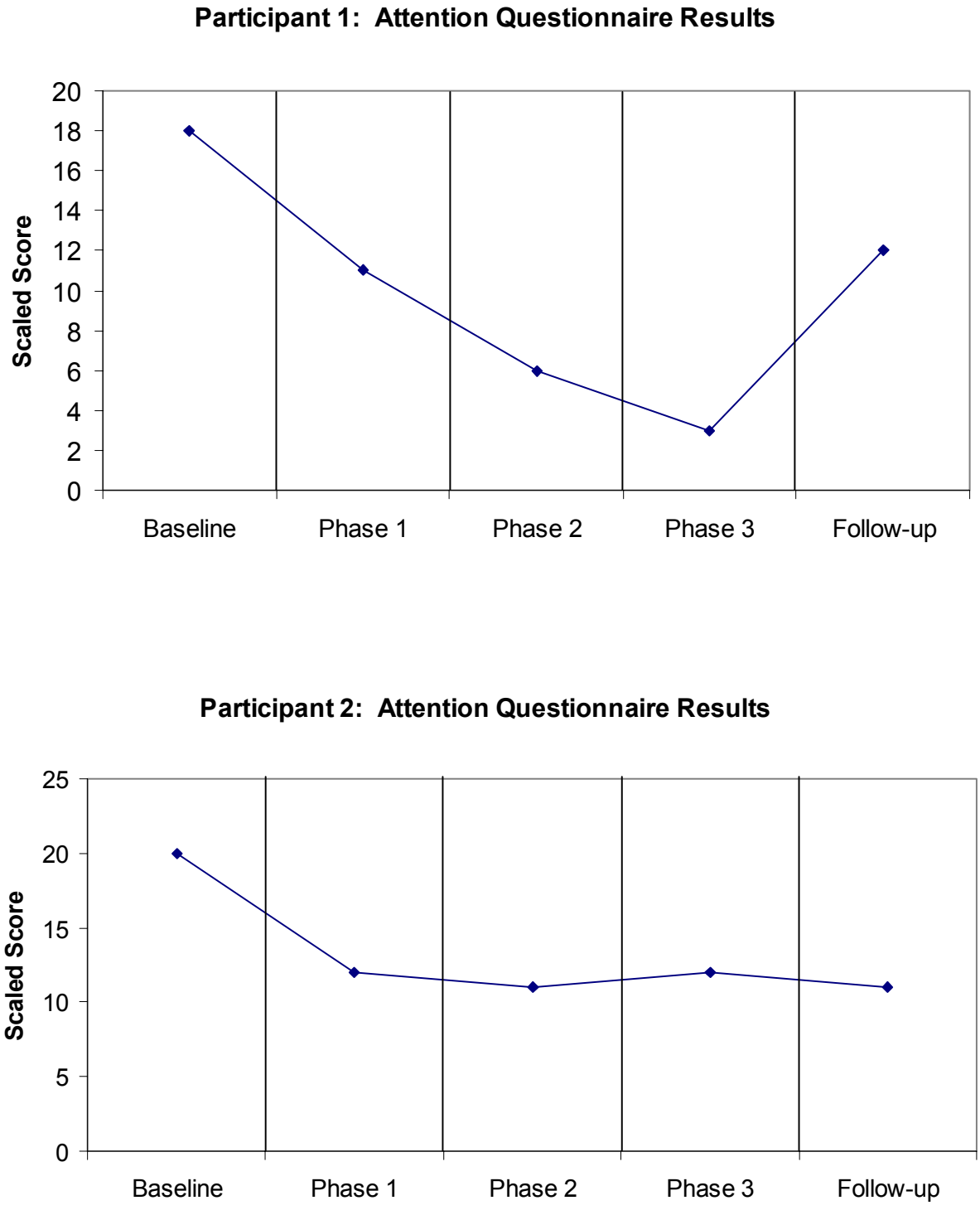
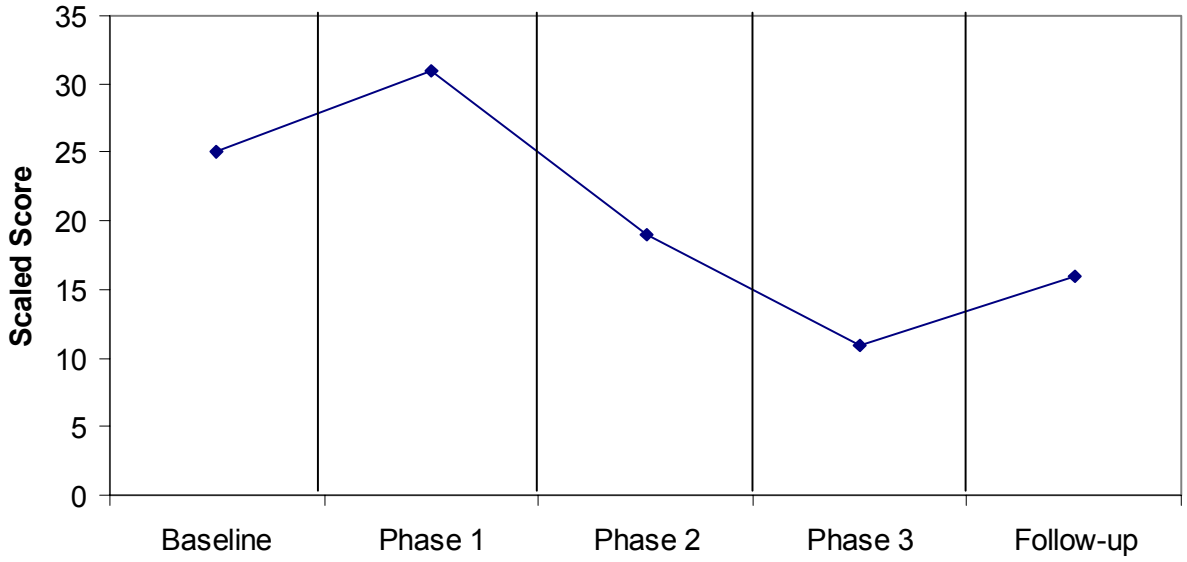


Figure 11. Attention Questionnaire Results for Each Participant



Participant 3: Attention Questionnaire Results



Participant 4: Attention Questionnaire Results

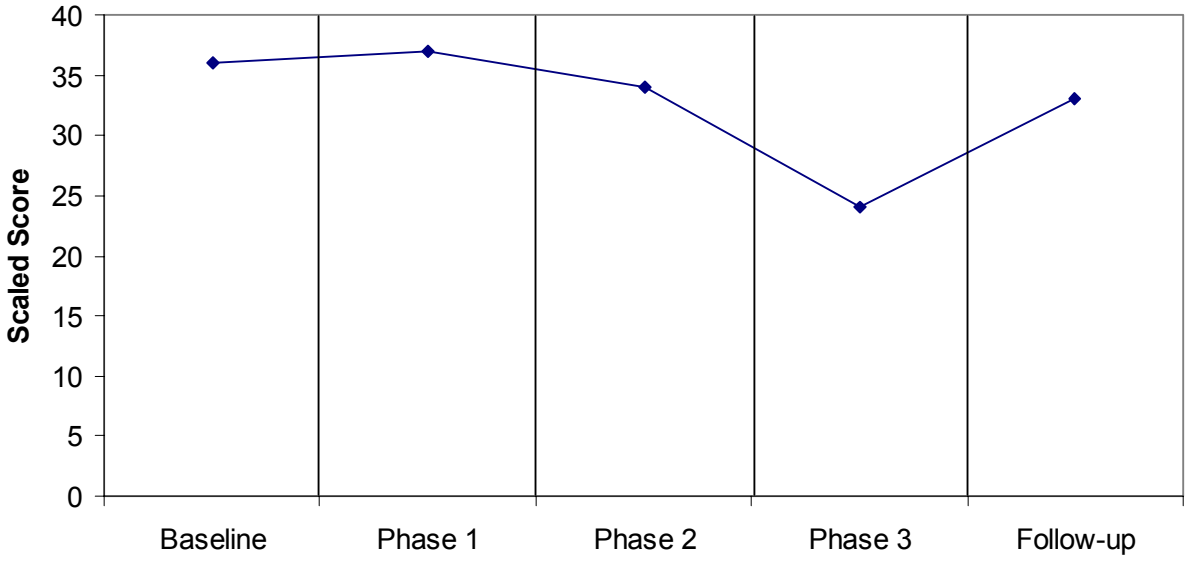
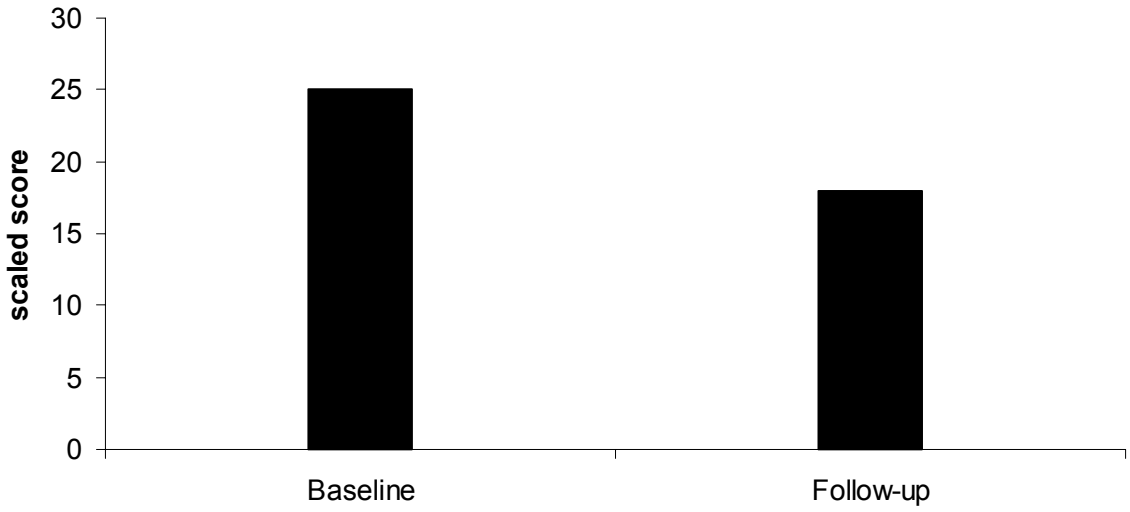


Figure 12. Mean Attention Questionnaire Results



Appendix A

INFORMED CONSENT FORM

Purpose of this Study and Procedure

The purpose of this study is to provide an intervention for attentional difficulties. There will be approximately 3 participants in this study. If you provide consent, you will be administered several measures that will assess your intellectual and achievement performance, attentional functioning, and psychological functioning. If you provide consent, you will also be administered a comprehensive treatment program for symptoms of inattention. In addition, you and either a spouse, family member, or friend will be asked to complete measures throughout completion of the treatment program. The length of the treatment program will vary by individual, but it is expected that it will be completed in a maximum of 10 weeks, with two, two-hour sessions per week. Following the completion of the treatment program, you will be contacted approximately two months later for another assessment session that will assess whether treatment effects are stable over time. In addition, you will be compensated for your participation upon completion of the follow-up assessment. Your participation in this study is completely voluntary and you may withdraw at any time.

Risks

This study should not cause any discomfort and no more than minimal risks are involved. If any questions or tasks do upset you, you are encouraged to talk with Jenifer Francisco or Lee Cooper (see below for contact information).

Benefits

The benefits of this study will be a better understanding of how a treatment program improves symptoms of inattention. In addition, by completing the measures, you will be helping the researchers to better analyze the effectiveness of this treatment program and will allow us to create ways to help others with attention problems in the future. Please note there is no guarantee of benefits made to encourage you to participate. You will be given $50 for your participation in this study upon completion of the follow-up assessment. However, your participation is completely voluntary and you are free to withdraw from the study at anytime.

Confidentiality and Freedom to Withdraw

Any information obtained during this research will be kept confidential. However, your performance scores may be shared with you and you may be encouraged to seek psychological services if your responses indicate that you need specific help. All information is coded after it is obtained so there is no way to associate your name with the information. Any information carrying identifying material will be kept in locked files accessible only to the researcher. Results of this study may be published or presented for scientific purposes, but your identity will not be revealed.

Your participation in this study is completely voluntary. In addition, you may withdraw from the study at anytime. If you decide not to finish, your responses and questionnaires will be discarded.

Approval of Research

This research project has been approved, as required by the Institutional Review Board for Research Involving Human Subjects at Virginia Polytechnic Institute and State University, by the Department of Psychology.

Permission

I have read and understand the Informed Consent and conditions of this project. I understand that I will be asked to complete assessment measures and take part in a treatment program. In addition, I will be asked to complete questionnaires throughout the treatment program. I understand that I may withdraw from this study at any time and if I have questions, I can call Jenifer Francisco or Lee Cooper. I have had all my questions answered. I give my voluntary consent to participate in this project by returning this form to the researcher.

_____ _____

Signature Date

_____ _____

Witness Signature Date

Contact Information:

Jenifer Francisco, M.S.	(540) 231-6914
Lee Cooper, Ph.D.	(540) 231-6914
David Harrison, Ph.D.	(540) 231-4422
David Moore, Institutional Review Board	(540) 231-4991

REMEMBER, PLEASE RETURN THIS FORM IF YOU WANT TO PARTICIPATE IN THIS STUDY.

Yes, I (_____) want to participate in your study.

No, I (_____) do not want to participate in your study.

_____ _____
Signature Date

_____ _____
Witness Signature Date

Appendix B

CAADID: Conners' Adult Diagnostic Interview for DSM-IV

Instructions:

I am going to ask you about a variety of behaviors that you may have had during your adulthood and/or childhood. It is very important to remember that most people have these behaviors during the course of everyday life. What I am trying to determine is whether or not these behaviors occur or occurred for you more frequently than for other people that age and/or if you feel these behaviors did or did not cause you more problems than they do or did for other people that age.

DSM-IV Criterion A1. Six or more of the following symptoms of inattention have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level.

Criterion A1 (a): Often fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities.

CHILD: 1. When you were a child, did you often fail to pay close attention to detail or make careless mistakes.
ADULT: 1. Do you often fail to pay close attention to detail or make careless mistakes?

Criterion A1 (b): Often has difficulty sustaining attention in tasks or play activities.

CHILD: 2. When you were a child, did you find that you had a short attention span?
ADULT: 2. Do you find that you have a short attention span? Do you often have difficulty keeping your mind on tasks that require concentration?

Criterion A1 (c): Often does not seem to listen when spoken to directly.

CHILD: 3. When you were a child, did others report that you frequently had a hard time listening to them or that you did not seem to be listening even if you were?
ADULT: 3. Do others report that you frequently have a hard time listening to them or that you do not seem to be listening even if you are?

Criterion A1 (d): Often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace.

CHILD: 4. When you were a child, did you find it difficult to follow through on instructions and that you often started projects but did not finish them?
ADULT: 4. Do you find it difficult to follow through on instructions and that you often start projects but do not finish them?

Criterion A1 (e): Often has difficulty organizing tasks and activities.

CHILD: 5. When you were a child, did you often have difficulty with organization?
ADULT: 5. Do you often have difficulty with organization?

Criterion A1 (f): Often avoids, dislikes or is reluctant to engage in tasks that require sustained mental effort (such as schoolwork, or homework).

CHILD: 6. When you were a child, did you often avoid tasks that required a lot of mental effort?
ADULT: 6. Do you often avoid tasks that require a lot of mental effort?

Criterion A1 (g): Often loses things necessary for tasks or activities (e.g., toys, school assignments, pencils, books or tools).

CHILD: 7. When you were a child, did you lost things frequently?
ADULT: 7. Do you lose things frequently?

Criterion A1 (h): Is often easily distracted by extraneous stimuli.

CHILD: 8. When you were a child, were you often easily distracted by things going on around you?
ADULT: 8. Are you often easily distracted by things going on around you?

Criterion A1 (i): Is often forgetful in daily activities.

CHILD: 9. When you were a child, were you often forgetful?
ADULT: 9. Are you often forgetful?

DSM-IV Criterion B. Age of onset for any inattentive symptoms coded as present.

1. You reported that you had a number of inattention symptoms during your childhood (list symptoms endorsed for childhood criteria A (a) through A (i).

2. Since these inattention symptoms began, has there been a time when your inattention symptoms disappeared for a while and then returned?

DSM-IV Criterion C. Symptom Pervasiveness.

During your childhood school years (grades K-12), where did these inattention symptoms occur?
1. At school?
2. At home?
3. In athletics or clubs?

As an adult, where have your inattention symptoms occurred?
1. At school?
2. At home?
3. In athletics or clubs?

DSM-IV Criterion A2. Six or more of the following symptoms of hyperactivity/impulsivity have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level.

Hyperactivity

Criterion A2 (a): Often fidgets with hands or feet or squirms in seat.

CHILD: 1. When you were a child, did you fidget a lot when seated?
ADULT: 1. Do you fidget a lot when seated?

Criterion A2 (b): Often leaves seat in classroom or in other situations in which remaining seated is expected.

CHILD: 2. When you were a child, did you often have trouble remaining seated for extended periods of time?
ADULT: 2. Do you often have trouble remaining seated for extended periods of time?

Criterion A2 (c): Often runs about or climbs excessively in situations in which it is inappropriate.

CHILD: 3. When you were a child, did you often experience feelings of restlessness?
ADULT: 3. Do you often experience feelings of restlessness?

Criterion A2 (d): Often has difficulty playing or engaging in leisure activities quietly.

CHILD: 4. When you were a child, did you often have difficulty being as quiet as others around you?
ADULT: 4. Do you often have difficulty being as quiet as others around you?

Criterion A2 (e): Is often "on the go" or often acts as if "driven by a motor".

CHILD: 5. When you were a child, were you always "on the go"? Did you feel that you often had more energy than others?
ADULT: 5. Are you always "on the go"? Do you feel that thou often have more energy than others?

Criterion A2 (f): Often talks excessively.

CHILD: 6. When you were a child, did others report that you often talked too much?
ADULT: 6. Do others report that you talk too much?

Impulsivity

Criterion A2 (g): Often blurts out answers before questions have been completed.

CHILD: 7. When you were a child, did others report that you often answered questions before they had been completed?
ADULT: 7. Do others report that you often answer questions before they have been completed?

Criterion A2 (h): Often has difficulty awaiting turn.

CHILD: 8. When you were a child, did you often have trouble waiting for your turn?
ADULT: 8. Do you often have trouble waiting for your turn?

Criterion A2 (i): Often interrupts or intrudes on others(e.g., butts into conversations or games).
CHILD: 9. When you were a child, did others report that you often interrupted them?
ADULT: 9. Do others report that you often interrupt them?

DSM-IV Criterion B. Age of onset for any hyperactivity/impulsivity symptoms coded as present.

1. You reported that you had a number of symptoms of hyperactivity/impulsivity during your childhood (list symptoms endorsed for childhood criteria A2 (a) through A2 (i).

2. Since these hyperactive/impulsive symptoms began, has there been a time when your hyperactive/impulsive symptoms disappeared for a while and then returned?

DSM-IV Criterion C. Symptom Pervasiveness.

During your childhood school years (grades K-12), where did these hyperactivity/impulsivity symptoms occur?
1. At school?
2. At home?
3. In athletics or clubs?

As an adult, where have your hyperactivity/impulsivity symptoms occurred?
1. At school?
2. At home?
3. In athletics or clubs?

DSM-IV Criterion D. Impairment.

We've established that as a child, you had a number of inattentive, hyperactive, and impulsive symptoms. I am now going to ask you how these symptoms may have caused problem for you (during your childhood/during your adult life). As a child/adult how did these symptoms impair your…
1. Work/school behavior?
2. Home behavior?
3. Social behavior?
4. Personal sense of self, self-concept, self-esteem?

Appendix C

Developmental History and Intake Form

Name:_____

Date of birth: _____/_____/_____ Age: _____ Gender: _____

Handedness: _____ Marital Status: _____

Race/Ethnicity: _____

Current Mailing Address: _____
_____

How long have you lived at this address? _____
What is your hometown? _____

Current phone numbers: (home) _____(work) _____ (cell) _____

Family Information:

Mother's Name:_____ Highest Level of Education: _____
Mother's Occupation:_____ Mother's Yearly Income: $_____
Mother's Address:_____
Mother's Home Phone Number:(_____)_____

Father's Name:_____ Highest Level of Education: _____
Father's Occupation:_____ Father's Yearly Income: $_____
Father's Address:_____
Father's Home Phone Number: (_____)_____

Current Family Information:
Please give the first name, age, and relationship to you, of persons in your current family, including spouse/significant other, children/stepchildren, and members of your extended family.

Name/Relationship **Age** **List any problems/conditions you know of:**

Developmental History:

Place of birth:_____ Birth weight/height: _____
Mother's pregnancy: (indicate if normal, or describe any difficulties/complications) _____
_____
_____

Delivery: (indicate if normal, or describe any difficulties/complications) _____
_____
_____

Please indicate the approximate age that you achieved these milestones, note any difficulties:

Walking: _____ Talking: _____

Childhood illnesses: _____

List any developmental problems (e.g., bed wetting, attention or sleep disorders, impairments in hearing, speaking, reading, writing, spelling, math, behavioral issues): _____
_____
_____

Academic Information:

High school attended: _____ Highest grade completed: _____
Other schools attended: _____
Special education:_____
Grades repeated:_____
Disciplinary problems:_____
Learning difficulties:_____
Current academic status: (indicate your academic level & major)_____
High school GPA: _____ If in college, current college GPA:_____
Current academic difficulties:_____
_____
_____

Work History:

Current employment & duties required:_____
Hours per week employed:_____ Work-related difficulties:_____
_____
Prior employment:_____
Military history:_____

Medical Information:

Medical diagnosis:_____
Serious illnesses or conditions (past and/or current):_____
_____
Describe any serious accidents or injuries (especially if it involved possible head injury):
_____
_____
_____

List any medications you are currently taking and note any psychiatric medications you took in the past:

Name of medication Current/past dose Why taken Prescribed by When started

If you are experiencing any side effects, please describe them:_____
_____
_____

Do you smoke?: ____ NO _____YES If yes, _____ packs per day
On average, how often do you drink alcohol? __ Never, ___ Once per month, ___Once per week, ___ 2-3 times per week, ___ 4 or more times per week

If you drink alcohol, how much do you usually consume at one time?
___ an ounce or less or liquor or one beer
___ 2-4 ounces of liquor or 2-4 beers
___ more than 4 ounces of liquor or more than 4 beers

Do you think you have a current (yes/no) _____ or past (yes/no) _____ drinking problem?

Do you use street drugs? ___ If yes, please describe:_____
_____

Have you had a problem with drugs in the past (yes/no)_____, currently (yes/no)_____

Do you consume caffeinated beverages? _____ If yes, how many per day/week? _____

Psychiatric History:

Diagnosis: _____
Treatment history (include dates of treatment, reason, & who you saw for therapy):
_____
_____
_____
Suicide history: _____

Appendix D

CAARS: Conners Adult ADHD Rating Scales (Long Version)

Instructions: Listed below are items concerning behaviors or problems sometimes experienced by adults. Read each item carefully and decide how much or how frequently each item describes you (this person) recently. Indicate your response for each item by circling the number that corresponds to your choice.

	Not at all, never	Just a little, once in a while	Pretty much, often	Very much, very frequently
1. like to be doing active things				
2. lose things necessary for tasks or activities (e.g., books, tools)				
3. don't plan ahead				
4. blurts out things				
5. is a risk-taker or daredevil				
6. gets down on self				
7. doesn't finish things started				
8. easily frustrated				
9. talks too much				
10. always on the go, as if driven by a motor				
11. disorganized				
12. say things without thinking				
13. hard to stay in one place very long				
14. have trouble doing leisure activities quietly				
15. not sure of self				
16. hard to keep track of several things at once				
17. always moving even when should be still				
18. forget to remember things				
19. have short fuse/hot temper				
20. bored easily				
21. leaves seat when not supposed to				
22. trouble waiting in line or taking turns with others				
23. throws tantrums				
24. has trouble keeping attention focused when working				
25. seek out fast paced, exciting				

activities				
26. avoid new challenges because lack faith in own abilities				
27. appears/feels restless inside				
28. distracted by sights/sounds when trying to concentrate				
29. is forgetful in daily activities				
30. is set off easily by many things				
31. dislikes quiet, introspective activities				
32. loses things needed for work or tasks				
33. has trouble listening to what others are saying				
34. am/is an underachiever				
35. interrupts others when talking				
36. change plans/jobs in midstream				
37. acts okay on outside, but appears unsure of self				
38. am/is always on the go				
39. makes comments or remarks that are regretted later				
40. can't get things done unless there is an absolute deadline				
41. fidgets (with hands/feet) or squirms in seat				
42. makes careless mistakes or has trouble paying close attention to detail				
43. steps on people's toes without meaning to				
44. has trouble starting on a task				
45. intrudes on others' activities				
46. takes a lot of effort to sit still				
47. has unpredictable moods				
48. doesn't like homework or job activities where effort at thinking a lot is required				
49. am/is absent-minded in daily activities				
50. am/is restless or overactive				
51. depends on others to keep life in order and attend to details				
52. annoys others without meaning to				

53. sometimes overfocuses on details, at other times, appears distracted by everything going on around				
54. tends to squirm or fidget				
55. can't keep mind on something unless its really interesting				
56. expresses lack of confidence in abilities				
57. can't sit still for very long				
58. answers questions before the questions have been completed				
59. likes to be up and on the go rather than being in one place				
60. has trouble finishing job tasks or schoolwork				
61. is irritable				
62. interrupts others when they are working or busy				
63. expresses lack of confidence in self because of past failures				
64. am/is distracted by things going on around				
65. has problems organizing tasks & activities				
66. misjudges how long it takes to do something or go somewhere				

Appendix E

APT-II Attention Questionnaire

Client Name: _____
Rater's Name and Relationship to Client (if applicable): _____
Therapist: _____ Date: _____

I. Rating Scale: Please answer the following questions about your (or _____'s) attention as it applies to daily functioning by ticking the box which offers the best description.

Description	Not a problem or no change from before	Only gets in the way on occasion (less than once a week)	*Sometimes* gets in the way (about 1-3 times per week)	*Frequently* gets in the way (is a problem most days)	Is a problem *all the* time (affects most activities)
1. Seem to lack mental energy to do activities					
2. Am slow to respond when asked a question or when participating in conversations					
3. Can't keep mind on activity or thought because mind keeps wandering					
4. Can't keep mind on activity or thought because mind feels "spacey" or "blank"					
5. Can only concentrate for very short periods of time					
6. Miss details or make mistakes because level of concentration decreased					
7. Easily get off track if other people milling about nearby					
8. Easily distracted by surrounding noise					
9. Trouble paying attention to					

conversation, if more than one person					
10. Easily lose place if task or thinking interrupted					
11. Easily overwhelmed if task has several components					
12. Difficult to pay attention to more than one thing at a time					
13.					
14.					

Scoring: a) total number of items ticked in 2nd column multiplied by (1) ____
b) total number of items ticked in 3rd column multiplied by (2) ____
c) total number of items ticked in 4th column multiplied by (3) ____
d) total number of items ticked in 5th column multiplied by (4) ____

Total Score: add a) through d) ___

II. Individualized Attentional Problem List: In the space provided below, describe the 5 most frequent and frustrating breakdowns in your attention ability.

Describe Attention Breakdown (include setting and approximate frequency)	**What do you do when it occurs?**
1.	
2.	
3.	
4.	
5	

Virginia Tech
VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Institutional Review Board
Dr. David M. Moore
IRB (Human Subjects) Chair
Assistant Vice President for Research Compliance
1880 Pratt Drive, Suite 2006(0497), Blacksburg, VA 24061
Office: 540/231-4991; FAX: 540/231-0959
email: moored@vt.edu

DATE: November 15, 2005

MEMORANDUM

TO: Lee D. Cooper Psychology 0355
Jenifer Francisco Psychology 0436

FROM: David Moore

SUBJECT: **IRB Expedited Continuation:** "An Attention-Specific-Intervention for adults with ADHD" IRB # 05-679 ref 04-651

This memo is regarding the above referenced protocol which was previously granted expedited approval by the IRB on December 29, 2004. The proposed research is eligible for expedited review according to the specifications authorized by 45 CFR 46.110 and 21 CFR 56.110. Pursuant to your request of last week, as Chair of the Virginia Tech Institutional Review Board, I have granted approval for extension of the study for a period of 12 months, effective as of December 29, 2005.

Approval of your research by the IRB provides the appropriate review as required by federal and state laws regarding human subject research. It is your responsibility to report to the IRB any adverse reactions that can be attributed to this study.

To continue the project past the 12-month approval period, a continuing review application must be submitted (30) days prior to the anniversary of the original approval date and a summary of the project to date must be provided. Our office will send you a reminder of this (60) days prior to the anniversary date.

Virginia Tech has an approved Federal Wide Assurance (FWA00000572, exp. 7/20/07) on file with OHRP, and its IRB Registration Number is IRB00000667.

cc: File

Jenifer Francisco, M.S.

229 Williams Hall
Blacksburg, VA 24061-0436
email: jfrancis@vt.edu

EDUCATION

Virginia Polytechnic Institute and State University, Blacksburg, VA (2001-present)
- M.S.: Clinical Psychology (Spring 2003)
- Current GPA: 3.70
- *Awards*: Graduate Student Assembly Research and Travel Award (2002, 2003, 2004); Graduate Research Development Project (GRDP) Award/Dissertation Research Grant for $500 (2005)

Virginia Polytechnic Institute and State University, Blacksburg, VA (1997-2000)
- B.S.: Psychology; GPA: 3.41, Major GPA: 3.65
- *Honors*: Graduated Cum Laude; Dean's List (1998-2000)

CLINICAL AND COMMUNITY EXPERIENCES

Externship II, Lewis Gale Behavioral Health Services
Department of Psychological Medicine
Units: Intensive Treatment Unit; Center for Recovery; Adult, Adolescent and Children's Units
Supervisor: John Todd, Ph.D.

> **July 2005 – October 2005**: Conducted psychosocial assessments and provide group therapy to adults, adolescents, and children at in patient facility. Participated in family meetings to determine follow-up care and planning. Documented patient progress and behavior. Attended and participated in multidisciplinary treatment planning and case staffing meetings. Planned and coordinated discharge and follow-up care for patients. Observed and assisted social workers with patients' managed care issues.

Graduate Clinician, Psychological Services Center of Virginia Tech
Supervisor: David Harrison, Ph.D.

> **August 2004 – May 2005**: Provided individual therapy to adults at outpatient community center; supervised first and second year graduate students on their individual therapy cases. Participated in weekly case presentation meetings. Main focus of this practicum team was Clinical Neuropsychology; observed and reviewed neuropsychological assessments (including syndrome analysis) as part of didactic work.

Outcome Measures System for Psychological Services Center of Virginia Tech
Supervisor: Lee Cooper, Ph.D.

> **January 2004 – present**: Implemented a clinic-wide outcomes measure for student therapists at community-based outpatient center. Trained and transitioned student therapists to administer and score Outcome Questionnaire (OQ) to each client using PDA's and online database system.

Externship I, Cook Counseling Center of Virginia Tech
Supervisor: Jane Kepple-Benson, Ph.D.

August 2003 – May 2004: Primarily conducted individual therapy and some group therapy to college students, aged 18-24 years. Received weekly individual and group supervision based on cognitive-behavioral, interpersonal, problem-solving, and family systems theories. Worked within structured, multidisciplinary, clinical environment. Consulted with staff psychiatrist on cases; provided students with university resources as needed.

Graduate Clinician, Psychological Services Center of Virginia Tech
Supervisor: Lee D. Cooper, Ph.D.

May 2002- Summer 2003: Provided individual and family therapy to children, adolescents, and adults at community outpatient center. Participated in weekly case presentation meetings; primary focus of intervention training consisted of interpersonal, family systems and cognitive-behavioral therapy.

Graduate Clinician, Psychological Services Center of Virginia Tech
Supervisor: George Clum, Ph.D.

August 2001 – May 2002: Provided individual therapy to an adult population at community outpatient center; participated in weekly case presentation meetings; interventions included cognitive-behavioral, interpersonal, and cognitive orientations.

Graduate Clinician, Psychological Services Center of Virginia Tech
Supervisors: Angela Scarpa, Ph.D., Elizabeth Van Voorhees, M.S., and Thompson Davis, M.S.

January 2002 – May 2002: Co-led EQUIP group intervention at Christiansburg High School with two advanced-level graduate students; attended weekly meetings and participated in supervision of cases. Population served was male adolescents with conduct problems and risk of dropping out of school.

Adult Assessment Team, Psychological Services Center of Virginia Tech
Supervisor: Lee D. Cooper, Ph.D.

August 2002 – Summer 2003: Conducted comprehensive psychoeducational assessments of adult clients. Administered and scored tests of intelligence (Wechsler Intelligence Scale for Adults), achievement (Wechsler Individual Achievement Test and Woodcock Johnson Test of Achievement), memory (Wechsler Memory Scale), structured ADHD retrospective interview (Conners' Retrospective ADHD Interview), and clinical symptoms (Symptom Checklist-90-Revised, Beck Depression Inventory, Conners' Adult ADHD Scales). Scored measures, staffed cases during bi-weekly supervision meetings, prepared assessment reports, and presented findings to clients.

Child Assessment Team, Child Study Center of Virginia Tech
Supervisor: Thomas Ollendick, Ph.D.

August 2000- August 2002; August 2003- January 2004: Conducted initial intake and psychoeducational assessments of child clients. Administered tests of intelligence (Wechsler Intelligence Scale for Children), achievement (Wechsler

Individual Achievement Test), visual-motor functioning and behavior, and semi-structured clinical interview (Anxiety Disorders Interview Schedule-IV, Child and Parent versions). Scored measures, staffed cases during weekly supervision meetings, prepared child assessment reports, and presented findings to parents during feedback sessions.

RESEARCH EXPERIENCE

Dissertation, Virginia Tech (Expected defense date: December 2005)
Title: **"**An Attention-Specific Intervention for Adults with ADHD"
Supervisor: Lee Cooper, Ph.D.

Summer 2004 to present: Developed model for conceptualizing a treatment plan for adults with ADHD based on developmental psychopathology perspective. Treatment plan is based on cognitive rehabilitation field and the study is a multiple baseline design.

Student Mentor, Virginia Tech McNair Scholars Program
Supervisor: Lee Cooper, Ph.D.

Summer 2005: Collaborated with student in McNair Scholars Progam and assisted him with data analysis and creation of a research paper and presention on the impact of comorbidity on CPT-II test performance in adults with ADHD.

Preliminary Exam, Virginia Tech (Defended May 2004)
Title: "The Development of Inattention and its Relevance to ADHD: A Developmental Psychopathology Perspective"
Supervisor: Lee Cooper, Ph.D.

Summer 2003 – Spring 2004: Conducted literature review of the typical and atypical aspects of attention deficit-hyperactivity disorder (ADHD); proposed developmental pathway for expression and maintenance of ADHD in children and adults.

Adult Assessment Clinic, Psychological Services Center
Supervisor: Lee Cooper, Ph.D.

Summer 2003 – present: Created and maintained a database of the adult assessments at the Psychological Services Center. Trained and supervised undergraduate students to score and enter assessment data.

Master's Thesis, Virginia Tech (Defended May 2003)
Title: "Social Information Processing as a Mediator of Exposure to Community Violence and Reactive and Proactive Aggression"
Supervisor: Angela Scarpa-Friedman, Ph.D.

Fall 2001 – Spring 2003: Goal of study was to determine whether witnessing community violence predicted aggressive outcomes (reactive and proactive aggression). The results indicated that violence that was observed in the home was a better predictor of aggression than was witnessing violence in the community.

Emotional Aggression Study, Psychological Services Center and Child Study Clinic
Supervisors: Thomas Ollendick, Ph.D. and Angela Scarpa-Friedman, Ph.D.

Spring 2001-Summer 2003: Administered the Anxiety Disorders Interview Schedule-IV (ADIS-IV) and other assessment measures to participants in the Emotional Aggression study. Scheduled clients and trained undergraduate students to administer the ADIS-IV and other measures. Attended research team meetings, helped recruit subjects to participate in this study, and worked on conference presentations with other group members.

Psychological Services Center and Child Study Clinic, Virginia Tech
Supervisor: Thomas Ollendick, Ph.D.

Summer 2000- Spring 2001: Assisted in the management and statistical analysis of a large-scale clinical and research database. Conducted research on multiple informant agreement using structured clinical interviews. Aided in the preparation of a manuscript and conference presentation on the Anxiety Disorders Interview Schedule for DSM-IV.

Fall 1999- Spring 2000: Aided in the management of two major databases. Entered and integrated SPSS data files from a longitudinal study on school dropout prediction in children. Scored clinical measures of behavioral, emotional, and visual-motor functioning.

Addictions Research Team, Virginia Tech
Supervisor: Robert Stephens, Ph.D.

August 1999- December 1999: Assisted in a study on marijuana dependence and treatment options; coded therapy sessions for compilation in the study. Assisted with graduate student's Master's Thesis.

May 1999- August 1999: Aided in the recruitment of subjects, data collection and entering of data in SPSS format for a graduate student's Master's Thesis on alcohol use among college students.

TEACHING EXPERIENCE

Course Instructor, Psychology Department, Virginia Tech
Supervisors: Jack Finney, Ph.D. and Robert Stephens, Ph.D.

Abnormal Psychology (Summer 2006)
- 15 students
- Developed lectures, in-class assignments, case studies, and exams

Advanced Developmental Psychology (Summer 2004-present)
- 18 students (Summer); 47 students (Fall); 60 students (Spring)
- Systems/developmental psychopathology approach, topically-based
- Developed course reading packet for class, along with all lecture material
- Instructor Evaluation Rating = 3.7 out of 4.0 (Summer '04), 3.6 (Fall); 3.9 (Summer '05)

Developmental Psychology Lab (Summer 2003)
- 12 students
- Instructor Evaluation Rating = 3.4 out of 4.0

Developmental Psychology (Fall 2003- Spring 2004)
- 57 students (Fall); 48 students (Spring)
- Lifespan approach, created syllabus and all lecture materials
- Instructor Evaluation Rating = 3.6 out of 4.0 (Fall); 3.8 out of 4.0 (Spring)

PROFESSIONAL PRESENTATIONS AND PUBLICATIONS

Francisco, J., Haden, S.C., & Scarpa, A. (2006). *The Relationship Between Depression and Aggression in an At-Risk Sample of Boys*. Poster accepted at the Annual Association for Behavioral and Cognitive Therapy Convention, Chicago, IL.

Francisco, J., Fornier, A., Donovan, K., & Cooper, L. (2005, August). *Back on Track: Evaluation of a Cognitive-Behavioral Group Treatment for Dually-Diagnosed Offenders on Probation or Parole*. Manuscript submitted to Journal of Offender Rehabilitation.

Francisco, J., Cankaya, B., Miller, R. & Cooper, L. (2004, November). *Adult ADHD: Comorbidity and Differential Processes*. Poster presented at Annual Association for the Advancement of Behavioral Therapy Convention, New Orleans, LA.

Francisco, J., Tanaka, A., Johnson, J., Scarpa, A. (2003, May). *Parental psychopathology and child anxiety as it relates to reactive and proactive aggression*. Poster presented at the Annual American Psychological Society Conference, Atlanta, GA.

Johnson, J., Francisco, J., Van Voorhees, E., Scarpa, A. (2003, May). *Family conflict and anxiety*. Poster presented at the Annual America Psychological Society Conference, Atlanta, GA.

Hurley, J., Francisco, J., Van Voorhees, E., Scarpa, A., Hirai, M., & Ollendick, T.H. (2003, August). *Emotional, Behavioral, and Psychophysiologial Correlates of Reactive and Proactive Aggression in Children*. Poster presented at the Annual American Psychological Association Convention, Toronto, Canada.

Francisco, J., Bowser, F., Van Voorhees, E., Travers, J., & Scarpa-Friedman, A. (2002, June). *The relationship between anxiety and depression and proactive and reactive aggression*. Poster presented at the Annual American Psychological Society Conference, New Orleans, LA.

Grills, A.E., Francisco, J., & Ollendick, T.H. (2001, March). *Discriminant Validity of Three Self-Report Measures of Anxiety*. Poster presented at the Anxiety Disorders Association of America Conference, Atlanta, GA.

Grills, A.E., Francisco, J., & Ollendick, T.H. (2001, July). *An examination of multiple informant agreement and variables which may influence agreement using the Anxiety Disorders Interview Schedule*. Poster presented at the World Congress of Behavioral and Cognitive Therapies, Vancouver, BC.

Grills, A. E., Francisco, J., & Ollendick, T. H. (2001, November). *Discriminant validity of self-report measures of anxiety*. Poster presented at the annual meeting of the Association for the Advancement of Behavior Therapy, Philadelphia, PA.

RELATED WORK EXPERIENCE

Special Education Department, Virginia Tech
Supervisor: Cherry Houck, Ph.D.

Spring 2001: Provided assistance in administration of graduate-level class, *Assessing Students With Special Needs*. Individually helped students learn how to score assessment measures (e.g., WIAT, Woodcock Johnson Test of Achievement) by hand and on the computer; maintained office hours and assisted during weekly class meetings. Supervised students who observed assessments at the Child Study Center as part of their semester project. Inventoried and maintained Dr. Houck's manuals, books, and assessment tools.

PROFESSIONAL AFFILIATIONS

Student Member, American Psychological Association
Student Member, Association for the Advancement of Behavioral and Cognitive Therapy