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**TREATMENT OUTCOMES OF THE SUMMER TREATMENT PROGRAM FOR
CHILDREN WITH ADHD AND COMORBID MENTAL HEALTH DIAGNOSES**

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DOCTOR OF PHILOSOPHY IN URBAN EDUCATION

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TREATMENT OUTCOMES OF THE SUMMER TREATMENT PROGRAM FOR CHILDREN WITH ADHD AND COMORBID MENTAL HEALTH DIAGNOSES

ANTHONY REGIS PIZZUTI

ABSTRACT

Although there is substantial support for the efficacy of the Summer Treatment Program (Pelham, Gnagy et al., 2010) for children diagnosed with attention deficit hyperactivity disorder (ADHD), limited research has evaluated whether children diagnosed with additional mental health disorders (comorbidity) show positive outcomes and improvements when exposed to an intensive behavior program such as the Summer Treatment Program (STP). Furthermore, there is no research available that shows whether children from differing ages or gender who are diagnosed with additional mental health disorders (comorbidity) show improvements over the course of treatment. With such limited research, this study investigated a few of the questions raised about the treatment outcomes of the STP and whether children diagnosed ADHD, with and without comorbid conditions, have positive treatment outcomes and efficacy differences as a function of comorbidity, gender and age.

This particular research study examined archival data from 345 children, aged 6 to 12 years old, who enrolled in a 7-week Summer Treatment Program from the summers of 1999 – 2012. The dependent variable included the STP point system total weekly points earned from the program utilized as the indicator of the rate of change. A series of mixed-effects regression models were computed with the independent measures for age group, gender comparisons, and ADHD comorbidity to address four research questions. The results of this investigation indicated no significant difference for children diagnosed

with ADHD alone in treatment outcomes from those children diagnosed with ADHD comorbidity. Both children with ADHD alone and those with ADHD comorbidity made treatment gains over the course of the program. Secondly, significant differences were found between males and females diagnosed with ADHD comorbidity regarding treatment outcomes, in that females earned significantly more points than males during the summer treatment program. Thirdly, there were no significant age group differences in treatment outcomes with children diagnosed with ADHD comorbidity. Lastly, of all ADHD comorbid diagnoses, only Oppositional Defiant Disorder (ODD) was significantly associated with lower weekly scores than children with a diagnosis of ADHD only.

The results indicate that treatment matching may reduce some of the clinical uncertainty in the literature regarding treatment options for children diagnosed with ADHD comorbidity.

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CHAPTER I

INTRODUCTION

ADHD is one of the most prevalent behavioral disorders of childhood in the United States and internationally (Tzang, Chang, & Liu, 2009; Visser, Bitsko, Danielson, Perou, & Blumberg, 2010). Roughly an estimated 9.5% of school-aged children are affected by ADHD and an additional 3.7% have ADHD combined with a learning disability (Center for Disease Control and Prevention [CDC], 2010; Pastor & Reuben, 2008). ADHD is a chronic illness that is characterized by abnormally high levels of hyperactivity, impulsivity and inattention. These symptoms are known to severely impair many domains of functioning including academic, behavioral, peer relationships, and self-esteem. Often times, these cognitive, behavioral, and social problems in childhood tend to be carried on through adolescence and well into adulthood (Barkley, 2003).

Evolving Concepts of ADHD

ADHD has been studied for well over the past 100 years; ADHD has taken on upwards of 20 various diagnostic labels as descriptors for early childhood mental health illnesses. Few reports were detailed before 1900, but one of the first researchers to describe this disorder was Dr. George Still, a pediatrician who depicted young boys as having a ‘defect of moral control’ (Still, 1902, p.1008). He detailed for the first time, a

biological link for the unmanageable behavior that these young children had shown as noted by their aggression and poor inhibition control (Barkley, 1990). Still suggested that these, mostly 8 year old boys, were considered morally defective with a genetic bias toward moral corruption, he believed this moral deficit represented the manifestation of some morbid physical condition (Still, 1902, p.1165). He dismissed cases of poor child rearing environments in his research. Twenty years later, ADHD was referred to as “postencephalitic behavior disorder” by Dr. Franklin Ebaugh (1923), named after the many children who survived the 1917-1918 encephalitis epidemic. Ebaugh linked severe brain damage with severe behavioral problems and was first to describe the “hyperactive” symptoms associated with ADHD today (Barkley, 2007).

Since Ebaugh’s first description of hyperactive symptoms, the term “hyperactivity” changed over time to such terms as, "restlessness," "irritability," and "overactivity." In the late 1930s, Dr. Charles Bradley (1937) accidentally discovered the effective use of amphetamines and is credited as the first physician to document the success of Benzedrine to treat hyperactivity in children. While caring for children’s headaches resulting from painful spinal taps, Bradley found that children’s headaches were not particularly affected or relieved by the drug (Bradley, 1950, p. 25). Instead, Benzedrine improved the behavior and school performance of over 30 children, as indicated by a stronger interest in school, improved work habits, and reduction in disruptive behaviors. The drug “calmed many of the children without dulling their attention span” (Bradley, 1937, p. 578).

Calhoun, Greenwell-Iorillo, and Chug (1997) studied the historical transformations of the labels and diagnostic categories of ADHD. They stated that the

1940s and 1950s brought new terms describing children with behavior problems; the term of choice was ‘distractibility’ by Strauss and Werner (1941) and Strauss and Lehtinen (1947). By the 1950's the labels employed to describe the condition included ‘minimal brain damage’ by Strauss and Kephart (1955) (Calhoun, Greenwell-Iorillo & Chug, 1997, p. 244). Another diagnostic category used in the 1950s to describe the condition included, "hyperkinetic impulse disorder," (Laufer, Denhoff, & Solomons, 1957, p. 38). As a new and specific diagnostic category, they noted, hyperkinetic impulse disorder was a behavior pattern that:

May be noted from early infancy on or not become prominent until five or six years of age...Hyperactivity is the most striking item... There are also a short attention span and poor powers of concentration, which are particularly noticeable under school conditions...The child is impulsive...irritable and explosive, with a low frustration tolerance. Poor school work is frequently quite prominent. (p. 38)

These terms and categories fell out of use during the end of the 1950s and 1960s as researchers studied ADHD more closely. However, during this time, important advancements in the use of psychiatric medicines occurred when Methylphenidate or Ritalin was introduced in the United States and eventually approved by the Food and Drug Administration in 1961 (Swanson, McBurnett, Christian, & Wigal, 1995). Even today, stimulant medications, including Methylphenidate or Ritalin, continue to provide benefits for individuals suffering from ADHD (Charach, Ickowicz, & Schachar, 2004).

In the early 1960s, Chess (1960) studied 82 children who were diagnosed as hyperactive out of a total of 881 children seen in her practice. Instead of focusing on theories of etiology in her 1960 publication, Chess focused on classification and clinical descriptions of hyperactive children. She offered a straightforward definition of hyperactivity: “The hyperactive child is one who carries out activities at a higher rate of speed than the average child, or who is constantly in motion or both” (Chess, 1960, p.

2379). According to Barkley (1990), Chess was able to differentiate hyperactivity from traumatic brain injury; “Chess was significant for her attempt to divide the heterogeneous group of hyperactive children into more homogeneous subgroups and for explicitly separating the concept of hyperactivity from that of brain injury” (p. 10).

During the mid 1960s, researchers were attempting to discover the definitive link between various severities of brain damage and hyperactivity (Herbert, 1964; Rapin, 1964). Children and adolescents previously diagnosed with hyperkinetic impulse disorder showed no evidence of brain damage (Chess, 1960). With researchers unable to reach a consensus, Barkley (1990) stated that the term, ‘minimal brain damage,’ became recognized as “vague, overinclusive, of little or no prescriptive value, and without much neurological evidence” (p.10). ‘Minimal brain damage’ transitioned into a new label called, ‘minimal brain dysfunction’ (MBD) which still pointed to central nervous system deficiencies, but left little explanation of what the deficiency may be (Clements & Peters, 1962).

When the American Psychiatric Association (APA) offered assistance in renaming various disorders during the late 1960s, the term ‘minimal brain dysfunction’ was deleted and with the introduction of the *Diagnostic and Statistical Manual of Mental Disorders-II* (American Psychiatric Association, 1968), the new term “hyperkinetic reaction of childhood” was added in the DSM-II. The work of Laufer et al. (1957) and Chess (1960) is notable for two important developments. First, the new criteria allowed for classifying hyperactive, impulsive behavior according to a central behavior symptom, such as hyperactivity, as well as shifting from the use of diagnostic labels based on etiology to taking into account the use of behavioral classification for ADHD. However,

the diagnostic label would not last; “hyperkinetic reaction of childhood disorder” provided little useful diagnostic information besides describing hyperactive behavior (Barkley, 1990, p. 10).

From 1980 to 1994, the APA published the third, *Diagnostic and Statistical Manual of Mental Disorders-III* (American Psychiatric Association, 1980) and the fourth, *Diagnostic and Statistical Manual of Mental Disorders-IV* (DSM-IV, American Psychiatric Association 1994) publications. The diagnosis changed from "attention-deficit disorder" (ADD) and "Attention-deficit disorder with hyperactivity" (ADD-H) to, “attention deficit hyperactivity disorder” (AD-HD). During this time, the APA defined three sets of specifiers under the diagnosis of ADHD. Currently, children diagnosed with ADHD fall into one of three specifiers, including predominately inattentive, predominately hyperactive, or most commonly, combined type.

Etiology, Features and Prevalence of ADHD

The etiology of ADHD has dodged researchers for decades, but recent studies suggest both a strong genetic link as well as biological factors, such as preterm delivery and possibly maternal smoking during pregnancy (Biederman, 2005; Milberger, Biederman, Faraone, Guite & Tsuang, 1997; Rowland, Lesesne, & Abramowitz, 2002). ADHD is a neurobehavioral disorder that typically begins in childhood and is marked by developmentally inappropriate problems with attention, organization, and hyperactivity that impede the child’s functioning in the family, social, and academic realms (APA, 2000). DSM-IV delineates three subtypes of ADHD: (a) ADHD, combined type (ADHD-C), encompassing persistent symptoms of inattention and hyperactivity; (b) ADHD, predominately inattentive type (ADHD-I) referring to children (or adults) who

meet the diagnostic criteria for inattention but not hyperactivity; and (c) ADHD, predominately hyperactive-impulsive type (ADHD-HI) denoting individuals who meet the criteria for hyperactivity and impulsivity but not inattention. Of the three subtypes, the ADHD-HI is the least prevalent (Tzang et al., 2009).

More than twice as many boys as girls are diagnosed with ADHD (Pastor & Reuben, 2008). Between 1997 and 2006, there was a 4% increase in the number of girls diagnosed with ADHD in the U.S. versus a 2% increase in boys, which may signify increasing sensitivity to ADHD in girls. Some studies reported that girls are more likely to have the inattentions subtype, which is less overt, which could lead to misdiagnosis or under-diagnosis in girls. However, other studies reported similar proportions of boys and girls with the ADHD combined and predominately inattention subtypes (Tzang et al., 2009). ADHD with comorbid LD was roughly twice as common in boys (Pastor & Reuben, 2008).

Gender is the most predictable factor in the demographic distribution of ADHD in the general population. The only reported ethnic variation in ADHD in the American population is that the prevalence is lower in Latino families. According to the 2004-2006 National Health Interview Survey (NHIS), Latino children were less likely to be diagnosed with ADHD than white or black children (Pastor & Reuben, 2008). However, 2007 data from the CDC's National Center for Health Statistics revealed increases in ADHD among Latino children though the prevalence was still lower for Latino children than for other ethnic groups (Visser et al., 2010). The CDC researchers proposed that the increase might reflect more acceptance of the ADHD diagnosis by Latino families, better access to health care, or a combination of both.

The role of socioeconomic status (SES) in ADHD prevalence is less consistent. According to the NHIS, ADHD without LD was most common in children whose mothers had completed high school but not college though older children with only ADHD tended to have the most educated mothers (Pastor & Reuben, 2008). ADHD combined with LD was most prevalent in children with the least educated mothers and also in families headed by single mothers. Diagnosed ADHD is more common in families with health insurance but the critical factor seems to be access to health care rather than SES; ADHD diagnoses are equally common in children with private insurance and Medicaid. Treatment with stimulant medication alone seems to be more prevalent among low-income children in the U.S. and Canada, under very different health care systems (Ter-Stepanian, Grizenko, Zappitelli, & Joobar, 2010).

National surveys consistently report that the financial cost of ADHD carries a heavy burden for families, schools, and the health care system (Pastor & Reuben, 2008). A 2006 estimate placed the number of school-aged children (aged 5-17 years) with diagnosed ADHD at 4.5 million. Schools report that the number of children with ADHD in special education programs is rapidly increasing. According to parents' reports, there was a gradual but decisive increase in the number of children with ADHD between 2003 and 2007 (Visser et al., 2010). Apart from financial cost, untreated or inadequately treated ADHD has serious human cost. ADHD interferes with academic achievement and children with ADHD and comorbid conduct disorder (CD) are at high risk for adolescent delinquent behavior and substance abuse (Molina et al., 2009). Young and Amarasinghe (2010) emphasized that ADHD is a developmental disorder beginning in early childhood and persisting into adulthood. Most research on ADHD has focused on

school-age children. Young and Amarasinghe advocated for multimodal interventions specially tailored to each developmental stage from preschool through adulthood.

Family Influences

ADHD is generally recognized as having genetic and environmental components, though there is some disagreement on the magnitude of each respective influence. Some may infer that because ADHD has biological roots, parents and families do not play a role in the etiology, management, or treatment, therefore medication should be the foremost treatment modality (Howe, 2010). From most perspectives, however, the environment is extremely important in the expression of ADHD symptoms and behaviors. Behavior modification centers on altering the child's environment, which cannot be accomplished without the efforts of parents, teachers, or other significant adults in the natural environment.

Researchers studying ADHD, point to the diathesis-stress model (Brown & Barlow, 1997; Monroe & Simons, 1991; Zuckerman, 1999) which suggested that some persons can be more vulnerable than others to stressful environmental influences, which then influences one's psychopathology. Similarly, the diathesis-stress model of ADHD, suggested that families, schools, and peer groups that display negative and punitive attitudes toward inattention, impulsivity, and hyperactivity and offer minimal support for the development of self-regulation skills are likely to perpetuate or intensify symptoms of ADHD in vulnerable children (Carr, 1999). On the other hand, social systems that are more accepting of inattention, impulsivity, and hyperactivity and offer opportunities for building self-regulation skills are more likely to help biologically vulnerable children develop self-discipline and control. Several key assumptions underlie the diathesis-stress

model. In the context of families, the model proposed that families struggling to deal with multiple stressors with minimal social support and poor quality of life may use parenting styles and patterns of family interaction that adversely affect children who are vulnerable to ADHD. In addition, parents with this profile often have childhood histories of ADHD symptoms. They may experience psychological distress as a result of caring for a child with ADHD (Harpin 2005).

Lange et al. (2005) examined the family factors that are associated with attention deficit hyperactivity disorder and emotional disorders in children and questions whether parents of children with other behavioral or emotional disorders report problems similar to parents of children with ADHD. To examine these issues, Lange et al. (2005) compared parents of children with ADHD with parents of children with other emotional disorders (such as depression or anxiety) and a control group of parents of children with no emotional or behavioral disorders. The participants were 22 mothers and 13 fathers of 22 boys who scored above 63 for externalizing behaviors on the Child Behavior Checklist (Achenbach, 1991) and had a DSM-IV diagnosis of ADHD, 20 mothers and 15 fathers of 20 boys with high scores for internalizing behaviors on the CBCL and diagnosis of major depression, dysthymia, or an anxiety disorder, and 26 mothers and 16 fathers of 17 control group boys.

The parents were also assessed on family life events, perceived social support, quality of life, family functioning, parenting styles, parenting satisfaction, general health, and their perceptions of ADHD symptoms in their own childhood. As Lange et al. (2005) expected, the two groups of parents whose children had ADHD or emotional disorders reported higher levels of stress, lower social support, and decreased quality of

life compared to the control group parents. Furthermore, the parents of children with clinical diagnoses experienced more family stress. However, there were no notable differences in the problems reported by the parents of children with ADHD and emotional disorders. One distinction in parenting style was that the parents of children with ADHD were more predisposed toward authoritarian parenting (Lange et al., 2005). As anticipated, the parents of the two clinical groups of children reported lower parenting satisfaction compared to the control group parents. Overall, the findings were essentially consistent with prior research on the psychosocial factors associated with ADHD and supported the diathesis-stress hypotheses. The most notable finding was the striking similarity in the psychosocial profiles of families of children with ADHD and emotional disorders.

Perhaps those similarities should not be surprising in view of the extent of ADHD comorbidity. Efron and Sciberras (2010) reported that among 64 children ranging in age from 4 to 9 years who were referred to a children's hospital for evaluation in response to suspected ADHD, one-third actually had a different primary diagnosis and three-quarters of the children had one or more comorbid disorders. Although the figure for comorbidity is high, it is not extraordinary. As in most studies, the most common comorbid disorders were ODD and LD. Given the high prevalence of comorbidity and the complex and multifaceted nature of symptom profiles and psychosocial assessments, it would virtually be impossible to treat ADHD with medication alone and without enlisting families as active partners in treatment. Family stress only works to sustain or exacerbate ADHD. In fact, parent behavior training programs for children with emotional and behavioral

disorders have strong empirical support (Pelham & Fabiano, 2001, 2008; Pelham & Gnagy, 1999; Young & Amarasinghe (2010).

Drabick, Gadow, and Sprafkin (2006) examined the coexistence of conduct disorder (CD) and depression in boys with ADHD who were evaluated in the diagnostic stage of a research project on boys with emotional and behavioral disorders. The 248 boys, aged 6 to 10, were recruited from several sources including a child psychiatry outpatient clinic, an ADHD parent support group, as well as referred by parents, schools, or other professionals. A number of psychosocial factors emerged as predictors for the development or escalation of conduct problems in children with ADHD. In particular, harsh, detached, and inconsistent parenting practices were associated with CD. A family milieu marked with low family cohesion, high conflict, and low marital satisfaction predicted both CD and depression. Finally, social problems were linked with depression. Drabick et al. noted that these relationships held regardless of whether the child's behavior was reported by a parent or teacher.

According to Drabick et al. (2006), their findings support the theory of shared risk factors for ADHD and Conduct Disorder comorbidity. In accordance with coercion theory, parenting behaviors reflecting hostility, inconsistent discipline, and detachment from the child predicted CD symptoms in the group of boys whose ADHD was reported by mothers and CD and depressive symptoms in the teacher-described group. Low marital satisfaction and low family cohesion were associated with depression, CD, and parenting behaviors. The one finding that contrasted with the researchers' expectations was that academic and cognitive functioning were not associated with depression, although Drabick et al. (2006) acknowledged that an earlier study by Biederman and colleagues

also found no relationship between ADHD and school problems and depressive symptoms.

Deault (2010) conducted a review of empirical literature from 2000-2008 examining parenting factors related to children's ADHD, with particular emphasis on the development of comorbid internalizing and externalizing problems and functional impairments in the academic and social environment. A total of 22 studies (18 correlational studies and 4 longitudinal studies) met Deault's inclusion criteria. The overall findings indicated that ODD rather than ADHD was more closely linked with negative parenting practices and family conflict. Factors potentially linked with oppositional and conduct problems in children with ADHD included parental ADHD, maternal depression, limited positive parent involvement, and family conflict. However, the specific patterns among these factors, in relation to behavior problems, are uncertain.

More recently, comorbidity with ADHD has stepped to the front as one of the most important aspects of this pervasive disorder (Brown, 2000; Jensen et al., 2001a, 2001b). Typically, rates of comorbidity with ADHD are high with boys presenting with higher rates of ADHD than girls. According to, The Agency for Health Care Policy and Research (AHCPR, 1999), a stronger presence of the externalizing disruptive behaviors are reported with almost one third of children diagnosed with ADHD also being diagnosed with oppositional defiant disorder (ODD) and one fourth of children diagnosed with ADHD qualifying for a diagnosis of conduct disorder (CD). Overall, there are fewer children diagnosed with internalizing disorders (depressive and anxiety) co-occurring with ADHD than children diagnosed with externalizing problems (Oppositional Defiant Disorder and Conduct Disorder) with ADHD. Less than one-fifth of children diagnosed

with ADHD also present with a depressive disorder while more than one-fourth of children diagnosed with ADHD have an additional anxiety disorder. Remarkably, almost one-third of children diagnosed with ADHD also have more than one comorbid condition. Overall, comorbid conditions range from 12.36% (learning disorders) to 35.15% (conduct disorder) in children. By definition, children diagnosed with ADHD and a comorbid diagnosis will have substantial difficulties in many areas, owing to increased psychopathology, necessitating treatment comprehensiveness for intervention in all impaired domains (AHCPR, 1999).

Various psychosocial and other treatments have been undertaken and are widely practiced interventions for ADHD, including traditional in-office psychotherapy, play therapy, vitamins, restrictive diets, biofeedback, chiropractic care, perceptual motor training, inner ear treatment, and pet therapy, among others. However, none of these therapies have shown empirical support in successfully treating ADHD (Pelham & Gnagy, 1999). Alternately, to improve daily living, treatments with sustained, intensive, and comprehensive behavioral interventions are recommended and supported (Chronis, Jones, & Raggi, 2006; Pelham & Gnagy, 1999). Although a number of treatment options are available to parents of children diagnosed with attention-deficit/hyperactivity disorder, Pelham and Gnagy (1999) stated only three approaches have been supported by empirical data and research, including, “1) behavior modification, 2) central nervous stimulants and 3) the combination of both” (p.225). Each of these three interventions has shown effectiveness in the short term; however, no treatments have been promising to positively impact adolescent or adult outcomes (Owens et al., 2003; Pelham & Gnagy, 1999).

The only form of psychosocial treatment with demonstrated efficacy is behavioral interventions for children suffering with ADHD. Behavioral treatments have been used for children specifically diagnosed with ADHD for numerous years and have been used to treat children variously described as aggressive, disruptive, or diagnosed with conduct disorder (Pelham & Gnagy, 1999). Epidemiological studies and clinical studies of comorbidity have suggested that the majority of children described as disruptive/aggressive in early studies would have been diagnosed with ADHD (with or without comorbid aggression, conduct disorder, or oppositional defiant disorder) had DSM criteria been used (Gillberg, Gillberg, Rasmussen, Kadesjo, Soderstrom, & Rastram, 2004). Thus, there is extensive literature on behavior treatments for ADHD, covering hundreds of studies and thousands of children (Brestan & Eyberg (1998), Eyberg, Nelson, & Boggs (2008); Pelham, Greiner & Gnagy., 1998; Wells et al., 2000a)

Researching behavioral treatments, or behavior modification, for children diagnosed with ADHD is accompanied with challenges that are not shared readily by research about medication management. For example, since behavioral treatment involves changing the environment around the child (i.e., external management), generalization of treatment effects to other environments (e.g., home, academic) is dependent upon application of similar contingencies within these other settings. This is different than medication management research, in which changes to the neurological functioning of the child's brain (e.g. internal management) is attained. Pharmacological research, therefore, is less susceptible to problems of generalization of treatment effects than behavioral research (e.g., with medication, if effective dose is identified, then effects tend not to vary as a function of the child's setting).

Pelham and Gnagy (1999) found outpatient behavioral treatments or what they called clinical behavior therapy, has a number of additional challenges. In many ways, clinical behavioral therapy has limitations similar to those of central nervous system stimulant medication. First, although children receiving clinical behavioral therapy interventions improved greatly, “they are less likely than the active medication group to normalize children on parent and teacher rating scales and large minorities of children fail to show improvements with clinical behavioral therapy” (Pelham & Gnagy, 1999, p. 230). Although moving to a cost-reward system would in many cases dramatically increase improvements, some parents and teachers are unable or unwilling to implement complicated behavioral interventions. Even when parents and teachers are willing to initiate comprehensive interventions, they typically do not continue them without ongoing consultation. Furthermore, there is a lack of evidence of long term effects of behavior therapy for children with ADHD similar to psychostimulant medication (Pelham & Gnagy, 1999). Overall, demonstration of the continuation and/or maintenance of treatment effects over time is one of the major concerns of those using behavioral interventions with children. Research regarding how to maintain effects in the long run has not been undertaken. Again, these limitations have led to a growing practice of using a combination of treatments, medications, and behavioral treatments.

One study of particular interest (also discussed in chapter 2) that has examined the effectiveness of using a combination of treatments (medications and behavior therapy) is the Multimodal Treatment Study of Children with ADHD (MTA Cooperative Group, 1999a; Arnold et al., 1997a, 1997b; Richters et al., 1995), which is one of the largest NIMH funded research projects conducted, regardless of diagnosis. The MTA assessed

the adequacy of 4 treatment groups in decreasing ADHD symptomatology, namely 1) standardized, careful medication management only (Jensen et al., 2001b; Vitiello et al., 2001; Greenhill et al., 1996), 2) standardized and manualized behavioral management only (Wells et al., 2000a; Pelham, 2000; Pelham et al., 1998), 3) a combination of the two, and 4) standard community care. Initial results reported by the MTA Cooperative Group (Jensen et al., 2001a) clearly pointed out the superiority of medication management only over all other groups.

However, a number of follow-up analyses have provided a better picture of which approach may work best for whom, especially when considering the potential moderators and mediators of treatment responses (Owens et al., 2003; Wells et al., 2000b; MTA Cooperative Group, 1999b). The specific aspects of the family, parent, or child demonstrated to have an impact on response to treatment include parental compliance and adherence with the treatment and family stress variables (Hinshaw et al., 2000), parent cognitions (Hoza et al., 2000), SES (Rieppi et al., 2002), severity (Swanson et al., 2001a, 2001b), and comorbidity (Jensen, 2001a). Additionally, a combined treatment approach is typically what most pediatricians recommend for most children and adolescents. In fact, the American Academy of Pediatrics (2001) has issued guidelines for the treatment of ADHD and a combined treatment approach is strongly recommended.

Much of the information that the American Academy of Pediatrics used to create proposed guidelines was interpreted from information that was generated by the MTA Cooperative Group. It can be argued that children diagnosed with ADHD and comorbid conditions would have a need for more intensive interventions due to their multiple impairments; a combined treatment approach is urgently needed. Therefore, treatment

must be implemented at home and school, and/or any location where the child may show impairment. Identifying a comprehensive intervention program which treats ADHD and comorbidity, regardless of whether the problems are co-occurring internalizing or externalizing disorders, remains of substantial interest to researchers.

One particular intensive behavioral intervention that uses a combined treatment approach that merits attention for treating children diagnosed with ADHD is the Summer Treatment Program (STP), a comprehensive day treatment program. To date, much of the research focused on the Summer Treatment Program has been conducted by Pelham et al., (2010). The STP was a critical component of the MTA behavioral management-only group and has been recognized as a model treatment program for ADHD by the National Institute of Mental Health for well over 20 years (Pelham & Hoza, 1996; Pelham et al., 1998). The intensive Summer Treatment Program combines the structure of the school-year with an outpatient follow-up program to provide a maximally effective psychosocial intervention for ADHD (Chronis et al., 2004; Pelham & Hoza, 1996). Yet to date, no research has fully addressed the potential effectiveness of such an intensive behavior program with children diagnosed with ADHD and comorbid conditions. Therefore, the purpose of this dissertation was to examine whether or not the Summer Treatment Program effectively treats children diagnosed with ADHD and a comorbid condition.

Research Questions

The purpose of this dissertation is to answer the following research questions:

- Do children diagnosed with ADHD alone, who attend an intensive summer treatment program, differ in treatment outcomes from those children diagnosed with ADHD and a comorbid diagnosis?

- Do males diagnosed with ADHD and a comorbid diagnosis, who attend an intensive summer treatment program, differ in treatment outcomes from females with ADHD comorbidity?
- Are there age group differences in treatment outcomes with children diagnosed with ADHD and a comorbid diagnosis who attend an intensive summer treatment program?
- Do children with different comorbid diagnoses and ADHD, who attend an intensive summer treatment program, differ in treatment outcomes?

To begin to answer these research questions, a review of literature was conducted. Chapter Two provides a look at treatments for ADHD and comorbidity, including information about: ADHD and comorbid learning disorders, ADHD related to gender and comorbidity studies, and the MTA Cooperative Group, comorbid subgroups studies, alternative intervention programs and the summer treatment program

Conclusion

In conclusion, this chapter outlined the historic and clinical foundations of this dissertation research. Highlighting the foundational studies led to the next research step of examining the efficacy of the Summer Treatment Program. The research questions were formed from the identification of the need for further research about treatments with children diagnosed with ADHD and a comorbid condition. A detailed examination of the relevant literature follows in Chapter Two.

CHAPTER II

LITERATURE REVIEW

This chapter reviews relevant literature, including studies' descriptions and analyses, to highlight some of the comparable research relating to this current dissertation. Sections in this chapter include discussions of both contributions and limitations, concerning the topic of treatment for ADHD and comorbidity, including information about: ADHD and comorbid learning disorders, ADHD relating to gender and comorbidity studies, and the Multimodal Treatment Study of Children with ADHD MTA Cooperative Group, comorbid subgroups studies, alternative intervention programs and the summer treatment program. The studies discussed in this chapter lead to a better understanding of how this dissertation research contributes a next step in the vast literature about ADHD.

Since the 1980s there has been an increase in the number of U.S. children diagnosed with behavioral and learning disorders (Pastor & Reuben, 2008). Increases in diagnoses of ADHD cross all socio-demographic lines (Visser et al., 2010). The growing numbers of children with behavioral and learning disorders have been met with an expansion of programs and services for children and adolescents.

Children diagnosed with ADHD often rely on stimulant medication as their only form of treatment. However, major professional organizations are virtually unanimous in endorsing the merits of combined medication and behavior therapy (Waschbush, Carrey, Willoughby, King, & Andrade, 2007). In 1987, the American Academy of Pediatrics (AAP) restated their earlier position that “Medication for children with attention deficit disorder should never be used as an isolated treatment,” and went on to describe several strategies for treating children with ADHD, such as behavior modification, physical education programs, and “the provision of structure,” in fact recommending that these strategies should be tried before resorting to medication (AAP, cited in Hoffman, 2009, p. 33). Stimulant medications have since become the first line treatment for ADHD. At the same time, there is an accumulating evidence base on psychosocial interventions that are effective for ADHD (Pelham & Fabiano, 2008).

Hoffman (2009) attributed the shift in thinking from behavioral interventions to reliance on medication to the publication of the Multimodal Treatment Study of Children with ADHD (MTA) in 1999. Studies reporting findings from the MTA are included in this chapter (Karpenko, Owens, Evangelista, & Dodds, 2009; MTA Cooperative Group, 2004a, 2004b; Molina et al., 2009; Owens et al., 2003). The more recent research findings support the assertion that medication is insufficient and that there is a need for a variety of available treatment options. Pelham and Fabiano (2008) emphasized that ADHD is a *chronic* condition and treatment must be both intensive and ongoing. In fact, Coles et al. (2005) argued that the inconsistent results of behavioral treatments for ADHD may be attributed to the general reliance on non-intensive interventions.

Pelham and Fabiano (2008) and Coles et al. (2005) conducted extensive research on the Summer Treatment Program (STP), detailing the variety of behavioral treatments in a unique atmosphere of combining recreational and academic activities. Prosocial behavior was continually rewarded and reinforced by program staff. The STP is also the focus of this dissertation.

Many of the children who participated in the STP were diagnosed with ADHD with one or more comorbid disorders, which affected their treatment responses (Coles et al., 2005). In fact, comorbidity in ADHD is rampant, especially a diagnosis including ODD (Barnett, Maruff, & Vance, 2008; Efron & Sciberras, 2010; Howe, 2010; Martel, Gremillion, Roberts, von Eye, & Nigg, 2010; Qian, Cao, Chan, & Wang, 2006).

Children diagnosed with ADHD are also at elevated risk for developing conduct disorder (Drabick, Gadow, & Sprafkin, 2006). Learning disabilities are also prevalent among children with ADHD (Jakobson & Kikas, 2002; Miranda, Soriano, Fernandez, Melia, 2008; Pastor & Reuben, 2008; Pelham & Fabiano, 2011). Many children diagnosed with ADHD also have depression and anxiety in conjunction with externalizing behavior problems. Further complicating the accurate assessment and treatment of ADHD is the fact that the symptoms of the coexisting disorders overlap considerably with the symptoms of ADHD (Rowland, Lesesne, & Abramowitz, 2002).

According to Pelham and Fabiano (2001), the pivotal factor in successfully treating children diagnosed with ADHD and comorbid conditions is not the diagnosis, per se, but rather the *impairment* associated with the comorbid conditions. They emphasized that ADHD is not solely defined by symptoms; impairment in functioning is typically the cause of referrals for evaluation and should be the focus of treatment. Karpenko et al.

(2009) addressed the question of whether *clinically significant* changes in the symptoms of ADHD and ODD translate into *reliable improvement* in psychosocial functioning.

One glaring gap in the research literature is the lack of attention to girls diagnosed with ADHD (Elkins et al., 2011; Lee & Hinshaw, 2006; Marks, Nichols, Blasey, Kato, & Huffman, 2002; Monteaux, Mick, Faraone, & Biederman, 2010; Pelham & Fabiano, 2008; Zalecki & Hinshaw, 2004). There is some evidence of a “gender paradox;” that is, when a disorder is more common in one gender, it may have more negative ramifications for the gender in which it is less prevalent (Elkins et al., 2011). However, it is impossible to ascertain whether that is accurate for ADHD without sufficient research on ADHD diagnoses in girls. Many studies have included only boys and examined individual variations, which are substantial in the case of ADHD. Beyond gender comparisons, there is a need for further investigation of individual differences among girls, including the etiology, manifestations, and treatment of comorbid disorders.

Gender, ADHD and Comorbidity

Rydell (2010) investigated family factors as features related to ADHD and ODD in a community sample drawn from two areas of Sweden. The random sample of 1,206 10-year old children was 52% male, with the overwhelming majority (93%) of the children having at least one sibling. Most of the children lived with both biological parents, whose educational level was fairly high. In addition to sociodemographic attributes and ADHD and ODD symptomology derived from DSM-IV criteria, the parents were queried about negative life events affecting the child and the family.

Sociodemographically, the children living in single or stepparent families, whose mothers had low educational level, and whose families were non-European heritage were

more likely to display high levels of ADHD and ODD symptoms (Rydell, 2010). It is questionable whether the effect of ethnicity, which was specifically linked with ODD, is applicable to the much more diverse U.S. society. Most of the non-Europeans were immigrant families from the Middle East and many were refugees, which heightens the stress of immigration. ADHD was strongly linked with residing in a single parent or stepparent family.

A notable finding was that adverse life events, especially family conflicts, increased the risk of ADHD and ODD above the effects of sociodemographic factors, but sociodemographic factors had minimal moderating effects on adverse life events (Rydell, 2010). Boys appeared to be more vulnerable to stress than girls. In view of the strong biogenetic component of ADHD, Rydell had expected sociodemographic factors to have less of an effect on ADHD than ODD; however, that was not the case. To Rydell, the most striking finding was the powerful impact of family stress on the development of disruptive behavior disorders.

Rydell (2010) observed that teachers, but not necessarily parents, tended to report a higher prevalence of ODD symptoms in boys compared to girls. Derks, Dolan, Hudziak, Neale, and Boomsma (2007) questioned whether gender differences in the prevalence of ADHD and ODD might reflect measurement bias. They also examined prospective gender differences in the genetic and environmental influences on the two behavior disorders. The study was part of an ongoing research project on development and psychopathology involving twins from the Netherlands Twin Registry. The twins were all from a 1992-1996 birth cohort considered nationally representative at age 3 based on their Child Behavior Checklist (Achenbach, 1991) scores and were later

assessed by their teachers at age 7 using the Conners Teacher Rating Scale-Revised: Short Version (Conners, 2001). The sample was composed of 800 male and 851 female 7-year old twins.

The teachers' assessments of ADHD and ODD behaviors were consistent for boys and girls, thus showing no indication of bias. Derks et al. (2007) interpreted this finding as evidence that boys are more susceptible to ADHD and ODD than girls. For boys and girls more than half the variation in ADHD and ODD was attributable to genetic factors. However, different genes seem to play a role in the gene expression of ADHD and ODD in each gender. The study did not explore specific environmental influences on behavior, except to conclude that the variation in ADHD and ODD, which is not accounted for by genetic factors, was attributable to unique environmental influences.

Marks et al. (2002) examined behavior problems associated with ADHD comorbidity in 40 girls diagnosed with ADHD, with 55 boys as a comparison group. Drawn from children who had been evaluated at a Northern California community behavioral health center, the children had a mean age of about 9 years and were primarily white or Latina/o. In addition to DSM-IV or DSM-III-R diagnostic tests, the children were assessed using the CBCL. There were no significant differences in ADHD subtypes based on gender. Consistent with the ADHD diagnosis, the girls were rated by their parents as exhibiting clinically significant levels of attention difficulties, regardless of a concurrent problem. However, different behavior patterns were found between the girls diagnosed only with ADHD or had ADHD with comorbid Axis I disorders and those who had ADHD diagnoses in combination with LD.

Apart from inattention, the girls diagnosed with ADHD and LD had few behavioral problems (Marks et al., 2002). Compared to that group, the girls with only ADHD had significantly elevated scores on the subscales of Delinquent Behavior and Somatic Complaints and the girls with ADHD and Axis I disorders were assessed by their parents as displaying more aggressive behavior and somatic complaints. Marks et al. noted that actually the girls' scores on the Somatic Complaints subscale were relatively low compared to other dimensions, but it served the purpose of distinguishing the three groups of girls: ADHD only, ADHD with Axis I disorders, and ADHD and LD, in particular the first two groups from the girls with ADHD and LD. Among the boys diagnosed with ADHD, those with ADHD and LD also had evidence of behavior problems, which is consistent with most research findings.

Monteux et al. (2010) investigated the role of gender in the trajectory of ADHD and comorbid conditions from childhood to adolescence. The participants came from two longitudinal family studies conducted in Massachusetts. The first study started in the late 1980s with families who had one boy with ADHD and a male sibling without ADHD between the ages of 6 and 17 at the onset of the study. The participants were assessed at 4-year and 10-year follow-ups. The second study, using the identical design, involved girls with ADHD and their female siblings. Monteux et al. combined the data from both studies, with a total sample of 471 participants with ADHD and a mean age of 11.5 at the baseline assessment.

For both male and female participants, Monteux et al. (2010) observed a decline in ADHD symptoms over time, which is commonly reported. However, gender differences emerged in the effects of age on comorbid conditions. Among the girls,

psychiatric comorbid diagnoses were relatively stable from childhood to adolescence, compared to their male counterparts. Additionally, childhood and adolescent ADHD comorbidity were not associated with adolescent comorbidity among the males, but among the females, the stability of comorbidity retained its significance even after accounting for the association between childhood comorbidity and ADHD. In both childhood and adolescence, the girls displayed significantly higher levels of severity of ADHD than the boys, providing some support for the gender paradox. However, Monteux et al. added that while the difference was *statistically* significant, it was small and minimally *clinically* significant. At the same time, they stated that this finding warrants additional research.

Comorbid psychopathology in childhood was a significant predictor of future comorbidity in adolescence. However, the differences in the patterns they found in the male and female participants led Monteux et al. (2010) to suggest that for males with ADHD, the persistence of comorbidity in adolescence may be more contingent on the severity and persistence of ADHD per se, while for females comorbidity in adolescence may be more of a result of both the persistence of ADHD and the comorbid condition. Their findings led the researchers to conclude that gender plays a critical role in the trajectory of ADHD and concurrent psychiatric conditions.

Academic Performance

Biederman et al. (2004) examined the impact of ADHD and deficits in executive function on children's academic performance using data drawn from two identically designed family studies of ADHD. The two studies involved children and adolescents with or without ADHD between the ages of 6 and 17 at the time of the intake assessment.

The second assessment was four years later. The data analysis included 121 male proband (individual or member of the family being studied) participants diagnosed with ADHD, 103 male control group participants, 138 female proband participants, and 122 female control group participants. The children were given a battery of psychiatric, psychosocial, cognitive, and neuropsychological assessments.

As predicted, the children and adolescents with ADHD had a higher incidence of executive function deficits than their control group peers (Biederman et al., 2004). In addition, among the participants with ADHD, executive function deficits increased the risk for LD, grade retention, and lower academic achievement. The analyses also showed that the children and adolescents diagnosed with ADHD and executive function deficits came from lower SES families than those with ADHD but no executive function deficits. This finding is consistent with the higher prevalence of concurrent ADHD and LD in children whose mothers have limited education (Pastor & Reuben, 2008).

Learning Disabilities

Miranda et al. (2008) investigated the impact of age and LD with 67 boys and 5 girls with ADHD. Most were from low SES families. The children were divided into four groups based on LD status and age: 6-9 years and 10-14 years. The children were assessed with the Conners' Teacher Rating Scales–Revised: Long (Conners et al., 1998) and the Strengths and Difficulties Questionnaire (Goodman, 1997). Parents and teachers both served as behavioral raters. It is not unusual for parents and teachers to diverge in their ratings of children's behaviors. There was more congruence between parents and teachers regarding externalizing behaviors which are more persistent, severe, and overt. On the more subtle internalizing symptoms of anxiety, emotional liability, and emotional

problems there was limited agreement between parents and teachers. There is always the question of whether parents and teachers have different subjective judgments or children behave differently at home and at school. Both explanations may account for some degree of discordant ratings.

The children diagnosed with ADHD and LD had more psychological problems than those with ADHD alone (Miranda et al., 2008). Based on the teachers' appraisals, the older children with ADHD had more psychological problems than their younger counterparts. According to the researchers, the older children may have had unsuccessful interventions in the past and their symptoms might have escalated. Alternately, there are more academic demands on children in the higher grades and problems such as inattention and lack of organization and planning present more of an impediment academically. Overall, the group with the highest level of problems was the younger children with ADHD and LD.

Jakobson and Kikas (2007) examined cognitive functioning in children with and without ADHD diagnoses, with and without LD. The participants were 152 children ranging in age from 7 to 10 years who were tested individually in private, quiet rooms in psychiatric hospitals for the clinical group and at school for the non-clinical group. All the children diagnosed with ADHD had the combined type. There was only one girl in each of the two clinical groups (ADHD-C plus LD or ADHD-C without LD). Each child was individually matched on age and gender with a control group child.

The study was conducted by researchers at the University of Tartu in Estonia who created the tests for the purpose of their study (Jakobson & Kikas, 2007). The children were presented with five tests of visual-spatial skills, including working memory tasks,

both verbal and visual-spatial, two tasks to test fine motor skills, and four tests of verbal ability. The children with ADHD-C, with or without LD, experienced difficulties performing tasks that demanded complex cognitive organization. Their ability to process visual information was substantially lower than the control group, though the children diagnosed with ADHD alone performed better than those with ADHD and LD. On the working memory tests, the two groups of children diagnosed with ADHD also performed lower than the control group but comparably with one another. Jakobson and Kikas (2007) suggested that poor problem solving skills might have caused the lower performance.

Having a task that was more concrete was helpful for the children with ADHD alone but not for the children diagnosed with ADHD and LD (Jakobson & Kikas, 2007). The only task on which ADHD did not impede performance was a fine motor task that demanded speed rather than accuracy. On the motor task that demanded coordination, both groups of children diagnosed with ADHD had difficulty, with some slight advantage for the children with ADHD and LD. Jakobson and Kikas used discriminant function analysis to determine if the tests could distinguish the children with ADHD-C and LD and ADHD-C without LD. The tests accurately classified 73.6% of the children. When the results of cognitive, academic, and psychosocial assessments of children with ADHD were examined together, it seems improbable that medication could sufficiently address the multiple impairments they experienced without psychosocial intervention.

Gender and Psychosocial Competence

Thorell and Rydell (2008) explored the associations between social competence and behavior problems and children's gender and age in preschool and school-age

children. Social competence was assessed using the Social Competence Inventory (Rydell, Hagekull, & Bohlin, 1997). The SCI has two subscales measuring prosocial orientation (ability to engage in positive peer interactions) and social initiative (ability to initiate and participate in social interactions). The Strengths and Difficulties Questionnaire (Goodman, 1997) was utilized to assess negative impact on the child's everyday life and family burden related to behavioral and emotional problems. The sample was comprised of 60 children who scored high on ADHD symptoms and 499 comparison children. Analogous to Rydell's (2010) study of ADHD and ODD, the children did not meet the full diagnostic criteria for ADHD.

According to Thorell and Rydell (2008), the major finding was that there was no main effect for age or group status on the children's behavior problems. Despite this, the parents of older children, especially those with high levels ADHD symptoms, reported a greater negative impact on everyday life and family burden compared to the parents of younger children. Gender did affect both ADHD and behavior. That is, the boys exhibited more severe symptoms of ADHD as well as related behavior problems. Implicitly, the gender differences are consistent with the notion that girls with ADHD are less likely than boys to display high levels of hyperactivity or impulsivity. However, Thorell and Rydell emphasized that there were considerable differences in externalizing behavior and adverse effects of behavior problems between girls with high levels of ADHD symptoms and the comparison group girls.

Thorell and Rydell (2008) found it especially striking that the preschool children with high levels of ADHD symptoms had serious behavior problems associated with ADHD, thereby implying that behavior problems should not be regarded as simply a

long-term consequence of untreated ADHD. In fact, they are present at a very young age. The researchers suggested that conceptualizing preschool ADHD as a “highly complex condition with elevated levels of several different types of comorbid deficits” might be more conducive to accurate and appropriate diagnosis and treatment (p. 593). This viewpoint is similar to that of Pelham and Fabiano (2001).

Elkins et al. (2011) included academic performance as one of several psychosocial domains in their study of the effects of ADHD and gender. Raising the question of whether there is indeed a “gender paradox” related to ADHD, their main issue was whether girls and boys diagnosed with ADHD are affected differently in various dimensions of psychosocial functioning. The participants were drawn from the Enrichment Study; an extension of the Minnesota Twin Family Study, designed to provide longitudinal data on children at high risk for adolescent substance abuse as a result of a childhood disruptive behavior disorder (Keyes et al. 2009). The participants for the Elkins et al. (2011) study were 520 girls and 478 boys, all 11 years old. The children were classified into four groups representing the three ADHD subtypes and a comparison group with no ADHD diagnosis. Clinical interviews disclosed several childhood disorders in addition to ADHD, including ODD, CD, depression, and separation anxiety. Measures of academic ability and performance included the children’s IQ scores, parents’ reports of academic problems and expectations for their child’s academic success, class GPA, and teachers’ appraisals. Peer relationships were assessed via the Popularity Scale from the Piers-Harris Self-Concept Scale (Hur, McGue, & Iacono, 1998) to assess the children’s self-concepts and the teachers’ assessments of peer relationships.

The number and severity of ADHD symptoms were comparable for girls and boys (Elkins et al., 2011). Beyond that commonality, Elkins et al. found a number of significant differences in the severity of the problems the children experienced based upon gender and ADHD status or subtype. Compared to their peers without ADHD, the girls diagnosed with ADHD experienced more adverse effects socially and academically. A predictable finding was that among ADHD subtypes, girls and boys with the combined type had the most extensive clinical contact (65.4% and 68.8%, respectively). However, the decisive factor in the observed “gender paradox” was a diagnosis of the ADHD inattention subtype. Specifically, girls with the predominately inattentive subtype had much greater difficulties socially and academically than boys with the same diagnosis.

The girls with predominately inattentive ADHD were especially disadvantaged in the academic realm, with significantly lower IQ, GPA, academic motivation, and academic expectations and significantly more academic difficulties than boys with the same ADHD subtype, as well as compared to girls without ADHD (Elkins et al., 2011). Socially, the girls with the inattentive subtype were also less popular and more vulnerable to being picked on or bullied than boys in the same ADHD group. Finding this gender distinction somewhat curious, Elkins et al. proposed that academic achievement and social status may be more closely related for girls than boys and therefore academic underachievement carries more social stigma for girls. Another possible explanation is that girls are expected to be more attuned and responsive to social cues than boys, and attention problems interfere with the ability to discern subtle social cues. It seems probable that both explanations play some role in the social rejection of girls with the inattention subtype, thus intensifying the magnitude of their social difficulties. Even

more ominous for future adjustment, Elkins et al. noted that being bullied raised the risk of internalizing behavior problems.

The combined ADHD subtype tended to have more negative effects for boys than girls (Elkins et al., 2011). Boys with the combined subtype were less likely to interact with prosocial peer role models than girls in the same ADHD group. Additionally, differences between the children with ADHD combined and their peers without ADHD tended to be more pronounced for the boys than the girls. The children diagnosed with the ADHD hyperactive-impulsive subtype, of both genders, had the fewest clinical visits and were least likely to be on medication, which according to Elkins et al. (2011) could explain their lower profile in ADHD research. Tzang et al. (2008) had expected their sample to represent all three ADHD subtypes but none of the children had the H-I subtype. Among the participants from the Enrichment Study, the boys with the H-I subtype presented an interesting picture, with high IQs but a significant degree of externalizing behavior problems and more deviant peers compared to the boys without ADHD (Elkins et al., 2011). Though they were relatively unimpaired socially as well as academically, Elkins et al. noted that their preadolescent profile suggested a high risk for future behavior problems and relational aggression.

In one of the few studies focused exclusively on girls with ADHD, Zalecki and Hinshaw (2004) explored variations in aggressive behavior among girls with different ADHD subtypes. The researchers noted that while girls are less likely to exhibit physical aggression than boys, they tended to be more predisposed toward relational aggression, defined as “harming others by purposefully damaging or manipulating their peer relationships, such as by gossiping, spreading rumors, or excluding others from the peer

group” (p. 126). No researchers had previously examined the nature, prevalence, or effects of relational aggression in girls with ADHD. Zalecki and Hinshaw (2004) conducted their research in the natural environment of a summer day camp, though the participants and staff were all selected for research purposes so that the study would synthesize “naturalism and rigor” (p. 127). The participants were recruited through a wide variety of channels, with screening surveys sent out to their parents and teachers. The research spanned three 5-week summer programs with 79, 77, and 72 girls, respectively. Most of the girls had never met one another before and the girls diagnosed with ADHD and the comparison girls interacted together throughout the summer.

Observational data was combined with formal assessments, including behavior ratings by the camp counselors and peer sociometric nominations (Zalecki & Hinshaw, 2004). Teachers and parents provided assessments of relational aggression. Not unexpectedly, the girls with ADHD combined subtype were more overtly aggressive than either the girls diagnosed with ADHD-I or the girls without ADHD. The girls with ADHD, including both the inattentive and the combined subtype, were rated as showing higher levels of relational aggression than the girls without ADHD by all informant groups although there were some distinctions for the two ADHD subgroups. That is, while the ratings of parents and teachers for relational aggression were equivalent for the girls with both ADHD subtypes, the counselors and peers perceived much higher levels of relational aggression in the girls with the combined subtype. This discrepancy probably reflects differences in the girls’ behaviors in different social settings. The staff members were most likely to witness the girls interacting informally as well as in sports and other recreational activities. Zalecki and Hinshaw (2004) also noted that the

association between relational aggression and positive peer nominations was attenuated when peer appraisals of relational aggression were excluded from the analyses, thus attesting to the importance of soliciting peer perceptions to understand subtleties in social aggression.

In contrast to the findings of Elkins et al. (2011), ADHD-I was less of a social liability for the girls than ADHD-C, according to Zalecki and Hinshaw (2004). Although both groups of girls with ADHD were less popular with their peers than the girls without ADHD; girls with ADHD-I as well as girls without ADHD who displayed aggressions, either relational or overt, still had peers who wanted to be their friends. That was not true for aggressive girls with the combined type, who were significantly more disliked and had few peers who wanted to befriend them. Relational and overt aggression did elicit a negative response from peers regardless of whether or not the girls had ADHD diagnoses, but the impact was much more intense for the girls with ADHD-C. Since the study was conducted, relational aggression has gained more research attention but perhaps due to the overall dearth of attention to girls diagnosed with ADHD, it is rarely examined in the context of ADHD.

Lee and Hinshaw (2006) and Owens, Hinshaw, Lee, and Lahey (2009) both explored psychosocial functioning in adolescent girls with an ADHD diagnosis in follow-ups conducted with girls who had been in the 5-week summer camp research programs. Lee and Hinshaw (2006) examined childhood ADHD, conduct problems, academic performance, substance abuse, psychological distress, and peer status in a sample of 140 girls and a comparison group of 88 girls without ADHD who were assessed five years after the summer program. Hyperactivity-impulsivity was significantly linked with

conduct problems. This finding, combined with an earlier study led Lee and Hinshaw (2006) to propose that in girls, hyperactivity-impulsivity may reflect the same trait that underlies conduct disorder in boys. Noncompliance was also a predictor of conduct problems while overt aggression, covert antisocial behavior, and peer preferences were not. The researchers noted that this finding parallels the role of noncompliance in predicting delinquency in boys over 5 years.

As in the study of Elkins et al. (2011), inattention was associated with poor academic performance (Lee & Hinshaw, 2006). At the same time, neither antisocial behavior, hyperactivity-impulsivity, or peer status related to academic performance. The power of inattention to affect the performance of girls with ADHD in the academic domain, even after controlling for other factors, led Lee and Hinshaw (2006) to stress the significance of inattention in the school realm. Only the girls with ADHD had histories of school suspensions or expulsions during the transition from elementary to secondary school. Additionally, noncompliance and peer status were independently linked with behavior problems at school.

In view of evidence that many youths experiment with substance use in adolescence, Lee and Hinshaw (2006) deliberately chose measures that captured substance dependence and the range of substances used. Hyperactivity-impulsivity proved to be the main predictor of substance dependence while noncompliance was significantly linked with using a variety of different substances. Hyperactivity-impulsivity was also the ADHD symptom most closely linked with internalizing symptoms. However, the most notable finding, according to the researchers, was the association of covert antisocial behavior with self-reported depression and of

noncompliance with internalizing symptoms. Lee and Hinshaw (2006) noted that internalizing and externalizing symptoms are often found in conjunction in girls, and girls are more susceptible to depression in adolescence. The range of behaviors included in the analyses highlighted the different ways in which symptoms of ADHD can manifest in girls. To Lee and Hinshaw (2006), the detrimental impact of externalizing behavior on the transition to adolescence underscores the importance of early intervention for ADHD and associated behavior problems.

Owens et al. (2009) conducted their research with the same sample of 140 girls with ADHD and 88 comparison girls included in the study of Lee and Hinshaw (2006), also analyzing the trajectory of ADHD on psychosocial functioning and symptoms manifestation in a number of psychosocial domains. Among the girls diagnosed with childhood ADHD, close to 20% had virtually no ADHD symptoms in adolescence. However, less than half the girls with ADHD scored below the researchers' criterion for internalizing problems (49.2%) or externalizing problems (42.1%), while the overwhelming majority of the comparison girls were below the same threshold (85.2% for internalizing problems and 91.3% for externalizing problems). More than twice as many comparison girls, as girls with ADHD, had sufficient social skills (82.7% versus 40.5%). The girls without ADHD also fared better on teacher ratings of social status and achievement in mathematics and reading.

In total, Owens et al. (2009) explored the participants' adjustments in adolescence across six dimensions: ADHD symptoms, externalizing problems, internalizing problems, social skills, academic performance, and peer acceptance. Between roughly 20% and 65% of the girls with childhood diagnoses of ADHD were positively adjusted with each

of the six dimensions, but in each dimension the proportion of girls with ADHD was significantly lower than the proportion of girls without ADHD. In addition, only 16.5% of the girls with ADHD showed positive adjustment in at least five dimensions compared to 86.4% of the comparison group. Owens et al. noted that even when psychiatric symptoms were excluded from the analyses, differences in the positive adjustment of the ADHD group and the comparison group remained.

Within the ADHD diagnostic categories, Owens et al. (2009) found that the girls with the inattention subtype fared somewhat less well in positive adjustments than those with the combined type. Although this finding contrasts with the popular assumption that the combined type is “worse” than the inattentive type, this pattern is consistent with the findings of Elkins et al. (2011) for girls diagnosed with ADHD. Owens et al. noted that there is additional evidence that the inattentive type is linked with negative psychosocial functioning and the symptoms of inattention are less likely to disappear over time. One area in which Owens et al. called for further research was in identifying the factors associated with positive adjustment which may allow for the early detection of children who are least likely to “grow out of” their symptoms as they mature. They also called for the development of appropriate interventions.

Medication Treatment and Comorbidity

Ter-Stepanian et al. (2010) investigated the influence of comorbid disorders on the course of response to medication with methylphenidate in children diagnosed with ADHD. The research, conducted at the Douglas Mental Health University Institute in Montreal, took the form of a randomized, double blind, placebo controlled 2 week crossover trial of stimulant medication involving 267 children with ADHD ranging in age

from 6 to 12 years. Parents' and teachers' ratings were used in conjunction with clinical assessments. More than 80% of the children were diagnosed with one or more comorbid psychiatric disorders. Close to half (47.2%) of the children met diagnostic criteria for anxiety, 40.8% for ODD, 27.7% for CD, and 7.9% for depressive disorders. More than one-third of the children had comorbid ADHD and ODD or CD *and* an anxiety or depressive disorder. Boys predominated (77.9%) and a sizable proportion of the participants came from economically disadvantaged families.

According to Ter-Stepanian et al. (2010), the degree of comorbidity in their sample highlighted the complex clinical symptomology of children with ADHD. More than one-third of the children were referred by the Severe Disruptive Disorders Program, which included a day hospital. The presence of multiple comorbidities did not weaken the effect of the stimulant medication, but there were differences in medication responses contingent on the specific disorder. The children diagnosed with ADHD and ODD or CD tended to respond favorably to medication according to parent and teacher reports. Stimulant medication directly and indirectly affected the disruptive behavior the children displayed. At the same time, changes in the behavior of children with these disorders was easily detectable to observers and those with whom the children interact, which could account for some degree of the high response rate.

In contrast to the positive impact of medication on the children with comorbid ODD and CD, the presence of an anxiety disorder decreased the effectiveness of methylphenidate. Ter-Stepanian et al. (2010) suggested that cognitive behavior therapy (CBT) combined with medication would be an effective treatment for children with comorbid ADHD and anxiety. Van der Oord, Prins, Oosterlann, and Emmelkamp (2007)

also suggested that children with comorbid ADHD and anxiety might benefit from CBT intervention. Their own study found no support for the assumption that children with ADHD taking an optimum dosage of stimulant medication would gain additional benefits from behavioral interventions. However, they emphasized treatment must be tailored to each child's individual needs. Children from low-income families tended to respond well to the medication and indeed, low-income children with ADHD tended to use stimulant medications at higher than average rates (Ter-Stepanian et al., 2010). Genetic and environmental factors may play a role in the treatment response.

Faber et al. (2010) explored the treatment patterns of children diagnosed with ADHD in the Netherlands with emphasis on the use of stimulant medication and the presence of comorbid disorders. Children under 16 taking stimulant medication for ADHD were identified from the records of pharmacies and the researchers sent questionnaires to the prescribing physicians. The survey produced 510 completed questionnaires, with 31% of the children having one or more comorbid psychiatric conditions. The most prevalent comorbid condition was pervasive developmental disorder (10.4%), which is unusual in U.S. research on ADHD. In fact, the overall rate of comorbidity was low. Additional comorbid diagnoses included ODD or CD (9.8%) and LD (5.5%), with small numbers of children diagnosed with mental retardation, tic disorder, and anxiety disorder.

According to the physician reports, the children diagnosed with ADHD and comorbid conditions were more likely than those with ADHD alone to be involved in psychosocial interventions in conjunction with medication. They were also more likely to be taking psychotropic medications as well as stimulant medications, which Faber et

al. (2010) attributed to the number of children with PDD. They also suggested that the number of children participating in psychosocial interventions might be underestimated because the physicians might have been unaware of them. Combined medication and psychosocial treatment was generally recommended for children with ADHD and in particular, for children with ADHD and comorbid disorders.

Oppositional defiant disorder. Research has shown that children with comorbid ADHD and ODD respond favorably to the combination of counseling and psychotropic medication (Biederman et al., 2007). The cornerstone of medication treatment for ADHD and ODD generally involves treating the symptoms of poor impulse control, anger and irritability with stimulate medications such as methylephenidate. Additional classes of medication have also been shown to be effective in treating comorbid ADHD and ODD including atypical agents (aripiprazole) antidepressants (fluoxetine) and beta blockers (atomoxetine). Of the previously mentioned classes of medication, there is far less research on the use of atomoxetine for treating children with ADHD than the extensive body of research on methylphenidate. In addition, there is limited research on atomoxetine for treating comorbid ADHD and ODD (Biederman et al., 2007).

Biederman et al. presented a meta-analysis of the results of three randomized, double blind, placebo controlled trials of children and youth between the ages of 6 and 16. The participants received either a placebo or atomoxetine every day for 6 to 8 weeks. Out of 512 participants, 158 were diagnosed with comorbid ADHD and ODD. Compared to the placebo, atomoxetine resulted in a significant decrease in ADHD symptoms regardless of the presence or absence of ODD. Additionally, the medication treatment produced significant improvements on most dimensions of psychosocial functioning in the children

with ADHD only and comorbid ADHD and ODD. In fact, the decrease in ODD symptoms was heavily dependent upon the intensity of the ADHD response. The overall findings confirmed that the presence of ODD did not interfere with the children's response to atomoxetine.

Callous and unemotional traits. Waschbush et al. (2007) investigated the effects of behavior modification with and without methylphenidate medication in children with ADHD and conduct problems, including the prospective role of callous and unemotional traits on the children's academic and social competence. There is some evidence that callous and unemotional traits, such as lack of empathy and remorse, heighten the risk for future antisocial behavior in children with conduct problems. Early onset conduct disorders often occur in conjunction with ADHD and the behavior of children with conduct problems can be considerably different depending upon the presence of callous and unemotional traits. Prior to this study, there was considerable disagreement regarding whether this affects a child's response to behavioral interventions, and no previous research had examined the effects of stimulant medication on children with ADHD and conduct problems (CP) with and without callous and unemotional (CU) traits.

The participants in the study by Waschbush et al. (2007) were 29 boys and 8 girls with an age range from 7.24 to 12.53 years who had attended the Summer Treatment Program (STP). All the participants had diagnoses of ADHD-C (combined type) in conjunction with either ODD (43.2%) or CD (56.8%). Callous and unemotional (CU) traits were assessed on the basis of parent and teacher ratings using the Antisocial Process Screening Device (Frick & Hare, 2001). Nineteen of the children scored below the cut-

off point and 18 scored above the cut-off and were designated the ADHD/CP-CU (conduct problems and callous and unemotional) group. All of the children participated in the STP activities which included behavioral feedback. The medication regimen utilized an individualized within-subject, placebo controlled format. After an initial 2-week baseline period, each child was involved in a 6-week medication assessment to test the effects of the placebo. Medication was assigned randomly and due to absences, there were individual differences in the number of days the children received low dose or high dose medications or a placebo, but there were no differences in the average medication days or dosage according to group (ADHD/CP-only or ADHD/CP/CU).

The findings demonstrated that when the children received behavior therapy without medication, those who had callous and emotional traits in addition to ADHD and conduct problems displayed more antisocial behavior than their peers with ADHD and conduct problems alone (Waschbusch et al., 2007). The group distinctions that emerged centered mainly on conduct problems, rule following, and noncompliance rather than on behaviors such as classroom seatwork, helping and sharing or on ADHD symptoms such as disruptive behavior. While acknowledging that the reason for this pattern is uncertain, Waschbusch et al. proposed that results may have reflected differences in the baseline prevalence of antisocial behaviors. In other words, children with callous and emotional traits initially had markedly higher levels of antisocial behavior, which behavior therapy alone was inadequate to change. Another prospective explanation was that children with callous and emotional traits reacted differently to behavioral reinforcements.

Notably, the group differences decreased dramatically when the children took stimulant medication in addition to participating in behavior therapy (Waschbusch et al., 2007). In fact, the responses of the children to the stimulant medication surpassed the expectations of the researchers, who expected their medication responses to be less pronounced than the children with ADHD and conduct problems only. There is some controversy on the question of whether the reduction of impulsivity allows children with antisocial tendencies to engage in more *planned* antisocial behavior, but that did not turn out to be the case. At the same time, Waschbusch et al. acknowledged that the assessment tool they used was not sensitive enough to discern whether the antisocial behavior was planned or unplanned. There was some evidence that stimulant medication may have decreased some manifestations of antisocial behavior but increased others. Waschbusch et. al also noted that while there were few significant group differences, individual differences between participants suggested that overall, treatment was less likely to normalize the behavior of children who displayed callous and emotional traits in addition to ADHD and conduct problems.

Psychosocial ADHD Treatments

Pelham and Fabiano (2008) built on a research review conducted by Pelham, Wheeler, and Chronis (1998) examining evidence-based psychosocial interventions for children with emotional and behavioral disorders (EBD). The original research review produced several conclusions. First, behavioral parent training marginally met criteria for well-established treatment, but it did meet criteria for a probably efficacious treatment. Second, classroom behavior contingency management had an extensive evidence base. Third, there was additional support for classroom interventions found in

studies conducted before DSM-III became widely used, documenting the effectiveness of behavior modification for children with inattention or disruptive behaviors although not formally diagnosed with ADHD. Fourth, there was insufficient evidence in support of social skills training or other peer interventions. Fifth and finally, there was no empirical support for cognitive interventions for children with ADHD.

In view of the upsurge in research on psychosocial treatments for ADHD since 1998, Pelham and Fabiano (2008) examined studies that had been conducted since the original research review. The empirical evidence bolstered support for the effectiveness of behavioral parent training, and behavior contingency management, and also documented the effectiveness of intensive, peer oriented behavioral programs conducted in recreational environment such as summer programs. The overarching conclusion was that ADHD is a *chronic* disorder and therefore it is misguided to believe that a “*brief, time-limited* [original emphasis] treatment regimen” regardless of its nature would be “sufficient and effective” for treating children with ADHD (p. 209). Pelham and Fabiano (2008) emphasized that most children with ADHD will require prolonged “chronic, intensive, pervasive, palatable treatment that promotes engagement and adherence” (p. 210).

Reeves and Anthony (2009) outlined several benefits of employing multimodal treatment rather than medication alone for children and adolescents with mental health disorders. First, psychosocial interventions offer an opportunity for parents to be actively involved in their child’s treatment and to learn parenting skills that can have a positive impact on other siblings, as well as the target child. Second, medications may address disease-specific symptoms, but not the full scope of “symptoms-related” problems such

as impaired family or peer relationships, ability to cope with stress, or entrenched aggressive behaviors. Essentially, this corresponds to Pelham and Fabiano's (2001) call to treat impairments rather than symptoms. Both sources agree that psychosocial treatments can have a powerful impact on child and family functioning that may decrease the need for medication. Third, the time spent engaged in psychosocial interventions can mean more time for support and time for the clinician to assess a child's safety in areas such as suicidal feelings or child abuse (Reeves & Anthony, 2008). Multimodal therapy also allows clinicians more time to spend with parents discussing medication issues as well as the child's overall treatment.

Multimodal Treatment Study of ADHD

The Multimodal Treatment Study of ADHD (MTA) was a randomized clinical trial sponsored by the National Institute of Mental Health (NIMH) and conducted at 6 sites (MTA Cooperative Group, 2004a). A sample of 597 children diagnosed with ADHD combined type between the ages of 7 and 10 were randomly assigned to 1 of 4 modes of therapy: medication management, behavior modification, combined medication management and behavior modification, and routine care community treatment. At the end of the initial 14-month treatment phase, all four groups of children displayed substantial improvements, though some differences were observed. Medication management and combined therapy were both more successful in treating ADHD symptoms than behavior management alone or routine community care. On subjective assessments, the combined treatment was superior to all three of the other treatments based on oppositional and aggressive and internalizing symptoms reported by parents' and teachers' assessments of social skills, parent child relationships, and reading

performance. While two-thirds of the children receiving community treatment were taking medication, the intensive MTA medication regimen proved more effective.

The researchers attempted to identify characteristics that would predict the children's responses. However, rather than predictors they found *moderators* in treatment response (Owens et al., 2003). Specifically, medication management and combined treatment were linked with lower rates of "excellent response," defined as the reduction of ADHD and ODD symptoms to a level at or near the normal range in children who began the study with extremely severe ADHD symptoms or had depressive symptoms according to parents' reports. Excellent response rates were particularly low when the child also had an IQ below 99. None of the characteristics examined moderated the effects of behavior therapy alone or community care treatment.

A critical point for the MTA was whether the treatments would have enduring effects. The first follow-up was conducted at 24 months, with data from 540 children (MTA Cooperative Group, 2004a). The follow-up affirmed the superiority of the MTA medication management and the combined medication management and behavior modification over behavior modification alone and routine community care. However, the effect size was only half as large after 24 months than at 14 months for both ADHD and ODD. Consistent but non-significant effects were observed for the superiority of the combined treatment over intensive medication management alone on measures of ODD symptoms, social skills, and parental discipline, along with overall normal adjustment. This pattern reflected similar findings at 14 months.

According to the researchers, the finding suggested that the high dosage of medication used by the medication management and combined MTA groups provided an

early advantage that lingered even if the children stopped taking the medication after 14 months (MTA Cooperative Group, 2004a). Nevertheless, the effects of intensive medication management dissipated over time. Though non-significant in the quantitative analysis, the behavior modification techniques appeared to have given a social advantage to the children in the combined group that extended beyond the effects of ADHD symptom reduction.

The MTA researchers also examined the effects of the intensive medication regimen on the growth of the children, which also entailed a more detailed analysis of the dosage and maintenance of the stimulant medication (MTA Cooperative Group, 2004b). The analysis suggested that the decline in effectiveness during the follow-up stage might have been due to a reduction in medication as opposed to a decrease in effectiveness of the stimulant medication over time. According to the researchers, this explanation is consistent with the prevalent viewpoint that stimulant medication effectively treats symptoms of ADHD, but it does not have enduring effects once the medication is stopped. On the other hand, while behavior modification had a less powerful impact than medication, it can produce lasting benefits if the behavior is generalized and reinforced.

The researchers were somewhat surprised by the number of children in the medication management and combined treatment groups who stopped taking stimulant medication after the study and the number of children in the behavior modification group who did not take medication (MTA Cooperative Group, 2004b). However, while clinicians may find this counterintuitive, the parents' reports of satisfaction with treatment revealed that the parents in the behavior management group were more

satisfied with treatment than those in the medication management group and reported equivalent improvements despite the objective differences in symptom reduction.

There is no clear understanding of how treatment preferences and availability influence the treatment planning of families of children diagnosed with ADHD (Brinkman & Epstein, 2011). Brinkman and Epstein conducted a research review on the topic, which disclosed a number of factors that influenced the initial decision in choosing treatment after the child's ADHD diagnosis. The family's beliefs about the nature of the child's disorder play a major role in the choice of treatment, along with the information—or misinformation—they acquired from various sources. Over time, their treatment preferences were shaped by their own experiences with different therapeutic modalities, and whether or not treatment plans were continually reassessed and revised. As described by Brinkman and Epstein, the process entailed an ongoing cost-benefit analysis in which the family works with their health care team to create a treatment plan that maximizes the benefits to the child and minimizes detrimental effects and costs.

Undesirable side effects are often the cause for individuals to stop taking medication even when it helps the condition for which it is prescribed. The MTA researchers acknowledged that their evaluation of treatment effectiveness did not include ratings of medication side effects, tolerance, adaptive functioning, or quality of life, which are important elements of subjective satisfaction with treatment (MTA Cooperative Group, 2004b). The one medication side effect that was examined as part of the MTA was possible growth suppression from taking stimulant medication. There was some evidence of this phenomenon in that the children who continually took medication grew at a somewhat slower rate than those taking no medication. At the same time, there

could be other factors affecting the children's growth. The researchers emphasized that there is no way to predict how medication would affect the eventual size of preadolescent children. In addition, they pointed out that stimulant medication did not seem to affect the adult height of the now adult participants in studies of ADHD medication conducted in the 1970s.

Karpenko et al. (2009) investigated the relationship between clinically significant changes in the symptoms of ADHD and ODD and reliable improvement in psychosocial functioning across multiple domains among MTA participants. The analysis was based on 417 children using data from baseline and 14-month assessments. The results demonstrated that the children who experienced clinical changes in ADHD and ODD symptoms had a significantly higher probability, than those with no clinical changes, to enjoy reliable improvements on 6 out of 9 psychosocial indices.

An intriguing finding, however, was that 14% to 52% of the children who did *not* display clinically significant change also showed reliable psychosocial improvement, depending upon the particular domain (Karpenko et al., 2009). The most marked improvements were in the areas of parent-rated social competence (52%), teacher-rated social competence (49%), and homework (45%). In addition, 35% showed improvements in the pervasiveness and severity of their attention difficulties at home. Karpenko et al. acknowledged that these positive changes might be more meaningful for parents and teachers than changes in the clinical symptoms of ADHD and ODD. There is often a discrepancy in the perceptions of parents, teachers, and clinicians. Comprehensive instruments that are able to capture the full spectrum of behaviors associated with ADHD would provide a more multifaceted portrait of change that occurs

with treatment. De Los Reyes and Kazdin (2006) created a Range of Possible Changes Model encompassing multiple outcome measures, multiple informants, and multiple analytic strategies. Karpenko et al. recommended future research using the model.

Molina et al. (2009) presented recent findings from the MTA when the participants were assessed 6 years and 8 years after the initial study. For the most part, the analyses included the same variables that were used in the earlier MTA reports and extended them into the domains of adolescent functioning. The measures included parents' and teachers' assessments of ADHD and ODD symptoms, aggression and conduct; parent and youth reports of delinquent behavior, contact with the juvenile justice system; parents' assessments of functional impairments; self-reported depression and anxiety symptoms; various measures of school functioning and academic performance; social competence; psychiatric hospitalizations; and driving accidents or citations for those old enough.

The participants' randomized treatment groups, when they entered the study, had no major impact on their ADHD and psychosocial trajectories, but the course of ADHD symptoms in childhood emerged as a powerful predictor of adolescent outcomes after 6 and 8 years (Molina et al., 2009). Overall, while there was general improvement from the time of the study, the participants with ADHD still fared less well over time than the classmate comparison group that entered the study at the time of the 24-month assessment. The psychosocial and symptom profiles of the participants when they began the study were the key predictors of functioning in mid or late adolescence. These factors included the degree of ADHD symptoms severity, intellect, conduct problems, social competence, and the magnitude of the initial responses to ADHD treatment rather than

the type of treatment per se. The most favorable outcomes were found for participants who entered the study with lower symptoms severity, fewer conduct problems or learning problems, higher IQs and social skills, and families that were more stable and more affluent. These participants also had the most marked and enduring declines in ADHD symptoms at 36 months.

Some of the participants continued to take medication 6 or 8 years after they entered the MTA, but the only advantage medication seemed to offer was for mathematics achievement (Molina et al., 2009). While 30% of the participants no longer met DSM-IV criteria for ADHD, Molina et al. were skeptical of whether the criteria may be too stringent to capture manifestations of ADHD in adolescence and adulthood. Their overarching conclusion was that there is an urgent need for devising treatments that are effective, accessible and with lasting benefits, for teenagers diagnosed with ADHD and their families. They also noted that adherence to ADHD medication tends to decline drastically with the onset of adolescence. One recommendation is to encourage youth to participate periodically in psychosocial interventions, a strategy that has some empirical evidence. For this practice to become more prevalent there must be an accompanying effort to develop developmentally appropriate, engaging interventions for adolescents.

MTA Study: Comparing Subgroups

Another study which has emerged from the large, controlled clinical MTA study addressed whether ADHD with co-existing comorbidities should constitute separate clinical entities. Drawing upon cross-sectional and longitudinal information, Jensen et al. (2001a) studied 579 children who were assigned randomly to one of four groups, based on the presence of comorbid conditions: ADHD alone; ADHD with an anxiety disorder;

ADHD with either oppositional defiant disorder or conduct disorder; and ADHD with both an anxiety disorder and either oppositional defiant disorder or conduct disorder. This division of the participants revealed that the relative effectiveness of the different treatments depended on the condition of the children. Participants diagnosed with ADHD and anxiety responded equally well to all three experimental conditions – medication alone, behavioral alone, or the combination. The ADHD-only and ADHD plus conduct problems groups responded only to treatments including medication. The group with all three conditions appeared to derive substantially greater benefits from combination interventions compared with all other treatments (Jensen et al., 2001a).

The Jensen et al. (2001a) findings are very important, partly because of the implications for understanding and treating ADHD in children and partly because they illustrate the importance of conducting analyses in which the subjects are disaggregated and not viewed as if they were a homogeneous entity. This type of analysis allows researchers to determine how to best match treatments with characteristics of individuals. The Jensen et al. (2001a) study gave us a better understanding for making a case to consider differing ADHD classifications across ADHD subtypes.

Alternative Intervention Programs

Few research studies have investigated the efficacy of intensive intervention programs for children suffering with ADHD and the presence of comorbid conditions. Barkley et al. (2000) studied annual screenings of 158 preschool children with ADHD symptoms including aggressiveness, hyperactivity, impulsivity and inattention behaviors. Children were randomly assigned to one of four treatment groups for the entire school year: 1) no treatment, 2) parent training only, 3) full-day treatment classroom only, or 4)

the combination of parent training with classroom treatment. Their findings suggested that “when parent training is offered at school registration to parents of disruptive children identified through a brief school registration screening, it may not be a useful approach to treating children in home and the community...most treatment effects were specific to the school environment and did not affect achievement skills” (p. 319).

August, Realmuto, Hektner, and Bloomquist (2004) studied elementary school children with early onset aggressive behavior. The program that they studied was called The Early Risers Program. This program featured 4 CORE components: a) an annual 6 week summer school program b) a teacher consultation and student mentoring program, c) child social skills groups, and d) parent education and skills training groups. August et al. (2004) found children participating in the program showed significant improvement in academic achievement and school behaviors. Results showed that both girls and boys had similar treatment responses.

Goossensen, Glind, Carpentier, Wijsen, Duin and Kooij (2006) studied an intervention program for inpatients diagnoses with both ADHD and substance use disorders (SUD). Although the sample consisted of adults, the research investigated an intervention program for screening, diagnosis and treatment of ADHD in patients with SUD. Just as there is a lack of intervention programs for children with ADHD and comorbidity, Goossensen et al. (2006) reported the comorbidity of attention deficit hyperactivity disorder is frequently not well recognized in substance abuse treatment and that ADHD comorbidity treatment is lacking. Results from their study found the intervention program: “1) feasible to implement, 2) more than 20% of new patients

screened positive, and 3) 60% of those patients met criteria for ADHD” (p.259). Further research was encouraged to address substance abuse treatment with comorbid ADHD.

Summer Treatment Program

One treatment program, the Summer Treatment Program, which provides treatment for children diagnosed with ADHD has not yet generated much research that considers the treatment of ADHD with comorbid disorders. The intensive Summer Treatment Program uses a variety of evidenced-based strategies across academic and behavioral settings (Coles et al., 2005). The program is based on a token economy in which the children earn points for appropriate behaviors and lose points if they behave inappropriately. Although the format is not unusual for a behavior modification program, the STP stands out for its fusion of recreational and academic activities with therapeutic treatment. Serious behavior transgressions (such as intentional aggression, intentional destruction of property, and repeated noncompliance) are met with a time out. Conversely, the staff members continually reinforce positive social behavior with praise. Classroom instruction includes seatwork, peer tutoring, technology instruction, and art. The children are given daily report cards on which the clinical staff members establish each child’s individual target behaviors and goals for recreational and academic activities. The parents attend weekly training sessions where they learn how to reinforce and reward prosocial behavior based on the daily report card performance. In addition, the counselors hold social skills training sessions each morning and reinforce the exercise of appropriate social skills throughout the day and weekly parent training are held. The program is further outlined in detail in Chapter Three.

When the standardized behavioral therapy is inadequate for inducing positive behavioral change, the child is given an individually tailored behavior program targeting his or her specific problem areas (Coles et al., 2005). For evaluation purposes, the behavior modification protocols were suspended for two weeks. During that time, the atmosphere reverted to a more typical summer camp, and the children went on trips or used other privileges they earned. Negative behavior was halted only when it became disruptive or threatening to others.

Coles et al. (2005) focused on four children, 3 boys and 1 girl, each one with different behavior patterns. All four children enjoyed substantial improvements in behavior, though there were some differences according to the settings where the behavior change was most evident. The study design allowed the researchers to distinguish individual program effects and evaluate the overall program success at the same time. For example, one boy had marked improvements in recreational activities but fewer improvements in the academic setting while for another boy the effects were reversed. It is noteworthy that the boy who fared well in the recreational setting had a relatively low IQ which made it harder for him to transfer behavior from a formal to an informal environment.

Unlike the inconsistent patterns exhibited by the two boys, the girl showed decisive benefits from the program across different settings. She had comorbid ODD and an above average IQ (the highest of the four children). Three of the four children were diagnosed with ODD and one boy was diagnosed with CD. Coles et al. (2005) stressed that the children had differences in comorbid disorders, internalizing versus externalizing

behaviors, intellect, medication treatment, and other characteristics. Overall, the four children made meaningful and substantial gains in behaviors.

Pelham et al. (2002) examined the effects of stimulant medication (methylphenidate) and expectancy on the behavior, academic performance, and attributions of 136 boys attending the STP over four summers. Expectancy conditions were established by manipulating the children's beliefs of whether they were taking a stimulant pill or placebo. The design was a within-subject, balanced placebo with daily crossovers among four conditions (accurately told placebo, placebo received real medication, real medication but told placebo, accurately told real medication).

The results of the experiment showed that taking a low dose of stimulant medication produced improvements in the boys' behaviors and substantially increased the probability that they would meet their behavioral goals (Pelham et al., 2002). Expectancy about medication had an influence on their predictions for success that day but it did not affect their behavior. The boys made stronger internal than external attributions for success but were adamant in denying internal causes for failure. Taking the stimulant medication improved the boys' behaviors on nearly all dimensions in both recreational and academic environments as well as helping them reach their behavioral goals.

A second experiment examined whether the results Pelham et al. (2002) observed in the STP would be generalized to the natural classroom environment. The study took place with 110 of the 136 boys during the school year in their regular classrooms. Apart from the medication protocol and the daily report card used in the STP, there were no changes made to the natural setting. The medication effects and attributions paralleled those observed in the structured STP setting. There was clear and compelling evidence

of the positive impact of stimulant medication and no evidence that the children felt that their success was dependent on medication rather than their control of their own behavior. According to Pelham et al. it was important that the children did not feel unduly dependent on medication but at the same time, if they felt medication did not affect their behavior, they may decide to stop taking it, which is often the case among adolescents (Molina et al., 2009). Overall, Pelham et al. (2002) viewed the effects of medication on behavior as highly positive. The children's successes imbued them with confidence, which served as further motivation for prosocial behavior.

Fabiano et al. (2007) explored the effects of varying intensities of methylphenidate and behavior modification with 44 boys and 4 girls attending the STP. For each type of treatment the intensity was high, low, or no treatment. Behavior modification treatment was varied in blocks of 3 weeks, with the order randomly assigned by group. The medication varied on a daily basis and was randomly assigned for each child. The study focused on classroom behaviors, using the standard STP behavioral protocols. The results affirmed the effectiveness of medication and behavior modification independently and combined. Fabiano et al. also noted that a low dose of medication (0.15 mg/kg) was sufficient to produce a dramatic increase in academic productivity and increasing the dose resulted in no more than modest increases. The standard dose of methylphenidate is usually twice as high.

Low intensity behavior modification was as effective as the other interventions with the exception of the highest medication dose or a combination of high intensity behavior modification and medication (Fabiano et al., 2007). According to Fabiano et al., the key implication of their findings was that children taking high doses of stimulant

medication may be able to decrease the dosage, or possibly the need for medication, if the teacher implements behavior modification techniques in the classroom. They suggested that parents work with teachers to develop a plan and that doctors and school mental health professionals involved with medication trials should routinely survey the effectiveness and extent of behavior modification practices, which can be successfully implemented in most classrooms.

Pariseau et al. (2010) examined whether having additional time would improve the performance of children with ADHD on academic assignments in a group of 33 children attending the 2007 STP. According to the researchers, the provision of extra time may actually be counterproductive for children with ADHD, who have difficulty with sustained attention. The study took place during afternoon seatwork when the children were working on three assignments: math fluency workbooks, a reading exercise, and a writing exercise. The children had either 30 minutes or 45 minutes to finish their assignments. The results, which were based on accuracy and rule following during the assignment, confirmed the theory that extended time is not helpful for children with ADHD. Notably, the children's work was more accurate when they had to complete it within the shorter time period. Pariseau et al. added that the behavior modification strategies used in the STP might have allowed the children to complete more accurate work during the standard time period. Given that children with ADHD have to participate in high-stakes assessments and an important treatment goal is to improve academic performance, children with ADHD need strategies that are proven with that specific population.

Lopez-Williams et al. (2005) examined the role of athletic performance and social behavior in the social acceptance of 63 children with ADHD enrolled in the STP.

Recreational activities were an important feature of the summer program and included skills training in soccer, basketball, baseball, and swimming. For the purpose of the study, the researchers focused on two types of athleticism: general athletic performance and performance in a specific sport. Standardized performance measures were developed by several researchers working together. Social behavior was assessed and recorded continually throughout the program. Peer nominations and sociometric ratings were used to assess peer acceptance.

Both athletic performance and social behavior proved to be significant factors in the social acceptance of children with ADHD. Lopez-Williams et al. (2005) noted that in general, athleticism is an important dimension of children's social worlds; therefore it is not surprising that it should affect the social behavior of children with ADHD. The more athletic the children according to the measures used for the study, the more popular the child was likely to be with the group, the more likely to be nominated as a best friend, and the less likely to face rejection. Negative social behavior was also a powerful predictor of acceptance but in the opposite direction; in short, negative behavior was linked with social rejection and the more negative behavior the more likely the child was to be rejected by peers. On the other hand, positive behavior made others want to befriend the child. One aspect of the association between athletic performance and social acceptance that Lopez-Williams et al. did not address was the impact that ADHD symptoms had on athletic performance. While athletic children may generally be popular, children who excel in structured athletic activities would be unlikely to exhibit

disruptive behaviors that interfere with the game or meet. That is, an additional reason why children who perform well in sports may be popular with peers is that they are able to control their behaviors. This proposed association between social behavior and athletic performance may have been captured by the behavioral observations at the STP, though it was not explicit. The STP program is further outlined in detail in Chapter 3.

Conclusion

ADHD has been identified as one of the most common reasons for referral to professionals who care for children's mental health, health, and educational needs (Anastopoulos & Farley, 2003; Pelham & Waschbusch, 2004), and it is often accompanied by comorbid disorders, notably ODD, CD, LD, anxiety, and depression. Pharmacological treatment with stimulant medication has emerged as the first line treatment for children with ADHD. However, medication does not produce lasting effects (Molina et al., 2009). Furthermore, medication alone may only address the specific symptoms of ADHD and still leave children with psychosocial problems that disadvantage them socially and academically. In addition, the customary high doses may have unpleasant side effects. There is a growing body of empirical evidence supporting the effectiveness of psychosocial interventions for children with ADHD (Pelham & Fabiano, 2001, 2008). Through the involvement of parents, teachers, other important adults, and peers, children diagnosed with ADHD learn to master prosocial skills, providing they are continually reinforced. Behavioral treatment plans can be individualized to each child's needs, which is important given the numerous individual variations. The critical issue is that the target behavior must be continually reinforced in

the natural environment. The most effective therapy for children diagnosed with ADHD may be multimodal, intensive, sustained, and individualized.

In conclusion, there is substantial existent literature examining both treatment and intervention programs for those diagnosed with ADHD and learning disabilities, internalizing and externalizing disorders and substance abuse. However, there is an absence of research that examines the effectiveness of comprehensive intervention programs for the treatment of ADHD with other comorbid conditions. Specifically, a review of the literature found no studies or programs suggesting children from differing age groups, gender or comorbid diagnoses benefit from an intensive comprehensive intervention program such as the Summer Treatment Program. Therefore, this dissertation research is intended to gain more knowledge about children diagnosed with ADHD and a comorbid diagnosis. The next chapter describes the study's participants, the data collection procedures within the Summer Treatment Program (STP), instrumentation, and the research design including limitations of analyzing the data, research questions, and a statistical plan and analysis of data.

CHAPTER III

METHODOLOGY

Introduction

The description of the methodology, in this chapter, is divided into four sections. First, the characteristics of the study's participants are discussed. The second section presents the data collection procedures within the Summer Treatment Program (STP). Third, the instrumentation is discussed. Lastly, the research design including limitations of analyzing the data, hypothesis, and a statistical plan and analysis of data is detailed.

Data Source

This research was based on archived data from 1999 - 2012 retrieved from the Summer Treatment Program implemented through an ADHD behavioral clinic of a large, metropolitan children's hospital in Northeast Ohio.

STP Implementation History

The Summer Treatment Program has been offered throughout the United States including: Florida State University (1980-1986), the University of Pittsburgh Medical Center (1987-1996), and the State University of New York (SUNY) at Buffalo (1997 to present), Canada and Japan. This intensive treatment program has also been offered as a part of further comprehensive treatment packages such as the National Institute of Mental

Health Multimodal Treatment Study of Children with ADHD and the Early Risers Program. To date, the program has been replicated at approximately 30 sites varying from mental health agencies, University settings and national hospitals. Adolescent programs of the STP have also been offered throughout the United States as well. Numerous studies of child behavior and treatment responses have been conducted within the context of the STP. Program efficacy has been evaluated in several studies and reviewed by the Substance Abuse and Mental Health Service Administration's (SAMHSA) National Registry of Evidence-based Programs and Practices (NREPP). The NREPP has independently assessed and rated the STP as high in quality of research and readiness for dissemination (<http://www.nrepp.samhsa.gov/ViewIntervention.aspx?id=8>).

Data Collection

Prior to enrollment and acceptance into the program, parents signed informed treatment consent forms which included information about current and future research relating to the program. The behavioral clinic granted permission to analyze the archived data and the documentation for use of the data can be found in Appendix (A). Likewise, Cleveland State University's (CSU) Institutional Review Board (IRB) approval was also obtained (included in Appendix B).

Outcome data from the Summer Treatment Program was retrieved from the previously created data set located within the behavioral clinic, which included all weekly point totals obtained by every participant throughout the Summer Treatment Program. Additional Summer Treatment Program records, weekly point totals, individual treatment summaries and materials were reviewed. Information related to ADHD diagnosis, comorbidity type, demographic and medication information, were

collected and analyzed from the Summer Treatment Program to answer the four research questions.

Ensuring Confidentiality

Steps were taken during the review of archived data to ensure confidentiality. Previously collected Summer Treatment Program records, weekly point totals, individual treatment summaries and materials were reviewed for the purposes of this dissertation within the behavioral clinic. All dissertation study information related to ADHD diagnosis, comorbidity type, demographic and medication information were stripped of identifiers and re-coded. All children's names were eliminated from the data set and given a CSU ID code and numerical values were assigned to the following variables (STP year, CSU ID, Program Year, Week/Time, Age, Group, Race, Gender, Primary Diagnosis, Comorbidity, Comorbidity Type1, Comorbidity Type2, Comorbidity Type3 , Comorbidity Type4, STP Medication, Total weekly Pts).

Sample

During the summers from 1999 - 2012, participants enrolled in the Summer Treatment Program (Summer Treatment Program, Pelham, Greiner et al., 2010) met between June through July at various site locations including the campus of a small, liberal arts colleges in Northeast Ohio (7 summers), local suburban elementary schools (4 summers), and a Jewish Community Center (3 summers). Approximately 516 children participated in the Summer Treatment Program (STP) sponsored through an ADHD specialty clinic of a large, metropolitan children's hospital in Northeast Ohio. Although children may have participated in the program more than one year, for the purpose of this dissertation, only first year participants were included. Children who had more than one

exposure generally had a greater advantage and understanding of the nature and expectations of the program and would presumably bias the sample.

The number of participants included in this dissertation research was reduced for the following reasons: 140 subjects were removed because they were not first year participants, 21 subjects were removed due to age exclusions (1 was 5 years old, 20 had no age listed), 10 subjects were removed by primary diagnosis (3 Pervasive Developmental Disorder, 1 cyclothymia, 1 Oppositional Defiant Disorder, 1 Mood Disorder, 2 No diagnosis, and 2 were missing primary diagnosis. Also, due to small comorbid confirmed diagnoses, children with Comorbid adjustment disorder (1), enuresis/encopresis (4), subsyndromal yet clinically significant (8), and other (13) comorbidities were excluded from the sample. An encouraging aspect of these data was that the overall proportion of missing variables was low.

A final total of 345 subjects were selected for inclusion in this analysis. Subjects had a median age of 8.53 years; were mostly male (77.1 %); predominantly Caucasian (70.7 %), and diagnosed ADHD combined and hyperactive/impulsive type (93.6). Most participants had at least one comorbid mental health diagnosis (52.8%), and had taken some type of psychotropic medication (82.7%) while in the program.

The children participating in the summer treatment program were grouped by their age, each treatment group consisting of 10 to 14 children, based on each child's birthday. Although the program also included an adolescent treatment groups, this dissertation focused specifically on ages 6 to 12 year olds. The children's names were not included in this research; the data for this research was information that was collected

as standard procedure for participation in the Summer Treatment Program. For this dissertation, children's data only included the first year participation in the program.

Recruitment, Screening and Application processes for the STP

Local education agency's school personnel, mental health agencies, primary care physicians, and social work professionals, as well as individual parents referred children for enrollment into the Summer Treatment Program. Recruitment efforts were conducted by local media advertising, such as brochures, informational workshops, and web postings. Parent and Teacher rating scales/assessments, medical-social forms, birth, family, and demographic questionnaires were included in application packets and sent via US Mail to interested parents.

Behavioral and emotional rating scales collected from both parents and teachers during the application and screening processes included the Achenbach Child Behavior Checklist (Achenbach, 1999) and the Teacher Report Form (Achenbach, 1991), the DuPaul ADHD Rating Scale-IV (DuPaul, Power, McGoey, Ikeda, & Anastopoulos, 1998), the Connors (1990, 2002) Abbreviated Symptom Questionnaire (ASQ) and the Clinical Global Impressions Scale (Guy, 1976). These measures were used to assist with the confirmation of ADHD diagnosis and acceptance into the summer treatment program. Additionally, parents could supply copies of their child's: Individual Education Plans, mental health/psychological diagnostic assessments, and/or evaluations to assist in the enrollment process. Parent and teacher scales/ratings were scored and evaluated to confirm primary diagnosis of ADHD and inclusion into the program by the Clinical director. If necessary, semi structured interviews with parent and child were necessary for inclusion into the program in order to assist with diagnosis confirmation. These

assessments and materials were all collected prior to the children's participation in the summer treatment program, for the program's purposes, and were not collected for the purposes of this research. The archived records, including weekly point totals, were the data source to answer this study's research questions and for the data analyses.

STP Inclusion and exclusion criteria

The records of the children meeting *Diagnostic and Statistical Manual of Mental Disorders-IV* (American Psychiatric Association, 1994) and the *Diagnostic and Statistical Manual of Mental Disorders IV TR* (American Psychiatric Association, 2000) symptom criteria for attention-deficit/hyperactivity disorder (ADHD) are the records of interest for this dissertation research and necessary for inclusion into the program. DSM-IV attention-deficit/hyperactivity symptoms were rated by parents and teachers using the ADHD Rating Scale (DuPaul et al., 1998). To enroll in the program, participants must have been between the ages of 6 and 14 years of age and have met symptom criteria for ADHD, either Combined Type, Predominantly Inattentive Type or Predominantly Hyperactive-Impulsive Type. Comorbid mental health diagnoses and psychotropic medication use were permitted. Although such diagnostic comorbidities were generally allowable, the clinical director at each site may have excluded a child if it was determined that the comorbid disorder was primary over the ADHD or that the severity of the comorbid disorder would clearly disrupt the treatment (e.g., autism, schizophrenia, bipolar disorder or conduct disorder with severe behavioral disruption). Fees for the program were collected and based on the cost of providing intensive daily therapy and interventions. Children who met the program's criteria were offered admission.

Demographics and descriptive information

A description of the children who completed the summer program between 1999 and 2012 included a) the percentage of children diagnosed with ADHD by subtype, namely ADHD-Combined Type, ADHD-Predominantly Inattentive Type, and ADHD-Predominantly Hyperactive-Impulsive Type, b) percentage of children with comorbid disorders by type, c) age, d) sex, and e) race are outlined in Table 1.

Table 1

Psychosocial and Demographic Variables: Descriptive Statistics (N=345)

Variables	M	SD	%
Age	8.53	1.71	
Number of comorbidities	0.71	0.81	
Race/Ethnicity			
	Caucasian		70.7
	African American		18.6
	Hispanic		2.3
	Asian		2.0
	More than one selected		6.1
ADHD diagnosis type			
	Combined/hyperactive/impulsive		93.6
	Inattentive		6.4
Diagnosed comorbidity			
	Yes		52.8
	No		47.2
Prescribed medication			
	Yes		82.7
	No		17.3
Gender			
	Male		77.1
	Female		22.9

Verification of ADHD Comorbidity

Application packets and materials, previously completed by parents and teachers to rate ADHD symptoms, were required by the program in order for the clinical director to confirm diagnoses of ADHD along with any possible comorbidities. All application packets were reviewed by the clinical director prior to offering acceptance into the

Summer Treatment Program. The Achenbach Child Behavior Checklist (CBCL; Achenbach, 1999) and the Teacher Report Form (TRF; Achenbach, 1991), the DuPaul ADHD Rating Scale-IV (ARS-IV; DuPaul, Power, Anastopoulos et al., 1998), the Connors (1990, 2002) Abbreviated Symptom Questionnaire (ASQ) and the Clinical Global Impressions Scale (CGI; Guy, 1976), were key in the confirmation of ADHD diagnoses and comorbidities. Primary Diagnosis with comorbidity type was then transcribed onto a separate form, “ADHD application review and acceptance form” (see appendix C) which was located in every child’s file and co-signed by the Clinical Director. The “ADHD application review and acceptance form” served the purpose of confirming that the child met criteria for primary diagnosis of ADHD, listed all comorbidities, and verified that the child was accepted into the program. For the purpose of the dissertation, the “ADHD application review and acceptance form” was reviewed for ADHD diagnosis and comorbidity type and collected for this research.

Definition of Comorbid Subgroups

Additional diagnostic information was collected and evaluated as part of the STP application process, including symptoms of oppositional-defiant disorder (ODD), bipolar disorder (BP), conduct disorder (CD), pervasive developmental disorder (PDD), anxiety (ANX), obsessive compulsive disorder (OCD), post-traumatic stress disorder (PTSD) and depression (DEP).

For the purposes of this dissertation research, children were also identified as having ADHD alone or as having ADHD with an additional diagnoses (CO1) noting those with two diagnoses [CO2], or three [CO3] as outlined in Table 2.

Table 2

Descriptive Statistics of Comorbidity Type (N=345)

Type	N	%
Anxiety disorders (OCD, PTSD)	44	13.0
Mood disorders (depression, bipolar)	37	10.7
Opposition defiant disorder	45	13.0
Pervasive developmental disorders (Asperger's, autism spectrum	26	7.5
Tic-Tourette's	22	6.3
Learning disorder	42	12.5
No Comorbidity	163	47.2
One Comorbidity	33	9.6
Three Comorbidities	15	4.3

Procedures

The Summer Treatment Program is a 7-week, intensive summer behavioral intervention program designed for children diagnosed with ADHD, aged 6 to 12 years old, as well as an adolescent group for ages 12 to 14. Children aged 6 to 12 years of age attended from 8:30 AM to 5:30 PM, Monday through Friday, and adolescents attended from 8:00 AM to 5:50 PM weekdays as well. For the purpose of the dissertation, archival data from the adolescent component was not studied.

Quite similar to a day treatment program, the STP tailors individualized treatment goals specific to the needs of each child. Generally, 10 -14 children comprised a treatment group with 5 to 6 clinical staff members present. Groups were facilitated by a

graduate level lead counselor and 4 or 5 undergraduate level group counselors. The team of group counselors monitored children closely throughout the day, implementing the program and recording behaviors. Prior to working with children, all staff received two weeks of intensive training covering the entire program manual. All staff members and counselors hired for the program were required to pass an operational definitions exam covering all aspects of the Summer Treatment Program (point system behaviors, lists of rules for all activities, hierarchical system for classification of behaviors).

Throughout the day, children engaged in social skills training, recreational activities, and skill drills for the following sports: basketball, softball and soccer, as well as swimming. Children also participated in academic learning centers, instructed by elementary school teachers, to strengthen their ability to follow through with instructions, attend to and complete tasks, and comply with adults' requests in the classroom (Caserta, 2008). Academic learning centers were designed similarly to elementary school classroom settings and children participated in computer and art instruction by specialty teaching staff. Children and counselors remained in their assigned group throughout the summer to build relationships and consistency. The children spent 3 hours daily in learning centers (LC), including an Academic LC, a Computer LC, and an Art LC. Again, these classrooms were supervised by developmental specialists (typically special education teachers), and developmental aides (undergraduate students). These staff members implemented behavior modification programs designed to treat children's problems in a classroom context. Children spent the remainder of each day engaging in recreationally based group activities, while under the supervision of the counselors.

Weekly parent training classes and medication assessments were also vital parts of the Summer Treatment Program. One evening a week, each child's parent/s was invited to participate in training sessions held by the clinical director to learn skills and strategies to improve the parent-child relationship and behavior management skills for home. Although not required, some parents and children participated in medication trials designed to assist the family in evaluating the optimal medication dosage while participating in the STP.

Dependent Variable: Point System and Token Economy

The point system, or token economy, is a major component of the STP intervention, and children earned or lost points contingent upon their behaviors. Children earned points and exchanged them for a variety of rewards, including home and program privileges, field trips, and special honors. The point system served the following two primary functions in the STP: 1) one of the main procedures used to increase the frequency of appropriate behaviors and to decrease the frequency of undesirable behaviors exhibited by the children in treatment and 2) the primary data system for the STP. Accurate recording of positive and negative behaviors provided the clinical staff members with the necessary information for developing and monitoring a child's treatment. In addition to helping determine the nature of the children's behavior problems, the data was used to evaluate response to treatment, as significant changes in the frequencies of behaviors may reflect positive responses to behavioral treatment.

This token economy varied slightly as a function of the activities in which the children and adolescents participated. Namely, during the four 1-hour, recreational activities, children continuously earned points for exhibiting appropriate behaviors and

lost points for exhibiting inappropriate behaviors; whereas, during the three classroom activities, the behavioral system was less complex and involved a reward and a response cost system in which children began each learning center with 100 points and lost 10 points for each rule violation.

Throughout the day, staff members recorded the frequency of both positive, prosocial behaviors and negative, disruptive behaviors. There were nine prosocial behaviors that were socially desirable and 16 negative behaviors which were undesirable. The point system behaviors were operationally defined and mandated whether points were awarded or taken away for a specific action or verbalization. The positive category behaviors included: Following Activity Rules, Good Sportsmanship, Behavior Bonus, Attention, Compliance, Helping a Peer, Sharing with A Peer, Contributing to Group Discussion, and Ignoring a negative stimulus. The negative category behaviors included: Violating Activity Rules, Poor Sportsmanship, Intentional Aggression toward a peer or staff member, Unintentional Aggression toward a peer or staff member, Intentional Destruction of Property, Unintentional Destruction of Property, Noncompliance, Repeated Noncompliance, Stealing, Leaving the Activity Area without permission, Lying, Verbal Abuse to Staff, Name Calling/Teasing, Cursing/Swearing, Interruption, and Complaining/Whining.

The daily frequencies of behaviors have been demonstrated to hold validity in assessing children's responses to both behavioral and pharmacological treatments (Pelham & Hoza, 1996). Point system behaviors throughout the STP were, therefore, used as dependent measures of children's responses to treatment. Behavioral data for every child was entered into a computer database at the end of the treatment day by two

group counselors from each child’s group which allowed for evaluation of the frequency with which children exhibited both prosocial and disruptive behaviors. Means for every point system behavior were automatically calculated on a daily basis, which allowed for not only the evaluation of specific behavioral changes, but also the speed with which children changed such behaviors over time. For this dissertation, the amount of points earned by each child was calculated to show treatment outcomes compared by age, gender, and comorbidity type. The more points a child earned therefore reflected more appropriate and positive behavior. The weekly point totals for participants from 1999 to 2012 ranged from -40910 to 21340 (M=6301, SD=7820). Weekly point total scores were considered the dependent variable for this dissertation. A summary of weekly point totals is outlined in Table 3.

Table 3

Summary of Total Weekly Points Earned During Weeks 2 – 6 (N=345)

	Missing	N	Mean	SD	Minimum	Median	Maximum
Total weekly points	35	1689	6301	7820	-40910	7585	21340

Treatment Integrity and Fidelity

The summer treatment program includes treatment integrity and fidelity checks and quizzes. Treatment integrity and fidelity checks were conducted weekly by the Clinical Director to ensure that the intervention was implemented as intended. Feedback was given to lead counselors, group counselors and teaching staff during the program, as well, to prevent serious errors which can occur when interpreting treatment responses. Treatment integrity and fidelity checks are an important part of the manualized program and designed to maximize Pearson correlations between the observations made by staff

members and those made by trained independent observers. Previous studies have demonstrated Pearson correlations above .8 (Chronis et al., 2004).

In addition, children's daily point totals were entered in the Summer Treatment Program Data base by two staff members to ensure accurate data entry and consistent data reliability of the summer treatment program. Treatment integrity and fidelity was critical to both the clinical treatment being offered at the time of the program and for further investigation of research projects in the future.

Daily Report Card

Although the STP provides a standardized manual for implementation of the group treatment, treatment is individualized for each child through the development of a Daily Report Card (DRC). Children's behaviors were monitored during the first week of the program in order to identify target behaviors that were creating the most significant impairment. After identifying these individualized, target behaviors, staff members calculated the child's daily average instances of each behavior and set a goal for the child to reach at the start of the second week of the program. Target goals would be adjusted based on their lack of success, whereby the goals may have actually been increased (for negative behaviors) or decreased (for positive behaviors) in order to continuously allow the child to succeed with a target goal. Children that met 75 percent of their daily report card during the week could earn a weekly field trip reward on Fridays. The weekly success of the daily report card is an important component of the summer treatment program; however due to the variability of each child's target goals, the success was not utilized as an indicator of the rate of change for this dissertation.

Treatment Outcomes

For this dissertation, treatment outcomes were measured by the rate of change for age groups, gender, and comorbidities. The dependent measures included an analysis of the point system behaviors recorded during the program from baseline to end of treatment. For the purposes of this dissertation research, treatment outcomes were assessed via the point system behaviors from weeks 2 through 6. The first week of the program is generally considered the “honeymoon” and the last week of the program considered the “termination week.” Children’s weekly scores during weeks 1 and 7 were not true indications of their individual responses to treatment. Similarly, the program completed individual treatment reports detailing each child’s individual daily report card treatment outcomes based on Weeks 2 through 6. Therefore, similar to the program’s individual treatment summary reports, this dissertation focused on treatment outcomes of the 14 years of data from program weeks 2 through 6, as well.

Analyses and Statistics

For the purposes of this dissertation research, linear mixed effects regression analysis was selected. Mixed-effects regression models are advantageous relative to standard repeated-measures analysis of variance because of their ability to accommodate missing data (not all archival data was captured due to some incomplete values (e.g. some children missed a week of data for vacation purposes and subjects not finishing program) to explicitly model relationships between repeated measures (rather than assuming sphericity), and to directly model the effects of time (Manos et al.; 2012).

Numerical measures were summarized by median and interquartile range. Categorical variables were summarized by frequency and percentage. Univariable

comparisons by comorbidity status were performed, utilizing Wilcoxon's rank sum test, and chi square tests. The test use was denoted in the output, see Table 4.

Table 4

Comparison of Subject Descriptors by Comorbidity Status

Factor	Total	No		Yes		p-value
		N	Statistics	N	Statistics	
Age ^a	345	163	8 [7, 10]	182	8 [7, 10]	0.055 ^W
Race ^b	345					0.51 ^C
Caucasian	244	112	45.9	132	54.1	
Other	101	51	50.5	50	49.5	
Gender ^b	345					0.42 ^C
Female	79	41	51.9	38	48.1	
Male	266	122	45.86	144	54.14	
Age Group ^b	345					0.13 ^C
1	125	69	55.2	56	44.8	
2	96	39	40.62	57	59.38	
3	108	49	45.37	59	54.63	
4	16	6	37.5	10	62.5	

^a Median [P25, P75]; ^b Percentage

C: Pearson's Chi-squared test with Yates' continuity correction

W: Wilcoxon rank sum test with continuity correction

Table 4 (continued)

Comparison of Subject Descriptors by Comorbidity Status

Factor	No			Yes		p-value
	Total	N	Statistics	N	Statistics	
Summer treatment program year ^b	345					0.54 ^C
1999	38	17	44.74	21	55.26	
2000	20	10	50	10	50	
2001	28	16	57.14	12	42.86	
2002	21	7	33.33	14	66.67	
2003	21	8	38.1	13	61.9	
2004	27	11	40.74	16	59.26	
2005	22	6	27.27	16	72.73	
2006	22	10	45.45	12	54.55	
2007	29	13	44.83	16	55.17	
2008	25	14	56	11	44	
2009	23	13	56.52	10	43.48	
2010	27	15	55.56	12	44.44	
2011	21	10	47.62	11	52.38	
2012	21	13	61.9	8	38.1	

^a Median [P25, P75]; ^b Percentage

C: Pearson's Chi-squared test with Yates' continuity correction

W: Wilcoxon rank sum test with continuity correction

Total weekly points were modeled using linear mixed effects methods with comorbidity status, age, gender, and race as independent variables. Whereas the data were relatively balanced (the same number of observations per subject), 95% confidence intervals and p-values were calculated from normal standard errors. Subject ID was entered as the random effect and evaluated by visual inspection of plots and a likelihood ratio test. Additional models for weekly points were developed to evaluate the relationship of specific comorbidities on weekly points. Treatment outcomes are reported based on results from weeks 2 through 6 of the Summer Treatment Program. A linear mixed effects methods analysis was conducted with the dependent measures for the age group, comorbidity, and gender comparisons to test all four research questions (see Appendix D). The research questions are as follows:

1. Do children diagnosed with ADHD alone, who attend an intensive summer treatment program, differ in treatment outcomes from those children diagnosed with ADHD comorbidity?
2. Do males diagnosed with ADHD comorbidity, who attend an intensive summer treatment program, differ in treatment outcomes from females with ADHD Comorbidity?
3. Are there age group differences in treatment outcomes with children diagnosed with ADHD comorbidity who attend an intensive summer treatment program?
4. Do children with different comorbid diagnoses and ADHD, who attend an intensive summer treatment program, differ in treatment outcomes?

Conclusion

Over a fourteen year period, from 1999 -2012, the collection of data from the Summer Treatment Program (STP) offered through an ADHD specialty clinic of a large, metropolitan children's hospital in Northeast Ohio, offered this researcher an opportunity to analyze the aforementioned research questions. This chapter provided specific information about the STP participants, the program, the procedures, instruments, and the data analyses. Chapter Four provides the results of the linear mixed effects methods analysis performed on all four research questions.

CHAPTER IV

RESULTS

This chapter is organized around the sequence of the research questions. Each question is stated and followed by the results of the analyses. The tables of the output are given to assist with explanation of the findings.

Research Question 1

Do children diagnosed with ADHD alone, who attend an intensive summer treatment program, differ in treatment outcomes from those children diagnosed with ADHD comorbidity?

No, the children diagnosed with ADHD alone did not differ in treatment outcomes from those with ADHD Comorbidity. Week two mean predicted score of the comorbidity group was lower than in the no comorbidity group (5673.95 compared to 6057.71, respectively). This pattern was also true for week 6, although the difference increased very slightly (7808.50 compared to 8192.27, in the comorbidity and no comorbidity groups, respectively), as outlined in Table 5.

Table 5:

Predicted Weekly Scores in No Comorbidity vs. Comorbidity by Week (N=345)

Program Week	ADHD Alone	ADHD with Comorbidity
2	6057.71	5673.93
3	6821.24	6437.47
4	7439.75	7055.98
5	7754.64	7370.88
6	8192.27	7808.50

In both groups, predicted weekly scores showed consistent improvement from week two through week six. While the children with at least one comorbid diagnosis scored consistently lower than their ADHD alone counterparts, they appeared to have a similar relative benefit to their baseline scores. Over the course of the program, it was estimated that children with comorbidities would score an average of -375.24 points lower than children with ADHD alone. This difference was not statistically significant (Beta = -375.24; T = -0.60; df = 331; p = 0.55), see Table 6.

Table 6:

Linear Mixed Effects Model Summary for Total Weekly Points and Comorbidity

Factor	Level	Beta	95% Confidence Interval	T	P-value (T)
(Intercept)		319.3	(-3380.19, 4018.81)	0.17	0.87
Comorbidity	Yes vs. No	-375.2	(-1598.07, 847.59)	-0.60	0.55
Week/time	3 vs. 2	771.3	(183.11, 1359.44)	2.57	0.01
	4 vs. 2	1385.5	(804.38, 1966.61)	4.68	< 0.001
	5 vs. 2	1698.6	(1115.54, 2281.62)	5.71	< 0.001
	6 vs. 2	2140.7	(1555.3, 2726.15)	7.17	< 0.001
Age		781.5	(419.4, 1143.61)	4.23	< 0.001
Race	Other vs. Caucasian	-301.7	(-1666.69, 1063.36)	-0.43	0.66
Gender	Male vs. Female	-1382.8	(-2866.02, 100.38)	-1.83	0.068
Medications during STP	Yes vs. No	-718.9	(-2351.16, 913.3)	-0.86	0.39

Additionally, an interaction between comorbidity status and week was investigated. The presence of such an interaction would indicate that change in total weekly scores develop at different rates in the comorbidity and ADHD alone groups across time (e.g., non parallel slopes). Results reported in the ANOVA table showed no overall effect for this interaction, suggesting that the interaction may be left out of the model ($F = 1.06$; num. $df = 4$, den. $df = 331$; $p = 0.38$). See Table 7.

Table 7

Analysis of Variance Table: Comorbidity and Week Interaction

	Df	Sum Sq	Mean Sq	F value	P
Comorbidity	1	6.13e+05	6.13e+05	0.04	0.839
Week.Time_factor	4	9.29e+08	2.32e+08	15.77	0.000
Age	1	2.95e+08	2.95e+08	20.03	0.000
Race2	1	1.32e+05	1.32e+05	0.01	0.925
Gender	1	4.81e+07	4.81e+07	3.27	0.072
STP.Med	1	1.10e+07	1.10e+07	0.74	0.389
Comorbidity:Week.Time_factor	4	6.22e+07	1.55e+07	1.06	0.378
Comorbidity:Age	1	1.98e+07	1.98e+07	1.34	0.247
Week.Time_factor:Age	4	1.70e+08	4.25e+07	2.89	0.023
Comorbidity:Gender	1	1.02e+07	1.02e+07	0.69	0.406
Comorbidity:Week.Time_factor:Age	4	6.80e+07	1.70e+07	1.15	0.331

Research Question 2

Do males diagnosed with ADHD comorbidity, who attend an intensive summer treatment program, differ in treatment outcomes from females with ADHD comorbidity?

Yes, the males diagnosed with ADHD comorbidity did differ in treatment outcomes from females. Week two mean predicted score for females was higher than for males (8126.83 vs. 5819.17, respectively). This pattern was also true for week 6

(10672.22 compared to 8364.55, in the females and males, respectively), as outlined in Table 8.

Table 8

Predicted Weekly Scores for Female Comorbidity vs. Male Comorbidity by Week (N=182)

Program Week	Female Comorbidity	Male Comorbidity
2	8126.83	5819.17
3	9321.69	7014.03
4	9645.69	7338.03
5	10284.03	7976.37
6	10672.22	8364.55

In both genders, predicted weekly scores showed consistent improvement from week two through week six. While males scored consistently lower than females, they appear to have a similar relative benefit to their baseline scores. Over the course of the program, it is estimated that males will score an average of -2307.66 lower than females. This difference is statistically significant (Beta = -2307.66; T = -2.08; df = 170; p = 0.038), see Table 9.

Table 9

Linear Mixed Effects Model Summary for Total Weekly Points and Gender Comorbidity

Factor	Level	Beta	95% Confidence Interval	P-value (T)
(Intercept)		1592	(-3744.06, 6928.29)	0.56
Week/time	3 vs. 2	1195	(411.77, 1977.96)	0.003
	4 vs. 2	1519	(745.36, 2292.38)	< 0.001
	5 vs. 2	2157	(1380.24, 2934.17)	< 0.001
	6 vs. 2	2545	(1771.88, 3318.9)	< 0.001
Age		1495	(-24.89, 3013.93)	0.054
Race	Other vs. Caucasian	-1063	(-3044.29, 918.9)	0.29
Gender	Male vs. Female	-2308	(-4483.72, -131.6)	0.038
Medications during STP	Yes vs. No	1033	(-1310.99, 3376.48)	0.39

Research Question 3

Are there age group differences in treatment outcomes with children diagnosed with ADHD comorbidity, who attend an intensive summer treatment program?

No, there were not age group differences in treatment outcomes with children diagnosed with ADHD comorbidity. Week two mean predicted score for six year olds was lower than 12 year olds (4075.56 compared to 7064.60, respectively). This pattern was also true for week 6 (6620.95 compared to 9609.99, in the 6 year olds and 12 year olds, respectively), see Table 10.

Table 10

Predicted Weekly Scores for Age of Participants by Week (N=182)

Week	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11	Age 12
2	4075.56	4573.73	5071.90	5570.08	6068.25	6566.43	7064.60
3	5270.42	5768.60	6266.77	6764.94	7263.12	7761.29	8259.46
4	5594.43	6092.60	6590.77	7088.95	7587.12	8085.29	8583.47
5	6232.76	6730.94	7229.11	7727.29	8225.46	8723.63	9221.81
6	6620.95	7119.12	7617.29	8115.47	8613.64	9111.81	9609.99

In all ages, predicted weekly scores showed consistent improvement from week two through week six. While younger participants scored consistently lower than older participants, they appeared to have a similar relative benefit to their baseline scores. Over the course of the program, it was estimated that each year of increased age associated with an increase of 1494.52 points. The effect of age on weekly score was cumulative. Although this difference was not statistically significant (Beta = 1494.52; T = 1.93; df = 170; p = 0.054; as outlined in Table 11), the general trend shows that a seven year old would be expected to score 1494.52 more points than a six year old, and that an eight year old would score 2989.04 more points than the six year old, as the effect on weekly score is cumulative.

Table 11

Linear Mixed Effects Model Summary for Total Weekly Points and Age

Factor	Level	Beta	95% Confidence Interval	P-value (T)
(Intercept)		1592	(-3744.06, 6928.29)	0.56
Week/time	3 vs. 2	1195	(411.77, 1977.96)	0.003
	4 vs. 2	1519	(745.36, 2292.38)	< 0.001
	5 vs. 2	2157	(1380.24, 2934.17)	< 0.001
	6 vs. 2	2545	(1771.88, 3318.9)	< 0.001
Age		1495	(-24.89, 3013.93)	0.054
Race	Other vs. Caucasian	-1063	(-3044.29, 918.9)	0.29
Gender	Male vs. Female	-2308	(-4483.72, -131.6)	0.038
Medications during STP	Yes vs. No	1033	(-1310.99, 3376.48)	0.39

Research Question 4

Do children with different comorbid diagnoses and ADHD, who attend an intensive summer treatment program, differ in treatment outcomes?

Only one comorbid diagnosis was associated with statistically significant differences in weekly scores. Specifically, children with ADHD and ODD earned significantly fewer points than children with ADHD only. Children with this comorbid diagnosis earned 2048.7 fewer points than those with no comorbidities. This difference in scores ranged from -4015.76 to -81.64 points. These results did demonstrate statistical significance (Beta = -2048.7; T = -2.0438; df = 198; p = 0.041). All other comorbid diagnoses examined in this analysis were not associated with differences in treatment outcomes when compared to children with no comorbidities. Interestingly, among all children with at least one comorbidity, children with learning disorders had the highest mean weekly scores (7909.00), while children diagnosed with ODD scored the lowest (3973.00), see Table 12.

Table 12

Mean Summary of Weekly Scores by Number of Comorbidities and Type

	Number of Subjects	Mean Weekly Score	Mean Second Week Score	Mean Sixth Week Score
No comorbidities	163	6385	5459	7272
One comorbidity	131	6202	4968	7229
Two comorbidities	33	6508	4642	7946
Three comorbidities	15	5821	4080	6390
Anxiety D/O, OCD, PTSD	44	6474	5511	7496
Mood	37	6449	4128	7802
ODD	45	3973	3446	4438
PDD, aspergers, autism spectrum	26	4780	2488	5763
Tic-Tourettes	22	6661	4325	8068
Learning disorder	42	7909	6261	9407

Children with comorbid anxiety scored 734.27 lower than children with ADHD alone, though this difference may range from -2613.69 to 1145.16 points. The difference associated with an anxiety comorbidity was not statistically significant (Beta = -734.27; T = -0.7667; df = 198; p = 0.44). Children with mood comorbidities scored 394.44 lower than subjects with ADHD alone, though this difference may range from -2366.29 to 1577.4 points. The difference associated with a mood comorbidity was not statistically significant (Beta = -394.44; T = -0.3926; df = 190; p = 0.69). Children with any one comorbid diagnoses scored 358.02 lower than children with ADHD alone; children with two comorbid diagnoses scored 189.46 higher and those with three comorbidities scored 843.59 lower than those with no comorbidities. None of these comparisons, however,

demonstrated statistical significance (Beta1 = -358.02; T1 = -0.5346; df1 = 335; p1 = 0.59; Beta2 = -189.46; T2 = -0.1726; df2 = 335; p2 = 0.86; Beta3 = -843.59; T3 = -0.5461; df3 = 335; p3 = 0.59:.) It would appear that, although the pathologies and symptomatic behaviors of the various comorbidities differed, the treatment program showed similar results over all of the diagnoses and may be of benefit to children with any of these comorbid diagnoses, see Table 13. For complete model summaries of linear mixed effects for each comorbidity type and total weekly scores, see Appendix E.

Table 13

Linear Mixed Effects Model Summary for Total Weekly Points and Comorbidity

Factor	Level	Beta	SE	Lower	Upper	T	P-value (T)
Anxiety D/O, OCD,							
PTSD	Yes vs. No	-734.3	957.8	-2613.7	1145.16	-0.7667	0.44
Mood	Yes vs. No	-394.4	1004.8	-2366.3	1577.40	-0.3926	0.69
ODD	Yes vs. No	-2048.7	1002.4	-4015.8	-81.64	-2.0438	0.041
PDD, aspergers,							
autism spectrum	Yes vs. No	-1145.0	1212.6	-3524.8	1234.86	-0.9442	0.35
Tic-Tourettes	Yes vs. No	532.2	1274.7	-1969.5	3033.85	0.4175	0.68
Learning disorder	Yes vs. No	884.0	921.4	-924.1	2692.02	0.9594	0.34
Number of							
Comorbidities	1 vs. 0	-358.0	669.7	-1671.6	955.53	-0.5346	0.59
	2 vs. 0	-189.5	1098.0	-2343.0	1964.08	-0.1726	0.86
	3 vs. 0	-843.6	1544.8	-3873.6	2186.44	-0.5461	0.59

Summary

This chapter presented the analyses for each of the four research questions. Overall findings suggest that the total weekly points did not differ by comorbidity status, in that subjects with comorbid diagnoses demonstrated the same improvement in scores as subjects without additional comorbidities. Males had significantly lower total scores than females; however, while older subjects scored consistently higher than younger subjects, these differences were not significant. Children with a dual diagnosis of ADHD and ODD were the only children with comorbidities who evidenced significantly lower total points compared to children with no comorbidities. Furthermore, weekly scores were shown to improve steadily from week two through week six.

CHAPTER V

DISCUSSION

This chapter presents a discussion of the dissertation results. After the results for each research question are presented along with a general discussion, the implications that follow from the findings are explicated. Then, a discussion of the possible limitations of this study is outlined. Finally, this chapter ends with recommendations for future research and a general conclusion statement.

Discussion of Results per Research Question

Research question one. Children diagnosed with ADHD alone, who attended an intensive summer treatment program, did not differ in treatment outcomes from those children diagnosed with ADHD and at least one comorbid mental health diagnosis. When comparing average total points earned during each week of the STP, while children with ADHD only began and ended the program earning more points than children with ADHD plus comorbidity, these differences were not statistically significant. In both groups, average weekly point totals improved consistently from week two through week six. This demonstrates the efficacy of the STP for all children diagnosed with ADHD regardless of the presence of a dual diagnosis.

One interesting finding involved the lack of an interaction effect between the presence of comorbidity and week of the program. Children who do not demonstrate positive responses to the basic behavioral program are typically placed on an Individualized Treatment Plan (ITP), and children with comorbidities are usually those requiring individualized treatment. Given that an ITP is usually implemented only after sufficiently illustrating that the regular elements of the STP are not resulting in positive behavioral changes, an ITP is typically not initiated until the third or fourth week of the program. As such, it may have been predicted that children with comorbidities would take longer into the 7-week program to show positive responses. The lack of an interaction effect, therefore, may provide evidence that the process of implementing ITPs levels the proverbial playing field for children with ADHD and significant comorbidities

Research question two. Among males and females diagnosed with ADHD and a comorbid mental health issue, males were out performed by females and therefore differed in their treatment outcomes. Unlike the results of the first research question, when comparing average total points earned during each week of the STP, the differences in points earned were statistically significant, and females earned more points than their male counterparts. While females with ADHD comorbidity began and ended the program earning more points than males with ADHD comorbidity, the average weekly point totals of both genders improved consistently from week two to week six. The finding that females consistently earned more points than males is interesting when considering the prevalence rates of ADHD generally and which subtype of ADHD is most common among girls versus boys.

While the male-female ratio of the sample (3.5:1) was comparable to the ratios estimated in the DSM-IV-TR (2:1 to 9:1; American Psychiatric Association, 2000), one variable not included in these analyses involved ADHD diagnostic subtype by gender. This may be relevant in that females are more commonly diagnosed with ADHD Predominantly Inattentive Subtype than males, who are most often diagnosed with ADHD Combined Subtype or ADHD Predominantly Hyperactive/Impulsive Subtype (American Psychiatric Association, 2000). In this sample, of the 79 female subjects, 10% (n=8) had a primary diagnosis of ADHD Predominantly Inattentive Subtype, whereas 14 of the 266 male subjects (5%) had a primary diagnosis of ADHD Predominantly Inattentive Subtype. As such, this difference may have accounted for the finding that males earned fewer points overall than females. Here, it would be expected that children with primarily inattentive symptoms, as compared to those with primarily hyperactive and impulsive symptoms, would exhibit fewer rule violations overall and, therefore, would lose fewer points during the treatment program.

Research question three. While there were age group differences in treatment outcomes with children diagnosed with ADHD comorbidity, the differences were not statistically significant. Results from this dissertation illustrated that older children earned more points on average than younger children. This finding is consistent with previous research (Manos, et al. 2012) that suggests older children enrolled in the STP exhibit more positive and less negative behaviors than younger children. The normative behavior data collected by Pelham et al. (1998) demonstrated that even children without a diagnosis of ADHD show a similar developmental trend, in that older children (i.e., ages 10-12) exhibit fewer negative behaviors (e.g., violating activity rules, interruption, poor

sportsmanship) and more positive behaviors (e.g., helping, sharing, ignoring) than younger children (i.e., ages 7-10). Therefore, given that children earn points for positive behaviors and lose points for negative behaviors, it is not surprising that younger subjects were found to earn significantly fewer total points on average as compared to older subjects.

Research question four. With the exception of children dually diagnosed with ADHD and ODD, children with other comorbid diagnoses and ADHD, who attended an intensive summer treatment program, did not differ in treatment outcomes as measured by total average points earned. Therefore, the overall findings suggested that total weekly points neither differed by comorbidity types nor number of comorbidities. Similarly, the number of diagnosed comorbidities did not significantly affect children's earned total average points. Furthermore, weekly scores were shown to improve steadily from week two through week six, regardless of presence or number of comorbidities. Similar to the findings of the first research question, regardless of the number of comorbidities, children's average weekly point totals improved consistently from week two through week six, which again provides further support for the efficacy of the STP.

Interestingly, extant research has demonstrated that one of the most common ADHD comorbidities is ODD (Efron & Schibberas, 2010). Given this finding, combined with the fact that children with ODD exhibit significantly more clinical oppositionality than children with ADHD only, it is not surprising that the participants in this study with ADHD plus comorbid ODD earned the fewest amount of total points compared to children with other ADHD comorbidities, which was statistically significant. Additionally, it is also important to consider the influence of group interactions and group

composition as it relates to the findings. In this dissertation, children with ADHD and ODD comprised the greatest number of subjects with ADHD comorbidity. Again, given the finding that children dually diagnosed with ADHD and ODD scored significantly fewer points, the findings are consistent with similar research (Macgowan & Wagner, 2005) which suggests groups with higher percentages of children with disruptive behavior disorders (such as conduct disorder and ODD) display greater antisocial behavior in groups.

Another interesting finding is that children diagnosed with ADHD plus LD consistently earned more points than children diagnosed with ADHD plus any other comorbidity. This supports previous research that found that girls diagnosed with ADHD and LD have few behavioral problems relative to those with a diagnosis of ADHD only (Marks et al., 2002). Furthermore, given the clinical difficulties involved in differentiating symptoms associated with ADHD versus those associated with LD, this finding may provide evidence that children with learning disabilities may be improperly diagnosed with comorbid ADHD. Consider, for example, a child with a reading disorder who avoids homework, has difficulty focusing on homework, and needs almost constant redirection during academic tasks. Without the extensive psychological testing that is required in order to confirm ADHD symptoms across multiple domains, this type of child may incorrectly be labeled as ADHD Predominantly Inattentive Subtype.

Implications/Suggestions for Future Research

This research is important for several reasons. It suggests that clinicians providing intensive behavioral treatments like the STP may include children with ADHD only and those with ADHD and most comorbidities without fear that the latter group of

children will not benefit. Future research, however, should explore other mediating and/or moderating factors that may account for positive outcomes of children diagnosed with ADHD and other comorbidities. For example, by comparing children in the STP diagnosed with ADHD alone to children with multiple diagnoses or comorbidities, better treatment matching may be gained and may also reduce some of the clinical uncertainty that exists in the literature with regard to treatment options. Certainly, these potential findings may lead to additional research and treatment studies, as well as provide support for the clinical process of matching patients to treatment in the future. Also, children diagnosed with ADHD, including those with comorbidity, show improvement when enrolled in a comprehensive treatment program like the STP. Although in some cases the findings were not statistically significant based on the key dependent variable (i.e., total average points earned each week), the findings did reveal that clinically meaningful changes were made by the children enrolled in the STP. If a child is able to increase his or her average total points earned week to week, then it would be evidence of clinical improvement. More importantly, these findings indicate that the comprehensive interventions offered by the STP resulted in similar clinical outcomes regardless of gender, comorbidity type, and comorbidity number.

The near significant difference found across age may have important clinical implications for practitioners working with children diagnosed with ADHD via positive behavioral programming, especially when considering a patient's developmental and chronological age. Developmentally, older children may be more likely to shape their behaviors under the type of positive behavioral contingencies offered in the STP given the greater importance that they place on social acceptance. Additionally, the amount of

an individual's social awareness has been demonstrated to be maturational in nature, and this finding is present with or without a diagnosis of ADHD. In other words, as all children develop, they become more socially aware and, therefore, are more likely to adapt their behavior to fit the situation. This finding may be even more pronounced in children diagnosed with ADHD, who often lag behind their similar-aged peers from a social-developmental perspective. In the same manner, when planning for behavioral interventions, practitioners may anticipate the need to manage more challenging and disruptive behaviors from children diagnosed with ADHD plus ODD relative to their ADHD only counterparts. Once again, findings indicated that children with ADHD plus ODD earned fewer overall points, which suggests that they may present with more negative behaviors and therefore require more clinical attention.

Future research may also focus on treatment outcomes for children who return for multiple years to the STP, as compared to just one year. No such research has been conducted to date. It may be hypothesized that children who return for additional years of the summer treatment program would show significant differences in treatment outcomes compared to those who attend only one time. Specifically, multiple exposures to the STP may result in more improvement year to year. However, there may also be a plateau effect expected, such that children who return for several consecutive years fail to make additive gains year to year. Clinically, this would be invaluable information for practitioners to share with parents, teachers, and providers who may be struggling with the important decision of whether to reenroll their child, student, or patient for another year or years. Possible variables to explore within this research question include baseline severity of ADHD, parent sense of competence, treatment adherence (both parent and

child), and family resources. All of these factors may influence not only a child's need to return for another round of treatment, but also a family's ability to do so.

Finally, when considering the value of an intensive treatment program such as the STP, future studies may explore not only the clinical implications for children with comorbid ADHD, but may focus on the practical implications including the transfer of treatment and generalizability of treatment gains to both the home and school settings for parents and educators. As related to the home setting, future study may look at treatment outcomes based on the level of parent involvement as possibly measured by the number of parent training sessions and booster trainings attended by the parents of children with comorbid ADHD. It may be hypothesized that children whose parents attended and fully participated in the STP training and booster sessions would show significant differences in treatment outcomes compared to those whose parent/s that did not. Home assessments could also be developed to assess generalizability of STP behaviors to the home environment.

Future study may also explore the relationship between children attending an intensive behavior program and academic achievement. Possible variables to explore within this future research question include: total STP points earned, school behavior reports, school suspension/expulsion data, and academic grades. Ultimately this future research may shed light onto the efficacy of an intensive behavior treatment program when transferred to the school settings. For parents and teachers working with or who have children with ADHD comorbidity, the questions and answers learned would be valuable information.

Limitations

Just as this chapter acknowledged implications, limitations do exist. For example, not controlling for the program year, site location, and the use of psychotropic medication and status in the analyses could be viewed as limitations. First, due to the fact that the Summer Treatment Program was manualized and contained ongoing fidelity checks, it is understood that the quality and content of the program was constant from year to year and therefore the program year was not controlled for. Similarly, it was assumed that there were no systematic differences between site locations and the quality and content of the site locations were similar from year to year, therefore site location was not controlled for. Psychotropic medications were not controlled for in this dissertation as well. The focus of this dissertation was on the outcomes of children with ADHD enrolled in an intensive behavioral program by age, gender, and comorbidity regardless of whether they were prescribed psychotropic medication. While researchers may wish to further examine the impact of medications, extant research has already demonstrated the efficacy of both medication only (American Academy of Child and Adolescent Psychiatry, 2007) and behavioral only treatment for ADHD.(Pelham & Fabiano, 2008) Combined treatment (i.e., implementing medication and behavioral treatment concurrently; American Academy of Pediatrics, 2001) continues to be the gold standard of care in the treatment of ADHD, and whether or not combined treatment resulted in more improvement was not one of the research questions of this study.

Another limitation involves the fact that this sample included data collected during two STP years that involved research studies carried out within the context of the program. In one study conducted by Fabiano et al. (2004), the time-out procedures

utilized to manage more severe behaviors (e.g., repeated noncompliance, intentional aggression, and intentional destruction of property) were varied in order to determine their efficacy. In the other study conducted by Pelham et al. (2005), some children participated in a multi-site, double-blind trial that involved various doses of a transdermal methylphenidate patch and placebo. Data collected during such summers were not excluded from this analysis. As part of the typical treatments available to all children in the STP, parents were given the option to enroll their children in double-blind, psychostimulant medication trials with or without placebo. Unlike the aforementioned research trials, the medication trials were offered as a clinical service to parents of children who were naïve to medication management. Parents and STP staff members completed rating scales to determine a child's response to and tolerability of varying doses of medication and, when appropriate, compared to a placebo. In all three of these instances, the archival database utilized for the present analyses did not include variables that would identify children who may have participated. Therefore, it was neither possible to exclude such participants, nor control for them in the models.

Demographically, the participants in this dissertation represent a more homogeneous group lacking a robust ethnically and socio-economically diverse pool. Likewise the archived data was from middle to higher socio-economic classes and from a largely Caucasian racial background; therefore, inferences made or findings that are applied to the general ADHD comorbidity population must be done with caution. Another limitation lies within the comprehensive treatment program itself. It was not possible to identify children in the program for whom ITPs were developed, and,

therefore, future research may benefit from including this information so that a direct analysis can be conducted.

Another possible limitation involves the screening process used for acceptance into the STP, whereby children with more severe comorbidities may have been screened out. This may have resulted in the lack of finding a significant difference between the ADHD only and the ADHD Comorbidity groups (i.e., Type II error). Additionally, this may have important clinical implications for future practice, as it would be beneficial to better understand the impact that a child's comorbidity severity may have on positive outcomes. Additionally, quite similar to research question #1, and with the exception of ODD, the absence of significant differences across other comorbidities in research question #4 may have been impacted by the screening process, whereby children with more severe expressions of mood, conduct, PDD, etc. were screened out of the STP. Had these children been accepted into the STP and included in these analyses, differences may have been uncovered, and researchers are encouraged to investigate this further.

Finally, a highly intensive intervention is quite structured and costly, and the program is often difficult to replicate. Therefore, generalizing the positive results of the STP treatment to the home and other school settings may be difficult. However, with the current push for practitioners and teachers to utilize evidence-based treatments, more studies ought to be conducted in naturalistic settings that incorporate certain elements of the STP. This may allow for stronger claims of generalizability.

Conclusion

This dissertation has moved toward answering important questions regarding treatment outcomes for children diagnosed with ADHD and comorbid diagnoses. Both

children diagnosed with ADHD and those with ADHD plus a dual diagnosis showed improvements over the course of the 7-week Summer Treatment Program, as children in both groups earned more points from weeks two to six. By examining 14 years of archival treatment data, this research provides additional support for treatment matching of children with ADHD regardless of their gender, age, or presence of comorbidity. This dissertation also provides evidence of the clinical utility of the STP for children diagnosed with ADHD. Given that ADHD comorbidity is almost the rule rather than the exception, this study provides additional support for the efficacy of the STP regardless of the presence, type, or number of comorbidities.

In closing, one of the most common arguments against a manualized program like the STP involves its lack of individualization. Those who argue against manualized treatments suggest that such programs do not allow clinicians to adjust treatment in order to meet the needs of their patients. However, the results of this dissertation suggest that efficacious, manualized programs actually include individualized treatment as a core component. Although highly regimented in its design and implementation, the STP allows for the type of adjustment that is required based on each patient's unique needs.

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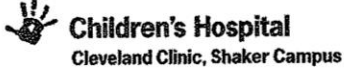
Washington, DC: American Psychological Association.

APPENDICES

APPENDIX A
PERMISSION TO USE LETTER

APPENDIX A

PERMISSION TO USE LETTER



Michael J. Manos, Ph.D.
Head, Center for Pediatric Behavioral Health
Director, ADHD Center for Evaluation and Treatment

January 31, 2011

Anthony Pizzuti
2659 Milton Rd
University Hts., OH 44118

Dear Mr. Pizzuti,

Your request for use and analysis of data from the Summer Treatment Program (STP) for your final dissertation at Cleveland State University is approved. Data collected through the Summer Treatment Program of The Cleveland Clinic Foundation has received IRB approval under our registry database entitled *Prospective and Retrospective Chart Review of Physician Prescribed Psychostimulant Treatment in Pediatric Practice* (IRB #4901). I can be reached at 216-445-7574 should you need further assistance

Sincerely,

A handwritten signature in black ink, appearing to read "M. Manos".

Michael J. Manos, PhD
Head, Center for Pediatric Behavioral Health
Pediatric Institute / Cleveland Clinic Foundation

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Pediatric Behavioral Health

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Cleveland, OH 44104

Tel 216 445-7574
Fax 216 448-6087

APPENDIX B
CSU IRB APPROVAL

APPENDIX B

CSU IRB APPROVAL



MEMORANDUM

Date: April 20, 2012
To: Sarah Toman CASAL
From: Barbara A. Bryant IRB Coordinator Barbara
Re: Renewal Notice of IRB Approval to Use Human Subjects

According to our records, the IRB approvals for the protocol listed below will expire as below:

Transaction No. 29318-TOM-HS Approval Expiration: May 25, 2012
Title: Treatment outcomes of the summer treatment program for children with ADHD and Comorbid Mental Health
Co-PI/Student: Anthony Pizzuti

As such, the following items must be completed, and this form returned to Office of Sponsored Programs & Research (OSPR), Parker Hannifin Hall, 3rd floor, no later than ten (10 days from the date of this letter or our office will consider the protocol closed and remove it from our active files.

- 1. This project is (X) Active and research will continue under this protocol. () Inactive or Complete
2. Has there been any change of investigators conducting this study? () Yes (X) No

If yes, please indicate the additional or deleted investigator(s) below:

- 3. Has there been any change in procedure, design, tools, methodology, or subjects since the last review of your protocol? () Yes (X) No
4. Have any unexpected or adverse developments or problems occurred during the course of this research? () Yes (X) No

If yes, please give details on reverse side or attach a separate sheet.

Signature of Principal Investigator/Faculty Supervisor

Date 4-24-12

Renewal Approved By: John Jeziorowski, Chair, IRB

Date 05-07-12

APPENDIX C
STATISTICAL METHODOLOGY

APPENDIX C

STATISTICAL METHODOLOGY

Research Questions	Variables	Statistical Analysis
Do children diagnosed with ADHD alone, who attend an intensive summer treatment program, differ in treatment outcomes from those children diagnosed with ADHD comorbidity?	Dependent STP point system Rate of change Independent ADHDType Comorbidity type	Linear Mixed Effects Methods
Do males diagnosed with ADHD comorbidity who attend an intensive summer treatment program, differ in treatment outcomes from females with ADHD comorbidity?	Dependent STP point system Rate of change Independent Gender	Linear Mixed Effects Methods
Are there age group differences in treatment outcomes with children diagnosed with ADHD comorbidity, who attend an intensive summer treatment program?	Dependent STP point system Rate of change Independent Comorbidity Types Age group	Linear Mixed Effects Methods
Do children with different comorbid diagnoses and ADHD, who attend an intensive summer treatment program, differ in treatment outcomes?	Dependent STP point system Rate of change Independent ADHDType	Linear Mixed Effects Methods

APPENDIX D

TABLES OF MODEL SUMMARY FOR TOTAL WEEKLY POINTS

APPENDIX D

TABLES OF MODEL SUMMARY FOR TOTAL WEEKLY POINTS

Model Summary for Total Weekly Points (Anxiety Comorbidity).

Factor	Level	Beta	95% Confidence Interval	T	P-value (T)
(Intercept)		-677.0	(-5139.07, 3784.96)	-0.30	0.77
Anxiety D/O, OCD, PTSD	Yes vs. No	-734.3	(-2613.69, 1145.16)	-0.77	0.44
Week/time	3 vs. 2	443.9	(-294.25, 1182.16)	1.18	0.24
	4 vs. 2	1325.8	(595.32, 2056.18)	3.56	< 0.001
	5 vs. 2	1250.2	(515.8, 1984.63)	3.34	< 0.001
	6 vs. 2	1856.7	(1117.25, 2596.07)	4.93	< 0.001
Age		2505.1	(1096.87, 3913.27)	3.49	< 0.001
Race	Other vs. Caucasian	492.2	(-1142.59, 2127)	0.59	0.55
Gender	Male vs. Female	-1389.5	(-3143.41, 364.44)	-1.55	0.12

Model Summary for Total Weekly Points (Mood Comorbidity).

Factor	Level	Beta	95% Confidence Interval	T	P-value (T)
(Intercept)		-1000.8	(-5340.23, 3338.58)	-0.45	0.65
Mood	Yes vs. No	-394.4	(-2366.29, 1577.4)	-0.39	0.69
Week/time	3 vs. 2	641.8	(-126.29, 1409.86)	1.64	0.10
	4 vs. 2	1583.8	(825.33, 2342.2)	4.10	< 0.001
	5 vs. 2	1576.9	(817.24, 2336.56)	4.07	< 0.001
	6 vs. 2	2103.6	(1335.49, 2871.75)	5.37	< 0.001
Age		832.2	(380.1, 1284.38)	3.61	< 0.001
Race	Other vs. Caucasian	319.9	(-1323.97, 1963.83)	0.38	0.70
Gender	Male vs. Female	-1126.4	(-2917.8, 665.06)	-1.23	0.22

Model Summary for Total Weekly Points (Oppositional Defiance Disorder).

Factor	Level	Beta	95% Confidence Interval	T	P-value (T)
(Intercept)		-3031.82	(-7698.38, 1634.74)	-1.27	0.20
ODD	Yes vs. No	-2048.70	(-4015.76, -81.64)	-2.04	0.041
Week/time	3 vs. 2	394.02	(-432.61, 1220.65)	0.94	0.35
	4 vs. 2	1065.70	(246.5, 1884.89)	2.55	0.011
	5 vs. 2	1142.91	(322.44, 1963.39)	2.73	0.006
	6 vs. 2	1574.41	(745.16, 2403.66)	3.73	< 0.001
Age		1085.31	(597.6, 1573.01)	4.37	< 0.001
Race	Other vs. Caucasian	34.92	(-1705.14, 1774.97)	0.04	0.97
Gender	Male vs. Female	-655.06	(-2569.95, 1259.82)	-0.67	0.50

Model Summary for Total Weekly Points (PDD, aspergers, autism spectrum).

Factor	Level	Beta	95% Confidence Interval	T	P-value (T)
(Intercept)		-1339.2	(-5831.16, 3152.66)	-0.59	0.56
PDD, aspergers, autism spectrum	Yes vs. No	-1145.0	(-3524.84, 1234.86)	-0.94	0.35
Week/time	3 vs. 2	653.1	(-142.4, 1448.55)	1.61	0.11
	4 vs. 2	1468.6	(681.03, 2256.2)	3.66	< 0.001
	5 vs. 2	1497.8	(707.6, 2288.05)	3.72	< 0.001
	6 vs. 2	1959.4	(1159.77, 2759.07)	4.81	< 0.001
Age		885.9	(421.5, 1350.34)	3.74	< 0.001
Race	Other vs. Caucasian	542.3	(-1268.56, 2353.11)	0.59	0.56
Gender	Male vs. Female	-1278.7	(-3223.95, 666.52)	-1.29	0.20

Model Summary for Total Weekly Points (Tic-Tourettes Comorbidity).

Factor	Level	Beta	95% Confidence Interval	T	P-value (T)
(Intercept)		-574.8	(-5166.07, 4016.42)	-0.25	0.81
Tic-Tourettes	Yes vs. No	532.2	(-1969.45, 3033.85)	0.42	0.68
Week/time	3 vs. 2	507.1	(-312.37, 1326.63)	1.21	0.22
	4 vs. 2	1428.2	(618.38, 2237.94)	3.46	< 0.001
	5 vs. 2	1543.2	(732.06, 2354.45)	3.73	< 0.001
	6 vs. 2	1982.2	(1161.25, 2803.26)	4.74	< 0.001
Age		783.8	(306.48, 1261.08)	3.22	0.001
Race	Other vs. Caucasian	550.0	(-1221.66, 2321.62)	0.61	0.54
Gender	Male vs. Female	-1134.2	(-3062.67, 794.25)	-1.15	0.25

Model Summary for Total Weekly Points (Learning Disorder Comorbidity).

Factor	Level	Beta	95% Confidence Interval	T	P-value (T)
(Intercept)		-1125.6	(-5347.38, 3096.27)	-0.52	0.60
Learning disorder	Yes vs. No	884.0	(-924.06, 2692.02)	0.96	0.34
Week/time	3 vs. 2	508.3	(-236.82, 1253.35)	1.34	0.18
	4 vs. 2	1294.0	(559.18, 2028.9)	3.46	< 0.001
	5 vs. 2	1554.4	(818.39, 2290.41)	4.14	< 0.001
	6 vs. 2	2054.4	(1310.46, 2798.38)	5.42	< 0.001
Age		860.2	(424.04, 1296.47)	3.87	< 0.001
Race	Other vs. Caucasian	546.8	(-1004.09, 2097.76)	0.69	0.49
Gender	Male vs. Female	-1234.0	(-2931.34, 463.35)	-1.43	0.15

Model Summary for Total Weekly Points (Number of comorbidities).

Factor	Level	Beta	SE	95% Confidence Interval	T	P-value (T)
(Intercept)		-0.07	1808.9	(-3547.96, 3547.81)	0.00	> 0.99
Number of Comorbidities	1 vs. 0	-358.02	669.7	(-1671.58, 955.53)	-0.53	0.59
	2 vs. 0	-189.46	1098.0	(-2342.99, 1964.08)	-0.17	0.86
	3 vs. 0	-843.59	1544.8	(-3873.62, 2186.44)	-0.55	0.59
Week/time	3 vs. 2	793.00	296.7	(211.11, 1374.89)	2.67	0.008
	4 vs. 2	1419.20	293.2	(844.2, 1994.19)	4.84	< 0.001
	5 vs. 2	1735.13	294.1	(1158.26, 2312.01)	5.90	< 0.001
	6 vs. 2	2177.07	295.3	(1597.86, 2756.28)	7.37	< 0.001
Age		755.80	183.6	(395.65, 1115.95)	4.12	< 0.001
Race	Other vs. Caucasian	-126.02	682.8	(-1465.21, 1213.16)	-0.18	0.85
Gender	Male vs. Female	-1482.08	749.0	(-2951.06, - 13.09)	-1.98	0.048