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Understanding the Contributions of Family Processes to Educational Outcomes for Children with ADHD: A Longitudinal Analysis

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Understanding the Contributions of Family Processes to Educational Outcomes for Children with ADHD: A Longitudinal Analysis

by

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Abstract

Children with Attention Deficit Hyperactivity Disorder (ADHD) are at elevated risk for a host of negative educational outcomes compared to their typically developing peers. Families coping with ADHD are also less involved in their child's education and have more impaired parent-child relationships compared with families without a child with ADHD. Existing interventions targeting educational outcomes have typically focused on improving skills or performance deficits; however, there has been little focus on the ecological context in which interventions have been implemented. More research is needed that investigates the interrelationships between the child with ADHD, important family, school, and family-school processes, and educational outcomes. The present study proposed a model based on the extant literature and used structural equation modeling to investigate the ways in which the processes of family involvement in education and the parent-child relationship are related to classroom behavior and academic performance. The study used a sample of students with ADHD who participated in a previously completed family-school intervention. It was hypothesized that the explanatory model will fit the data well and that more parental involvement in education and stronger parent-child relationships would be associated with better classroom behavior and academic performance over time. The results of model testing showed that parent ratings of increases in negative parenting practices were associated with teacher rated decreases in classroom behavior and academic outcomes. Also, increases in parent rated self-efficacy to be involved in their child's education was associated with teacher-rated improvements in child academic performance. Suggestions for future research in this area is discussed, as well as implications for practitioners.

Chapter 1

Statement of the Problem

Youth with Attention Deficit Hyperactivity Disorder (ADHD) exhibit developmentally inappropriate rates of inattention, hyperactivity, and impulsivity compared with their nondisabled peers (American Psychiatric Association, 2000). These symptoms often cause impairments in the academic, social, and behavioral domains of functioning (Barkley, 2006; DuPaul & Stoner, 2003). Most of the intervention literature has been dedicated to pharmacological and behavioral treatments to reduce the symptoms of ADHD; however, simply reducing the symptoms of ADHD has not been shown to evidence differences in the aforementioned functional impairments for this population (DuPaul & Stoner, 2003; Fabiano et al., 2010; Fabiano & Pelham, 2008; MTA Cooperative Group, 1999, 2004). This indicates that interventions that focus directly on ameliorating skill and performance deficits within this at-risk population are needed. Interventions that target functional impairments in the educational realm are of particular importance due to the overlap between the three core areas of functional impairment, their prevalence within the population of students with ADHD, and the negative outcomes with which they are associated. In the school setting, children with ADHD often present with higher rates of off-task and disruptive behaviors than their nondisabled peers, and these behavior problems are associated with poor relationships between students with ADHD and both their peers and teachers (Raggi & Chronis, 2006).These youths' academic performance is also impacted during the homework routine, with problems worse for older students (Booster, DuPaul, Eiraldi, & Power, 2012). These symptoms and functional impairments put children with ADHD at increased risk for lower reading, math, and spelling scores (Massetti et al., 2008) and school drop-out (Barbaresi et al., 2007; Loe & Feldman, 2007).

Empirical research in this area continues to grow, with over 120 published studies addressing the educational functioning of youth with ADHD now available (DuPaul, Eckert, & Vilardo, 2012). DuPaul et al. (2012) conducted a meta-analysis which showed that mean effect sizes for behavioral (2.20) and academic (3.48) outcome measures were positive and significant in single subject design research. When within-subject designs were used, behavioral and academic outcome measures were positive, but only behavioral outcome measures were statistically significant (0.72 and 0.42, respectively). The mean effect size for between-subjects design studies were 0.18 for behavior outcomes and 0.43 for academic outcomes; these effect sizes were not statistically significant. Although there are effective psychosocial interventions to address educational difficulties in the ADHD population, one area of weakness as it relates to interventions within this population is that they have often taken a "one size fits all" approach. Many of the interventions have been developed to address singular functional impairments within the ADHD population without regard for ecological context. Because of this approach to intervention development and implementation, we are less able to evaluate the mechanisms of action which bring about meaningful change for children and families coping with ADHD. Put simply, for all we know about "what" works (i.e., psychosocial interventions), we know surprisingly little about how, in what setting, and in what ecological context they work, and also what dose of these interventions are needed to bring about meaningful change in valuable outcomes.

Evaluating these studies in context, extant psychosocial interventions have varied along four dimensions: intervention package, setting of intervention, delivery format, and target behaviors of intervention. With regard to the intervention used, there is extensive support for psychosocial interventions used in the ADHD population. Pelham and Fabiano (2008) found that

well-established psychosocial treatments for children with ADHD include behavioral parent training, behavior contingency management, and behavioral peer interventions (when implemented in summer treatment programs). Although less often studied, there is also evidence that skill building interventions have a positive effect on academic performance within the ADHD population (DuPaul, Ervin, Hook, & McGoey, 1998; Clarfield & Stoner, 2005; Mautone, DuPaul, & Jitendra, 2005; Ota & DuPaul, 2002). Similarly, interventions using behavioral strategies which address poor homework performance have also been shown to improve homework outcomes (Goldberg, Merbaum, Even, Getz, & Safir, 1981; Habboushe, Daniel-Crotty, Karustis, Leff, Costigan, Goldstein, ...Power, 2001; Landers, 1984). The ecological factors associated with the implementation of these evidence-based treatments have varied along three dimensions. First, these interventions vary by the system level of implementation. Interventions have been targeted on outcomes relevant to either the home or school setting. Second, the delivery format of interventions has also varied. Group, consultative, and individual formats have all been used, and many interventions utilize multiple modes of implementation. Third, interventions vary in two main ways with regard to the target of intervention: those interventions targeted on direct skill building and those interventions targeted on performance support.

To summarize, studies are needed that use the psychosocial interventions that have been shown to be effective in ways that are expressly designed for implementation within a framework that expressly acknowledges the importance of the ecologies which affect children with ADHD. Research emanating from this framework provides the opportunity to better understand these ecologies and the ways in which psychosocial interventions can be implemented with optimal effectiveness and efficiency. In order to achieve improvements in the

effectiveness and efficiency of processes to target for intervention, research using this framework as a guide must also focus on identifying key process variables that are amenable to change and that are likely to lead to the desirable educational outcomes.

Addressing the Gaps in the Extant Literature.

. Power, Mautone, Soffer, Clarke, Marshall, Sharman, and colleagues (2012) have recently concluded a study that improved upon the previous treatment literature for homework outcomes within the population of children with ADHD. The Family School Success (FSS) program investigated in this project is a family-school program that incorporated strategies to improve parenting skills as well as promote family-school collaboration, parent involvement in education, and school functioning with regard to academic engagement and productivity. These key processes were identified by Power and colleagues as key process variables that are amenable change and are likely to lead to desirable educational outcomes.

The FSS intervention package (Table 1) was comprised of 12-sessions implemented across 12 consecutive weeks with a 3-month follow-up phase. The intervention components included in the FSS intervention are all evidence-based. As mentioned previously, there is a wealth of literature to support the use of behavioral parent training to improve parenting behaviors and reduce child behavior problems (Fabiano & Pelham, 2008; Fabiano, Pelham, Coles, Gnagy, Chronis-Tuscano, & O'Connor, 2009). Similarly, the homework intervention component included in the FSS intervention package included goal setting with contingency contracting, which has been shown to be an effective intervention to improve task completion in the population with ADHD (DuPaul & Stoner, 2003; Kahle & Kelley, 1994). Daily school-home notes have also been shown to be effective as a behavioral progress monitoring tool for students with ADHD. These daily notes serve to facilitate bidirectional communication between parents

and teachers on students' behavior through the use of operationally defined target behaviors (e.g., interrupting, noncompliance) and associated behavioral goals (e.g., three or fewer instances of a target behavior during a period of instruction). The student is evaluated daily based on behavioral performance and contingencies are administered based on whether the student achieved the behavioral goals. This intervention system has been shown to be effective reducing the rates of undesirable behaviors of students with ADHD receiving special education services (Fabiano, Vujnovic, Pelham, Waschbusch, Massetti, Pariseau, ...Volker, 2010), to be psychometrically acceptable as a progress monitoring tool (Fabiano, Vujnovic, Naylor, Pariseau, & Robins, 2009), and to be effective in improving attention and academic performance of students with ADHD in regular education classrooms with or without the use of response cost contingencies (Jurbergs, Palcic, & Kelley, 2007). Conjoint Behavioral Consultation (Sheridan & Kratochwill, 2008) is a structured problem solving approach that involves engaging relevant stakeholders (e.g., parents and teachers) to gain consensus on a plan of action and work through the stages of behavioral consultation. The use of CBC has been shown to work to improve the academic and behavioral functioning of students with ADHD (Murray, Rabiner, & Newitt, 2008; Sheridan, Eagle, Cowan, & Mickelson, 2001). The FSS intervention package was implemented using a combination of group, individual, and family-school formats, and included children in all sessions. These intervention delivery formats were selected with the ecology of families with ADHD in mind in order to facilitate optimal treatment efficacy.

Power et al. also included a comparison treatment, Coping with ADHD through Relationships and Education (CARE), that provided parent support and psychoeducation about ADHD to parents and controlled for nonspecific treatment effects, such as therapist time. Another unique design feature of the study design was that parents were able to opt for a

stimulant medication trial prior to attempting psychosocial treatment. This is mindful of the ecology of families coping with ADHD in that it simulates "real world" conditions and combines elements of both efficacy and effectiveness trials. Only those families with a child who continued to exhibit homework problems after the medication trial was considered eligible to participate in the study.

The study results indicated that approaching the development of the FSS intervention was efficacious in improving aspects of educational functioning. Participants assigned to the FSS group evidenced significantly more improvements than those assigned to the CARE group in quality of the family-school relationship, homework performance, and parenting behavior. This is a stringent test of such an intervention, considering that CARE was designed to control for nonspecific treatment effects, 40% of participants in both FSS and CARE were on an optimal dose of medication at the time of the study, and the significant improvements over time for both FSS and CARE groups on all outcome measures. The Power and colleagues study provides evidence that psychosocial treatments which are developed with the ecology of the child with ADHD in mind can improve educational outcomes. Considering that all measures showed significant growth over the duration of the study for both treatment groups, there is also an opportunity to further investigate mechanisms of action of family processes as they relate to educational outcomes within the entire sample. The next section provides a rationale for the importance of studying family processes in this way and offers two specific family processes that may represent mechanisms of action linked to educational outcomes for youth with ADHD.

The Relevance of Family Processes to the Educational Functioning of Youth with ADHD

Family processes, and the impact that they have on children's educational functioning, are as broad as they are empirically understudied. However, there are testable conceptual models

which are helpful for understanding the ecological context that the contributions that family processes have on children's educational outcomes. From a bioecological perspective (Bronfenbrenner & Morris, 2006), family processes have been described as just one component of the complex, often transactional, genetic and environmental interactions between parents and children that occur throughout the course of development. Bronfenbrenner and Morris (2006) contend that the family, school, and peer group systems are the relevant *microsystems* (i.e., ecosystems most proximal to the child) with which the child has the most interactions with throughout the school-age years. At the level of the *mesosystem* (i.e., those interactions between microsystems), interactions between the child's family, school, and peer group microsystems also have a salient impact on the child's educational outcomes. Bronfenbrenner and Morris call the interactions between both the child and salient microsystems *proximal processes*. These proximal processes are described as "the engines of development" and can either foster competence or dysfunction across domains of functioning, including those related to educational performance.

Similar conceptualizations of the complex relationships between the individual, the genetic makeup of the individual, and the environment over time have also been posited in developmental psychopathology as it relates to the contribution of the family system to both risk and protective factors for psychopathology (Cicchetti & Cohen, 2006). Within this framework, the contributions of genes and the environment over time at multiple levels of analysis is emphasized, as are the concepts that individuals with shared genetic and environmental predispositions ultimately express different impairments at a given point in development (i.e., *multifinality*) and those with diverse genetic and environmental predispositions also ultimately share expressions of the same impairments at a given point in development (i.e., *equifinality*).

Although the terminology differs between these two theoretical models (e.g., "genetic and environmental risk and protective factors" in developmental psychopathology instead of "proximal processes which foster competence or dysfunction" in bioecological theory), there is a shared theoretical underpinning that both adaptive and maladaptive outcomes at any point in the development of an individual is transactional and often amenable to change. This change can be accomplished through intervention to reduce or prevent risk factors for maladaptive outcomes and to foster protective factors against maladaptive outcomes. For this reason, empirical investigations are needed that examine the relative contribution of various genetic and environmental risk and protective factors to both desirable and undesirable outcomes. Once these salient factors are identified, they afford targets for interventions to improve outcomes.As it relates specifically to families coping with ADHD, one area of research that is needed is to identify risk and protective factors to educationally relevant outcomes. As stated previously, classroom behavior and academic performance are two key areas in which children with ADHD are impaired. Therefore, if we aim to improve child functioning in these areas through reducing risk factors and facilitating protective factors, we must begin by identifying such risk and protective factors. Then, we will be able to design and implement more effective and efficient interventions to remediate functional deficits in these domains of functioning. The following subsections will discuss two processes in the family system which have been shown to be risk factors to the educational outcomes of youth with ADHD when there is dysfunction.

Family Involvement in Education (FIE).

Studies have repeatedly shown that levels of FIE is positively related to child academic, behavioral, and psychosocial outcomes (Aeby, Manning, Thyer, & Carpenter-Aeby, 1999; Christenson & Sheridan, 2001; Miedel & Reynolds, 1999). The Hoover-Dempsey & Sandler

model of FIE (Walker, Wilkins, Dallaire, Sandler, & Hoover-Dempsey, 2005) posits that there are three main factors that are important for predicting whether parents will become involved in their child's education: a) motivational beliefs; b) perceived invitations to be involved; and c) perceived time, energy, skills, and knowledge to be involved. Research using the Hoover Dempsey and Sandler model has shown empirically that the model predicts a significant portion of the variance as it relates to FIE (Green, Walker, Hoover-Dempsey, & Sandler, 2007). Unfortunately, for parents of children with ADHD, there are typically more perceived barriers to involvement in education than parents of nondisabled students. For instance, Rogers, Weiner, Marton, and Tannock (2009) found that parents of children with ADHD had lower self-efficacy related to participation in their child's education, felt less welcomed, and reported less time and energy to be involved compared with a non-ADHD parent group. Of note, greater parenting stress and ineffective parenting practices were associated with higher inattentive symptom ratings and worse academic performance within this sample (Rogers, Wiener, & Marton, 2009).

Parent-Child Relationships (PCR).

Similarly, aspects of family relationships are often impaired for families coping with ADHD, including the PCR. For instance, children with ADHD rate their relationships with their parents as impaired with regard to problem-solving, communication, affective responsiveness, and affective involvement compared to children without ADHD (Ghanizadeh & Shams, 2007). This is often exacerbated by the fact that within these homes there is also more conflict among all family members, as well as diminished family cohesion, more negative interactions, and higher parent-rated child behavior problems compared to families without children with disabilities (Biederman, Milberger, Faraone, Keiley, Guite, Mick, …Davis, 2005, 1995; Drabick, Gadow, & Sprifkin, 2006; Wymbs & Pelham, 2010). These maladaptive behavior patterns have

detrimental impact on the family system, as evidenced by the fact that parents of children with ADHD, especially those with ADHD and elevated behavior problems, have a shorter latency to divorce than families without a child with ADHD (Wymbs Pelham, Molina, & Gnagy, 2008). Conversely, research in this area has also shown that better family cohesion, organization, expressiveness, parenting alliance, and lower levels of conflict are related to fewer child behavior problems (Harvey, 2000; Schroeder & Kelley, 2009).

In summary, FIE and PCR are two salient factors that, when impaired, are associated with negative educational outcomes. Research has demonstrated consistent positive correlations between high levels of FIE and better educational performance, and has also documented that parents of children with ADHD are less involved in their child's education due to more perceived barriers. With regard to PCR, children with ADHD rate their relationship with their parents as more impaired on average than their nondisabled peers with regard to the level of positive interactions as well as the level of negative and ineffective parenting practices used. The research literature has no known examples of investigations of the extent to which changes in these family processes are associated with changes in educational outcomes for children with ADHD over time. Indeed, few known studies which have investigated the relationships between FIE and educational outcomes have used longitudinal designs, and no studies investigating the relationship between PCR and educational outcomes have used such designs. The next section will delineate a testable theoretical model of the ways in which FIE and PCR are interrelated with changes in academic and behavioral functioning for students with ADHD over time.

Model of Interrelationships between Family Functioning and Educational Performance

Power and colleagues (2012) addressed gaps in the multimodal treatment literature for families coping with ADHD by placing an emphasis on improving aspects of family functioning

and by including a comparison group that controlled for nonspecific treatment effects. Embedded within the rationale to select interventions to target important family and family-school processes is the acknowledgement that these processes serve as risk or protective factors to child behavioral and academic outcomes. Power and colleagues tested whether the FSS intervention brought about statistically significantly different changes in levels of functioning between the FSS and CARE condition, which controlled for nonspecific treatment effects.

The study also affords the opportunity to investigate the ways in which changes in the family processes of FIE and PCR are interrelated with changes in behavioral and academic functioning throughout the course of the intervention. However, in order to evaluate this research aim, these mechanisms of action must be tested in a fundamentally different way. A model must be tested which evaluates the interrelationships between changes in the level of family processes over the course of the Power and colleagues (2012) study and changes in educational outcomes over the course of the study within the entire sample. The distinction is that this question primarily pertains to whether or not changes in these family processes are related to changes in educational functioning rather than whether the FSS intervention is more efficacious than the CARE intervention at improving these family processes.

As seen in Figure 1, the model that was tested in this investigation depicts graphically the ways in which aspects of FIE and PCR are hypothesized to be related both to each other and to school outcomes of classroom behavior problems (CBR) and academic performance (AP) over time. This study used the entire sample from the Power and colleagues (2012) study to investigate the interrelationships between these family processes and educational outcomes throughout the course of the study. Due to the design of the Power and colleagues study, we used the baseline, post-treatment, and follow-up waves of data collection to represent time in the

model, which gives a longitudinal level of analysis. Each of the four latent constructs (FIE, PCR, CBP, and AP) are modeled at each time point. Arrows in the figure represent correlations between these latent constructs. The associations with each other at each time point and subsequent time points are modeled, as are autoregressive relationships of each latent construct over time. Testing the model in this way also affords the opportunity to test interrelationships between family processes at each time point to give a cross sectional level of analysis as well longitudinal relationships between latent constructs, controlling for autoregressive effects of change within each construct over time. Due to the measurement collected in the Power and colleagues study, clarifications are warranted in terms of how the constructs of FIE, PCR, CBP and AP have been measured in the present study, and by extension, how fully these constructs delineated previously have been represented in the present study. The measures used and how they relate to each construct are discussed further in Chapter 3; the purpose of the following section is to describe the constructs represented in the model tested in the present study to enhance the context in which the results should be interpreted.

Family Involvement in Education. Hoover-Dempsey and colleagues conceptualize FIE as having three components that are salient in predicting caregivers' involvement behaviors: (a) parent motivational beliefs; (b) perceptions of invitations to become involved; and (c) perceived time, energy, and skills to be involved. Measures used in the Power and colleagues (2012) study adequately assess the domain of parent motivational beliefs, including role construction and self-efficacy. To a degree, measurement of aspects of the parent-teacher relationship employed in the study also address aspects related to the general invitations from the school (e.g., welcoming school climate) that are theorized to represent parents' perceptions of invitations to be involved (Hoover-Dempsey et al., 2005). Alternatively, the Power et al. (2012) study did not directly

measure parents' perceptions of explicit invitations from teachers and the child to become involved in educational activities as in other empirical investigations of the Hoover-Dempsey and Sandler model of FIE (Green et al., 2007, Rogers et al., 2009). Parents' perceived time, energy, and skills to be involved were not measured in the Power and colleagues study, and so FIE as measured in the present study does not represent the full FIE construct as theorized by Hoover-Dempsey and Sandler.

Parent-Child Relationship. The PCR in the present study was assessed using a measure of parent-rated use of discipline practices. Two aspects of the PCR are represented by the present study, one related to positive involvement practices as well as negative and ineffective discipline strategies. The measure collected was completed by parents as a self-report measure, and therefore reflects parents' perceptions of their relationship with their child, as opposed to child-rated perceptions or direct observations of parent-child interactions.

Classroom Behavior Problems. This construct is represented by a well-established measure of disruptive behavior disorders. The two factors measured in this study relate to ADHD symptoms and Oppositional Defiant Disorder symptoms, respectively. Disruptive behaviors were measured by teacher-report of student behavior.

Academic Performance. Teachers rated students on two measures of AP in the present study. Aspects of AP that were measured in the current study include homework as well as overall functioning during academic activities. For homework performance, teachers rated students' responsibility related to processes of homework, such as whether a student takes home and returns homework on time, or has necessary materials to complete the assigned homework. Student competence was also rated by assessing completion, accuracy, and comprehension of assignments, and independence during the homework routine. Related to general academic

performance, teachers assessed students' productivity on academic tasks (i.e., academic productivity) as well as the completion and accuracy of the work assigned (i.e., academic performance), and perceptions of the frequency of impulsive behaviors exhibited during academic activities.

Statement of Purpose and Research Questions

The purpose of the current study was to investigate the interrelationships between FIE, PCR, CBP, and AP over time within the entire sample that participated in the Power and colleagues (2012) study. As stated previously, extant research has consistently shown cross-sectional associations between these family processes and educational outcomes within the population of families coping with ADHD. Emerging research has begun to identify moderators of treatment effects within the ADHD population. For instance, Chronis-Tuscano, O'Brien, Johnston, Jones, Clarke, Raggi, Rooney, …Seymour (2011) found that reductions in child disruptive behavior in response to behavioral parent training was mediated by change in negative parenting practices over the course of the intervention. This finding is particularly intriguing considering that the population in this study consisted of mothers with elevated ADHD symptoms, which has been shown in prior research to be a predictor of lessened treatment response (see Chronis, Cacko, Fabiano, Wymbs, & Pelham, 2004 for review). Chronis-Tuscano et al. (2011) posited that inhibiting responding to child misbehavior with negative and ineffective discipline strategies may be a difficult skill for parents with elevated ADHD symptoms to perform consistently due to behavioral inhibition being a core deficit of the disorder. These findings provide preliminary evidence for reducing or eliminating negative and ineffective discipline as a potential explicit target of intervention, especially when elevated parental ADHD is present. Further research will be needed to identify whether these findings

extend to the population without elevated parental ADHD symptoms as well as a wider set of outcome variables (e.g., academic and social functioning). Extrapolating from previous research and in keeping with theoretical models in the bioecological and developmental psychopathology literature, it was expected that changes in these factors in desirable directions (i.e., increases in FIE, improvements in PCR) will be related to desirable educational outcomes (i.e., improvements in CBP and AP). Because this study is the first to investigate such interrelationships, the primary research aim was to explore the relationships between these family processes and educational outcomes both at each time point and across the duration of the Power et al. study implementation. However, because FSS was developed specifically to improve these family processes, differential effects across FSS and CARE treatment groups were investigated as a secondary, exploratory research aim. Specifically, the proposed study investigated,

Research Question One: Does the hypothesized model of interrelationships between family processes and educational outcomes fit the data well?

Hypothesis One: The proposed model will fit the data well at the level of the measurement model and structural model.

Research Question Two: What are the relationships between changes in aspects of family functioning (i.e., FIE and PCR) and changes in school performance (i.e., CBP and AP) over time?

Hypothesis Two: Improvements in FIE and PCR will be associated with improvements in CBP and AP.

Research Question Three: Is the model fit statistically significantly better for the FSS group compared with the CARE group?

Hypothesis Three: The third research question is considered to be exploratory due to the lack of sufficient sample size to test this research question with adequate power. However, if the study was adequately powered, it would be expected that the model would fit significantly better for the FSS group due to the specific focus of the intervention on these family processes.

Chapter 2

Review of the Literature

Psychosocial Intervention Literature Review

Although ADHD is widely recognized as a prevalent and impairing disorder (American Psychiatric Association, 2000; Barkley, 2006; DuPaul & Stoner, 2003), less is known about the remediation of the underlying functional deficits within this population than is known about pharmacological and behavioral treatments to reduce the symptoms of ADHD (DuPaul & Stoner, 2003; Fabiano & Pelham, 2008; MTA Cooperative Group, 1999, 2004). Educational functioning is a particularly salient issue for students with ADHD, as affected individuals have been shown to be at risk for a host of negative outcomes in this domain. These educational difficulties often begin in preschool, persist through adulthood, and are posited to develop due to maladaptive patterns of behavior that are incompatible with the expectations common in educational settings (Daley & Birchwood, 2010; Thorell, 2007). For example, students with ADHD often have high rates of off-task and disruptive behaviors that impair their relationships with teachers and peers, and are related to their academic difficulties (Raggi & Chronis, 2006). Due to these impairments, students with ADHD are at-risk for a host of negative educational outcomes, including lower reading, math, and spelling scores (Massetti et al., 2008), school drop-out (Barbaresi et al., 2008; Loe & Feldman, 2007), and academic skills and performance deficits (DuPaul & Stoner, 2003; Raggi & Chronis, 2006). There is also evidence that among youth with ADHD, more severe ADHD symptoms are correlated with academic underachievement in reading, writing, and mathematics (DeSahzo Barry, Lyman, & Grofer Klinger, 2002). As such, there is a clear need for interventions that are designed to improve the educational outcomes of students with ADHD in terms of classroom behavior and academic performance.

Unfortunately, the treatment literature addressing educational and functional outcomes continues to be less prevalent than literature focused on reducing the symptoms of ADHD. Nevertheless, with more than 120 published empirical studies targeting educational functioning within the ADHD population, this gap has grown narrower over time (DuPaul, Eckert, & Vilardo, 2012). The effect sizes obtained for school-based interventions in a recently published meta-analysis by DuPaul, Eckert, and Vilardo were moderate to large for both behavioral and academic outcomes; however, single-subject design studies generally showed more robust effect sizes than within-subjects and between-subject design studies. DuPaul et al. note that research in this area has predominately been single-subject, with larger controlled trials less prevalent. This limitation in the treatment literature is a contributing factor to the general lack of emphasis placed on key mechanisms of action and the ecological context in which the interventions are implemented. Rather, the treatment literature to date has largely focused on the components of the intervention and whether the implementation of a particular treatment package results in changes in important educationally relevant outcomes. Examining these studies in context, the extant literature targeting these outcomes varies across four dimensions: intervention package, system level of intervention, delivery format, and target behaviors of intervention. The next section of this chapter will focus on a review of the psychosocial intervention literature that has targeted classroom behavior problems and academic performance in the population of elementary school-aged students with ADHD first by the types of intervention packages used and then reviewing the ecological context in which the interventions were implemented.

Categories of Psychosocial Interventions to Improve Educational Functioning

Multicomponent Treatment. Although it is beyond the scope of this study to review here, there is also considerable evidence for the use of psychostimulant medication for the

treatment of ADHD (see Vaughn, March, & Kratochvil, 2012). Considering the wealth of literature on both pharmacological and behavioral treatments for children with ADHD, it is no surprise that studies have been performed to test the efficacy of these treatment approaches together and separately to examine the effects on psychosocial functioning and academic performance. The most notable example of this was the Multimodal Treatment of ADHD Study (MTA), which combined a multicomponent package of parent training, school consultation, participation within an intensive summer treatment program for ADHD, and a one-to-one paraprofessional aide in the classroom in combination with medication (MTA Cooperative Group, 1999). The initial results of the MTA indicated that all treatment groups improved in functioning from baseline to post-treatment and that the multicomponent treatment was superior to behavioral treatment alone on measures of parent-reported internalizing problems, ADHD and oppositional defiant disorder (ODD) symptoms, and standardized reading achievement scores (MTA, 1999). Since these initial findings were published, however, there have been numerous other publications that used alternative analytic approaches showing this view of treatment efficacy is incomplete, at best. For instance, it must be noted that those participants receiving combined treatment required a smaller dose of medication than those in the medication alone condition, which is salient because it has been shown that medication retarded growth rate over time in this sample (Swanson, Elliott, Greenhill, Wigal, Arnold, Vitiello, …Volkow, 2007). Also, Conners et al. (2001) conducted an alternative outcome analysis that used total scores for each measure and subjected them to factor analysis, which resulted in a two factor structure (parent and teacher). The results of the analysis of treatment effects showed that combined treatment had a small effect (ES = 0.28) above and beyond the effects of medication alone, moderate effect compared with the psychosocial treatment alone (ES = 0.58), and a large effect

compared to the community control condition (ES = 0.70). Although the effects of combined treatment compared to medication management alone was small, Conners et al. (2001) did show that these differences are certainly not trivial and should not be interpreted as equivalence between the two treatment approaches.

Considering the dearth of initial statistically significant group differences in treatment outcomes at post-treatment, it may come as little surprise that treatment group differences were not maintained long after treatment ended. At 10-month follow-up, the advantage of the combination treatment over behavioral treatment and community control on measures of ADHD and ODD symptoms was halved, and all other effects were nonsignificant (MTA Cooperative Group, 2004a, 2004b). Interestingly, these changes in efficacy of treatment had to do with differential maintenance of effects between randomly assigned groups after intervention had ended, with combined and medication alone groups decreasing in efficacy and behavioral treatment and community control group trajectories remaining stable. By follow-up at 3 years post-treatment, no treatment group differences were evident on ADHD or ODD symptoms (Jensen et al., 2007). The same was true 8 years post-treatment, and novel analyses showed that treatment groups also did not differ on functional outcomes such as classroom grades, number of arrests and psychiatric hospitalizations (Molina et al., 2009).

Specifically related to educational outcomes in the MTA study, Langberg, Arnold, Flowers, Epstein, Altaye, Hinshaw, and colleagues (2010) investigated treatment effects on parent-reported homework problems and potential moderation effects of demographic factors on treatment efficacy. Mixed effect regression analyses showed that all treatment groups improved significantly from baseline to post-treatment, but no statistically significant between treatment group differences were found. With regard to maintenance of effects, the combined treatment

and behavioral treatment groups were the only treatment groups to maintain these positive outcomes on inattentive and avoidant behaviors at the follow-up point occurring 2 years after the beginning of intervention and no treatment group differences were found at the 3 year follow-up point. For poor homework productivity and nonadherence to homework rules, no treatment group differences were found post-treatment and only the behavioral treatment group was superior to community control at 2-year follow-up. With regards to demographic factors that may have moderated treatment effects, Time X Treatment Group X Moderator effects was found for parent-rated ADHD symptoms at baseline only, with higher initial ADHD symptoms associated with greater improvement. Langberg et al. assert that these findings comport with what is known about treatment response within the population of students with ADHD. For instance, inattention and distractibility are amenable to change with psychostimulant medication, whereas productivity and follow-through on homework completion is related to behavioral skills typically taught in behavioral parent training such as the intervention provided in the MTA study. Therefore, a behavioral approach is of paramount importance for students with ADHD who are experiencing difficulty in the homework routine,.

There are both methodological strengths and limitations that are clinically relevant for treatment research on educational outcomes because there were both home and school-based treatment components that must be acknowledged when interpreting the results of the MTA study as it related to behavioral treatments. The parent training component of the psychosocial treatment included 27 group sessions and 8 individualized sessions (see Wells, 2000). As mentioned previously, school-home notes, parent education on advocating for educational needs, and having a paraprofessional aide in the classroom were all components that targeted educational outcomes. However, there is no way to dismantle these treatment effects from one

another or from the additional STP and family-based components to determine the most critical components of intervention. Because this is the case, it is not possible to know the relative contributions of each treatment component to homework performance or other treatment outcomes.

Other recent studies have focused more directly on educational outcomes for school aged children with ADHD. Hechtman et al. (2004) investigated the effects of multimodal treatment on educational outcomes, comparing a methylphenidate alone group (M) to a methylphenidate plus multimodal psychosocial treatment group (M + MPT) and a methylphenidate plus attention control group (M + ACT) . Treatments were implemented over the course of 24 months in a group of 7-9 year old students without comorbid disorders. For the M + MPT group during the first year of intervention, there was a 16 week organizational and study skills program, followed by an individualized academic plan that was implemented on a weekly basis for 8 months. The academic plan included remedial tutoring and consultation in reading, writing, and mathematics on an as-needed basis. The intervention package also included an individual psychotherapy component on a weekly basis that targeted knowledge about ADHD, attitudes toward medication, enhancing self-esteem, problem solving peer relationship difficulties, and self-regulation skills. During the second year of the intervention, therapy continued on a monthly basis. The M + ACT group engaged in nonacademic projects and received nonspecific homework help, such as understanding directions of assignments. Although all treatments were associated with positive growth, results indicated that there were no differences between groups at the end of the first or second year of treatment. Hechtman and colleagues concluded that these data suggest there is no evidence to support the use of psychosocial interventions for children with ADHD who do not have a learning disability or conduct disorder. As others have pointed

out (e.g., DuPaul, 2004), this conclusion is premature at best considering that only norm-referenced, standardized assessments of academic functioning were used and the academic intervention was only implemented once a week outside of the classroom.

Owens, Murphy, Richerson, Girio, and Himawan (2008) investigated a psychosocial treatment package including DRCs, behavioral parent training, teacher consultation, and individual child sessions in a group of 117 children in Kindergarten through 6th grade referred to an intervention program for children with disruptive behavior. Many of the participants in the treatment group met diagnostic criteria for ADHD (65 %), and 69 % of these participants met diagnostic criteria for either oppositional defiant disorder or conduct disorder. Those participants who did not meet diagnostic criteria for ADHD either presented with another disruptive behavior disorder, subclinical levels of disruptive behavior problems, or a mood disorder. The intervention was based in the school and was implemented throughout one school year by graduate students, and the effects of the treatment package was compared to the effects of a waitlist control group. Based on teacher ratings, the treatment group improved significantly more than the control group on symptoms of hyperactivity/impulsivity and conduct disorder, and although children in the intervention group did not improve significantly the trajectory of the control group evidenced a significant worsening of symptoms over time. Furthermore, participants in the treatment group improved at a greater rate than the control group on teacher-rated classroom functioning, teacher-student relationship, and overall functioning. Based on parent ratings, no treatment group differences were found; however, significant improvements over time were found in the treatment group on outcomes of disruptive behavior disorder symptoms and impairment at home and in the classroom. Classroom grades did not improve significantly differently between groups throughout the intervention. The effect sizes of the treatment group differences were in the small

to moderate range, which are smaller than other efficacy studies (e.g., MTA Cooperative Group, 1999) likely due to low socioeconomic status and related low treatment utilization. Overall, this study demonstrated that evidence-based treatments implemented in an underserved population in a school-based format were effective in reducing problem behaviors and school functioning.

Power and colleagues (2012) recently completed an efficacy trial testing a home-school intervention called Family School Success (FSS) to improve upon the previous homework intervention literature by combining homework interventions with behavioral parent training as well as DRCs and conjoint behavioral consultation (Sheridan & Kratochwill, 2008). Table 1 describes the session format of the FSS intervention; as well as a comparison treatment called Coping with ADHD Through Relationships and Education (CARE) that controlled for nonspecific treatment effects by matching for therapist time.

There were significant Group X Time interactions between the FSS and CARE groups for several outcomes. For instance, parents in the FSS group reported more positive attitudes toward actively participating in their child's education at post-treatment compared with CARE families, as measured by Parent as Educator Scale (Hoover-Dempsey et al., 1992; $F(1,358) = 7.25$, $p = .0074$, ES = 0.37). With regard to homework functioning, parents rated differential improvements between the FSS and CARE groups on the Inattention/Task Avoidance factor of the Homework Problems Checklist (HPC; Anesco, Schoiock, Ramirez, & Levine, 1987; $F(1,359) = 15.40$, $p < .0001$, ES = 0.52), although this was not the case with the Poor Productivity/Nonadherence factor of the HPC or Student Responsibility factor of the teacher-rated Homework Performance Questionnaire (Power, Dombrowski, Watkins, Mautone, & Eagle, 2007). On the Parent-Child Relationship Questionnaire (PCRQ), parents rated differential improvements between FSS and CARE on the Negative/Ineffective Discipline factor in the

desired direction ($F(1,352) = 17.27$, $p < .0001$, ES = 0.59). Interestingly, between-group differences were not found on direct observations of academic engagement, parent and teacher rated ADHD and oppositional defiant disorder symptoms, or teacher rated academic performance.

Overall, the evidence for multicomponent treatment for ADHD suggests that there are additional benefits relative to individual treatment components at the group level on both symptom reduction and functional outcomes. However, these studies largely lacked naturalistic measures of classroom behavior and academic performance. In summary, these results show promise for evidence-based treatments and future research should focus on using more naturalistic outcome measures as well as designs that can specifically compare treatment components to identify intervention strategies that are primarily accounting for observed change in functional outcomes.

Homework Interventions. Within the intervention literature on improving the educational functioning of students with ADHD, strategies to improve homework performance have received relatively little attention. This is surprising considering that homework problems are highly prevalent within the ADHD population (Power, Werba, Watkins, Angelucci, & Eiraldi, 2006). Raggi and Chronis (2006) describe early work in this area that involved training parents to establish a structured homework routine, use goal setting strategies, and consulting with school personnel. Despite the promise of these techniques, the scientific rigor of research in this area has been methodologically weak (Rhoades & Kratochwill, 1998).

More recently, Habboushe et al. (2001) described a family-school homework intervention called the *Homework Success Program* that included seven group sessions designed to build parents' skills in using behavioral strategies to establish ground rules, manage time and set goals,

and using positive and negative reinforcement. Teachers were contacted regarding the family's involvement in the program and encouraged to grade participants' homework assignments based on accuracy rather than completion due to the time limits placed on homework during the intervention. Children were also involved in each group session during the first 15 minutes, during which time the clinician provided an overview of the content of the previous session and of the between-session assignments. With regard to progress monitoring and outcome measurement, a multi-method, multi-informant approach was described that assessed ratings of academic performance, ADHD symptoms and other behavioral symptoms, parenting stress and family functioning, and treatment acceptability and knowledge. The results were promising; however, Habboushe et al. (2001) only report case examples within this publication. Resnick and Reitman (2010) published another case study example using the Homework Success Program with an 8 year old boy with ADHD. Results of the intervention showed that the homework routine improved such that the time taken to complete homework decreased from 3 hrs to 45 min and the percentage of homework completed improved from 55 % to 93%. These results were maintained both at 1 month and 7 month follow-up, and were rated by parent and teacher as highly acceptable.

The homework intervention described by Habboushe et al. (2001) represents progress for this line of research. The combination of multiple strategies to improve the homework performance of students with ADHD within a multimethod, multi-informant approach represents a significant improvement in the methodology in this area. Future research that scales up this type of program to test its efficacy on a broader scale would be a valuable contribution to the literature

Other Ecological Dimensions of Psychosocial Interventions

In addition to the category of the intervention itself, there have also been differences in psychosocial interventions for elementary school-aged children with ADHD across ecological dimensions. First, the interventions vary by *delivery format*. *Direct* intervention implementation occurs when the clinician teaches, models, or practices the intervention directly with the target individual. The vast majority of the extant literature has been implemented in such a format. The target individuals have typically included parents, teachers or other school staff members, and the target child. Homework interventions have also intervened directly with parents in order to structure the home environment in a way that sets the stage for improved homework performance as well as teaching contingency management and positive parenting strategies to reinforce desired behavior. Interventions delivered within a *consultative* framework are by their nature implemented in an indirect manner by working with teachers or other school personnel to identify target behaviors and then teach, model, and practice interventions with staff members who in turn implement the intervention with the target child. *Group* interventions occur when a number of individuals receive the same services, in the same setting and session, from a single clinician. Many behavioral parent training programs (e.g., MTA Cooperative Group, 1999; Power et al., 2012) implement core content that does not need to be individualized in such a fashion in order to increase efficiency of implementation. *Multicomponent* treatments typically involve a mix of both direct and indirect interventions. Behavioral parent training interventions comprise the majority of the intervention literature in this area, and involve directly intervening with parents in order to improve parenting skills and family processes. Teacher consultation is also typically an intervention component, which as mentioned previously is an indirect format of intervention.

Second, interventions have varied across the *system level of intervention*. The most common system levels to intervene with have been the home and school setting. Interventions targeted on the home system include behavioral parent training and homework interventions. Behavioral parent training interventions often are not implemented in the home environment, but rather are implemented in a clinic setting in a university, community mental health, or hospital setting. However, the target of intervention for behavioral parent training interventions has involved teaching parents skills to address the behavioral, academic, and social functioning of the target child. As it relates to improving educationally relevant outcomes for students with ADHD, the school system is an intuitive system with which to intervene. In fact, all categories of interventions have had links to the school system. For instance, direct skills interventions are implemented within the school setting to improve educational functioning. Consultative interventions are implemented in school settings in order to train and support the staff that interact with the target child in order to support performance and improve the teacher-student relationship. Homework interventions have also included the school setting due to the inherent connection to academics and focus on increasing home-school communication. Multicomponent interventions have incorporated aspects of the aforementioned interventions, as well as the frequent use of the home-school note in order to facilitate home-school communication and also support desirable behavioral and academic performance at school by implementing contingency management strategies at home daily.

The third dimension that psychosocial interventions have varied by is whether the interventions have targeted *skill building versus performance support*. Direct skills interventions have focused on identifying and targeting the underlying skills deficits that target children have had academically, behaviorally, and socially. Aspects of consultation interventions have also

involved skill building components, particularly those in which the clinician has taught teachers or other school staff members behavioral strategies to implement with the target child in the school setting. The same is true with many aspects of behavioral parent training and homework interventions in that much of the content of these approaches involves building positive parenting skills and teaching contingency management strategies. Other aspects of consultation, homework, and multicomponent interventions are targeted on performance support for students with ADHD. This is because the symptoms of ADHD often interfere with using the educationally relevant skills that individuals already have in their repertoire. In fact, a common element across intervention categories is putting artificial contingencies in place to increase motivation extrinsically where there is not sufficient intrinsic motivation within the target child. The skills taught to caregivers, teachers, and other school staff members (i.e., the skill building components of interventions) all involve ways in which individuals can use their attention strategically to encourage more desirable behavior and discourage undesirable behavior, which supports the target child in completing educational tasks.

Conclusions

The extant intervention literature targeting educational outcomes for students with ADHD is still in its early stages in many respects, and this is reflected in the paucity of research implemented with expressed regard for ecological context. Despite the limitations of existing research in this area, there are treatment approaches that show much promise. Direct skills training interventions are effective at the individual child level, yet still need to be scaled up for more rigorous testing. Similarly, teacher consultation approaches have been shown to be effective in improving achievement outcomes in reading more so than math, but more research is needed to determine for whom and under what circumstances more intensive support is

warranted. Also, both of these approaches are limited in their unisystemic approach to treatment, which is limiting because of the important family, family-school, and parent-child aspects of educational functioning that are ignored by only intervening in schools. The MTA study provided an intensive psychosocial treatment that was delivered across home and school settings; however, this treatment involved many components over an extended period of time. The feasibility of this treatment package in real-world settings is therefore questionable and also was limited in its focus on academic outcomes. Additionally, although the interventions included in the MTA study were evidence-based there was minimal theoretical rationale presented as to why each of the intervention approaches, or the components contained within these interventions, were selected. It is possible that this lack of focus on mechanisms of action of the treatments that were selected and the ecological contexts in which they were implemented impacted the efficacy of the treatments. Finally, homework interventions are needed that can be shown to be efficacious under more rigorous scientific conditions. Within the treatment literature for improving the educational outcomes of students with ADHD, homework interventions are the most lacking in terms of understanding which essential components should be included as well as what the effects of these interventions are on the family, school, and family-school outcomes that are salient for this population.

Family Processes and Educational Functioning in Youth with ADHD

The current gaps in the psychosocial treatment literature suggest that a way forward in terms of improving educational outcomes for youth with ADHD is to use an ecological framework to identify salient relational processes that are amenable to change. Therefore, processes within the family system are a logical place to begin this search. There are published conceptual models which also suggest that aspects of family functioning are important to the

educational outcomes of youth with ADHD, and fortunately these models have been designed to promote empirical testing. Bronfenbrenner (1977) described the ecology of human development as that of interactions between systems that varied in terms of their proximity to the individual. *Microsystems* were those ecologies closest to the individual (i.e., school, home, work), *mesosystems* were defined as the interrelations between microsystems, and *macrosystems* referred to overarching societal institutions, such as the economic, legal, and political systems. Bronfenbrenner argued that the transactional interactions of an individual with these systems are what comprised the context of all human development. His most recent iteration of a testable theory of development is called the *bioecological theory* (Bronfenbrenner & Morris, 2006). This theory emphasizes that an individual develops across the lifespan through *proximal processes,* which are the "engines of development" and comprise the interactions between the individual and microsystems across time. Adding the dimension of time to an ecological model of development distinguishes that proximal processes may lead to desirable or undesirable outcomes. Bronfenbrenner hypothesizes that, ultimately, developmental trajectories are determined by the confluence of these factors, along with the unique characteristics, skills, and abilities of the individual to navigate these interactions.

If bioecological theory is a general theory of human development across the lifespan, then *developmental psychopathology* (Cicchetti & Cohen, 2006) is the application of such a theory specifically to the factors affecting the expression of psychopathology across the lifespan. This framework models the development of psychopathology as a multilayered process of interrelationships between an individual, genetics, and the environment. Both genetic and environmental factors may serve as risk and protective factors to the development of psychopathology, and because the relationships are transactional, as opposed to unidirectional,

the individual affects the environment just as the environment affects the individual. Because of the transactional nature of development as it relates to psychopathology, this theory posits that individuals with shared genetic and environmental predispositions ultimately express different impairments at a given point in development (i.e., *multifinality*) and diverse genetic and environmental predispositions also lead to expressions of the same impairments at a given point in development (i.e., *equifinality*).

As it relates specifically to ADHD, both the bioecological theory and developmental psychopathology predict that family processes are worthy of study in order to identify risk and protective factors that affect educational outcomes in this population. This has also been borne out in research on educational outcomes of youth with ADHD. Latimer, August, Newcomb, Realmuto, Hektner, and Mathy (2003) conducted a longitudinal study of individual and family factors during childhood as predictors of later behavioral and academic performance in high school. The results showed that there were no direct associations between a diagnostic status of ADHD at baseline and academic or behavioral outcomes in adolescence. This finding suggests that there are indeed complex interrelationships between risk and protective factors over time that influences educationally relevant outcomes. The study also showed that those participants whose parents exhibited more positive parenting practices in the home did have better academic and behavioral outcomes; however, the study did not extensively measure the component family processes involved in parenting so these findings must be interpreted with some caution in terms of generalizability. Taken together, Latimer and colleagues (2003) show that ADHD is a disorder which conforms well to an ecological model of development and that parenting practices are implicated in the educational outcomes of youth with ADHD. What remains untested are the relative contributions of various family processes to the academic and behavioral outcomes of

youth with ADHD over time. Next, two family processes will be described which likely contribute meaningfully to the educational performance of youth with ADHD.

Family Involvement in Education. The links between family involvement in education (FIE) and positive academic, psychosocial, and behavioral outcomes for all children is well documented (Aeby, Manning, Thyer, & Carpenter-Aeby, 1999; Christenson & Sheridan, 2001; Miedel & Reynolds, 1999); Emerging research has begun to elucidate the processes by which parents of nondisabled students become involved and the effect it has on child outcomes at home and at school. The most recent revision of the Hoover-Dempsey and Sandler model of parent involvement in education (Walker, Wilkins, Dallaire, Sandler, & Hoover-Dempsey, 2005) presents three main ways parental perceptions contribute to involvement at home and school. First, parents' motivational beliefs are salient to their involvement, and are comprised of parental role construction and self-efficacy. Parental role construction consists of attitudes and beliefs on what parents are supposed to do to be involved in their children's education. Self-efficacy comprises parent-held beliefs on whether or not what they do will make a difference in their child's educational outcomes. The second domain of parent perceptions is related to invitations to be involved both from individuals at school and from their child. The third domain of perception is regarding the parents' perceived time, energy, skills, and knowledge to be involved in educational activities regarding their child.

Green, Walker, Hoover-Dempsey, and Sandler (2007) tested this theory empirically using hierarchical linear modeling to study the relative contributions of model constructs to parents' involvement decisions in a sample of 853 students in first through sixth grade. Overall, the model was a very good fit for the data and it predicted 39% of the overall variance in home involvement and 49% of the variance in school involvement of the parents in the sample. The

parental perceptions that significantly predicted home involvement behaviors included parent self-efficacy, specific invitations from the child, and the perceived time and energy to be involved. Parental role construction, specific child invitations, specific teacher invitations, and perceived time and energy were significant predictors of parents' involvement in educational activities at school. Green et al. (2007) were the first to establish that parent perceptions, as theorized by Walker et al. (2005), contributed significantly to the ultimate involvement decisions parents made and that these were somewhat different for home-based and school-based involvement.

Others have built upon the work of Hoover-Dempsey and colleagues to test the relationship between parent perceptions and other processes and outcomes. Semke, Garbacz, Kwon, Sheridan, and Woods (2010) investigated the contributions of role construction and self-efficacy as a mechanism for change in the relationship between parenting stress and family involvement at home, at school, and in terms of home-school communication. Semke and colleagues used path analysis to test these relationships, and the results indicated that parental role construction mediated the relationship between parenting stress and all three forms of parental involvement, and that self-efficacy mediated the relationship between parenting stress and home involvement only. Parenting stress had more of a negative impact on self-efficacy than role construction, explaining 30% and 5% of the variance, respectively. Similarly, role construction and efficacy together explained 19% of the variance in home involvement, 11% of the variance in school involvement, and 9% of the variance in home-school communication. As stated previously, parental stress is a risk factor associated with a host of negative educational and behavioral outcomes for children and also for marital relationships. Findings provide early evidence that improving parents' motivations to be involved in their child's education attenuates

the effect of parenting stress on educational involvement, and therefore may be a good target for intervention in future research.

Relatively little research on FIE has been conducted in samples of children with disruptive behavior problems. Nokali, Bachman, and Vortuba-Drzal (2010) investigated the contributions of parent involvement in education to changes in child functioning within a sample of children with elevated ratings of disruptive behaviors from 1st to 5th grade. Using hierarchical linear modeling, the results indicated that increased parent involvement predicted declines in problem behaviors and improvements in social skills, but was not a predictor of improvements in standardized achievement test scores. These results provide evidence that FIE is a strong component of the influence over their child's behavioral and social development.

In the only known study to investigate FIE as a predictor of child functioning within the ADHD population, Rogers, Wiener, Marton, and Tannock (2009a) investigated the differential contributions of supportive and controlling parental involvement on child outcomes. The authors posit that it is not involvement alone that is important for child outcomes, but that it is also important to consider the quality of this interaction. Rogers and colleagues maintain that controlling parental behaviors (e.g., frequent use of commands, punishments, criticism, coercion) will have a negative impact on child functioning. As stated previously, these ineffective parenting strategies are prevalent in parents of children with ADHD and these behaviors are associated with negative child and family outcomes. However, Rogers and colleagues were the first to test the relative contributions of different parent involvement styles to child outcomes. The authors analyzed two path analyses to test the differential contributions of parenting involvement style; in both models parenting stress was related to the type of involvement, type of involvement was related to child interactions and child ADHD symptoms, and child interaction

was related to child academic achievement. The results of the study indicated that parents who reported more parenting stress were more likely to use controlling involvement strategies, and that this was related to more child inattention and worse achievement. The model including supportive involvement strategies showed that parents who perceived less parenting stress also used more supportive involvement strategies, and that this was related to less child inattentive symptoms and higher achievement. Therefore, the results of this study suggest that parental stress and ineffective parenting practices when engaged in educational activities are potential risk factors for increased symptoms of inattention and worse academic performance. Also, it appears that the converse is true, and that lowering parental stress and using positive parenting strategies may be protective factors in the development of inattentive symptoms and worsening academic performance.

In summary, the most recent version of the Hoover-Dempsey and Sandler model of parent involvement (Walker et al., 2005) appears to be promising in predicting involvement decisions in nondisabled students. Furthermore, emerging evidence suggests that these involvement decisions at home and school are also related to important educational outcomes, such as social skills and problem behavior, for children with elevated rates of externalizing behaviors. Finally, in the only known study conducted within the ADHD population on the contribution of parent involvement in education to child outcomes, parenting stress and ineffective parenting practices emerged as promising targets for intervention. Although this research is in its early stages, especially as it relates to the population of children with ADHD, there is sufficient evidence to suggest that the quality of parent involvement is a process that makes a measurable difference in important child educational outcomes and that more research

should be conducted to further understand the ways in which improving these processes leads to changes in important child educational outcomes.

Parent-Child Relationships. Youth with ADHD are more dependent on external cues to regulate their behavior than their nondisabled peers due to deficits in self-regulation (Barkley, 2006). With regard to functioning in the home environment, parents are the stakeholders with the best opportunity to provide these external cues to the child. Although untested at this time, it may be the case that inconsistencies in parenting practices lead to both difficulty implementing effective parenting strategies and increase the discord in family relationships, including the parent-child relationship (PCR). Ghanizadeh and Shams (2007) published the only known study that compared PCR and other family processes in the ADHD population to that of the general population. In an Iranian sample, the authors compared the perceptions of 49 families with a child with ADHD to 51 families without a child with any disorder. Results showed that children with ADHD reported significantly more impairment in PCR than nondisabled children. Also, parents rated problem solving, communication, role construction, affective responsiveness and involvement, behavioral control, and global functioning significantly lower than parents of nondisabled children. Taking into consideration the cultural differences that may limit the generalizability of these findings to Western cultures, these striking differences between parent-child relationship variables still suggest that PCR is a promising target for intervention. Considering the potential impact PCR may have on educational outcomes, it is surprising that there are not more studies that investigate the interrelationship between the parent-child relationship and these outcomes in the population with ADHD. However, there are studies which have investigated the associations between impaired family relationship processes and child

processes and outcomes which further suggest that PCR may be a prime family process to investigate further as it relates to child outcomes.

In the only known study to investigate the relationship between parenting alliance and child functioning within the ADHD population, Harvey (2000) examined associations between parenting similarity and child and marital functioning. Using a cross-sectional design with a sample of 70 children with ADHD and their married parents, Harvey found that parenting similarity and discipline similarity were correlated with less disruptive behavior problems, even when controlling for parenting effectiveness. Additionally, parenting similarity was also associated with higher marital adjustment and lower marital conflict and discipline similarity was correlated with lower maternal ratings of parenting stress. These results suggest that children with ADHD whose parents hold dissimilar views on parenting and discipline are at risk for higher levels of disruptive behavior. The association between higher parenting alliance and lower marital conflict, stress, and child externalizing behavior problems shown in the Harvey (2000) study also suggest that parenting alliance may help these families avoid the negative consequences that have been shown to be associated with these impaired family processes. Indeed, research has shown that family conflict, lack of cohesion, and parental psychopathology are risk factors for increased child behavior problems and marital discord (Biederman et al., 1999; Schroeder & Kelly, 2009; Wymbs, Pelham,Molina, Gnagy, & Wilson, 2008).

However, few studies have examined the relationship between these processes in vivo. Wymbs and Pelham (2010) examined the behavior of parents of children with ADHD in an analog setting in which participants interacted with a child confederate during cooperative and parallel tasks. Wymbs and Pelham found that parents of children with ADHD interacted less positively and more negatively with each other both on parent ratings and direct observation

when compared to parents of children who did not have ADHD. In a follow-up study with this sample, Wymbs (2011) used path analyses to test whether parent affect and positive parenting practices mediated the relationships between the behavior of the child confederate and parent communication. The results indicated that parent-reported positive parenting partially mediated the relationship between child confederate behavior and parent-rated positive interpersonal communication. Similarly, negative parenting also partially mediated the relationship between child confederate behavior and both parent-rated and observational measures of negative parental communication. Conversely, parent affect did not mediate the relationship between child confederate disruptive behavior and parent communication.

Unfortunately, results are modest regarding the ability of extant treatments for ADHD to show treatment response in changing parental interactions with their children. In the multimodal treatment study by Hechtman and colleagues (2004) that was reviewed previously, parent ratings of significant increases in knowledge of behavioral strategies were evidenced but not significant increases in positive parenting practices. In the MTA study (MTA Cooperative Group, 1999), improvements in positive parenting practices were associated with increased social skills at school, and reductions in negative discipline practices mediated this relationship (Hinshaw et al., 2000). Only those receiving the Comb treatment evidenced reductions in negative discipline practices that significantly improved disruptive behavior in school relative to CC (Hinshaw et al., 2000). Negative and ineffective discipline practices were also shown to be a mediator of treatment response in a sample of youth with ADHD who also had mothers with elevated ADHD symptom ratings (Chronis-Tuscano, O'Brien, Johnston, Jones, Clarke, Raggi, …Seymour, 2011). Chronis Tuscano et al. (2011) found that the levels of maternal ADHD symptoms predicted change in child disruptive behavior throughout the course of intervention. However, when

mothers were able to reduce the frequency of negative and ineffective discipline practices during direct observation in a laboratory setting throughout the course of intervention, this mediated the relationship between maternal ADHD symptoms and child disruptive behavior.

To summarize, although the interrelationships between PCR and child educational outcomes have not yet been tested within the ADHD population, the extant literature shows evidence in imparirments in PCR in families coping with ADHD compared with families without disabled children. Other research in this area has found a link between impaired family relationship processes and a host of negative child and family outcomes, including parenting stress, marital conflict, divorce, and child externalizing behavior problems. Finally, positive parenting practices and negative and ineffective discipline strategies have been shown to be meaningfully associated ot mediators of treatment outcomes within the ADHD population as it relates to behavioral outcomes. This makes examining the contributions of changes in PCR to changes in educational outcomes over time worthwhile to examine as it related to a broader set of educational outcomes, including both behavioral and academic outcomes.

Conclusions

Current research is clear that many youth with ADHD struggle educationally due to the confluence of the symptoms of ADHD and impaired relationship processes throughout development. There are available intervention strategies to improve aspects of educational functioning, including direct skills interventions, consultation, multicomponent interventions, and interventions to improve homework performance. However, these interventions have often been limited in their consideration for the ecological context of interventions and have not intervened on important process variables important for educational outcomes. There are both genetic and environmental processes that interact with the individual with ADHD across

development across the home, school, and peer environments that contribute to outcomes across a variety of domains that are beyond the scope of any single investigation. Future research in this area would benefit from systematic investigation of likely processes which contribute to meaningful outcomes over the course of development. Within the family system, there is evidence that family involvement in education and the parent-child relationship are salient family processes that are amenable to change and may also be mechanisms of action which bring about change in educational functioning in terms of behavioral and academic functioning. Investigation of the interrelationships between changes in these family processes and changes in educational outcomes would represent a meaningful step in the right direction as it relates to better understanding of how to most effectively and efficiently intervene with the population of youth with ADHD to improve educational outcomes.

Chapter 3

Methodology

Participants

Participants of this study were previously part of an investigation that was conducted using an ADHD center located in a pediatric hospital in the Northeast United States. To meet inclusion criteria for entry to the study, the following conditions must have been met: (a) child must be enrolled in grade 2 through grade 6; (b) child must meet diagnostic criteria for either the Combined Type (ADHD/COM) or Inattentive Type (ADHD/I) of ADHD on the Schedule for Affective Disorders and Schizophrenia for School Age Children- DSM IV (K-SADS-P IVR; Ambrosini, 2000), based upon parent report; (c) child must be rated by their classroom teacher at or above the 85th percentile on the Inattention or Hyperactivity-Impulsivity factor of the ADHD Rating Scale-IV School Version (ADHD-IV; DuPaul, Power, Anastopoulos, & Reid, 1998), or on the Attention Problems or Hyperactivity subscales of the Behavior Assessment System for Children, Second Edition (BASC-2; Reynolds & Kamphaus, 2004); (d) child must be rated by parents at least 0.75 standard deviations above the mean on the Homework Problem Checklist (Anesko, Shoiockm Ramirez, & Levine, 1987); and (e) child must earn a score at or above an estimated IQ of 75 on the Weschler Abbreviated Scale of Intelligence (WASI; Psychological Corporation, 1999).

Potential participants who met DSM-IV-TR criteria for a psychotic disorder, bipolar disorder, chronic tic disorder or Tourette's disorder, obsessive-compulsive disorder that was serious enough to warrant treatment on its own, history of any major neurological illness, or history of suicidal or homicidal behavior or ideation were excluded from the study. Additionally, those children who were currently receiving psychotropic medication and whose parents

declined to participate in a new medication trial were also excluded from the study. Finally, children with a learning disability (as defined using data collected during the screening phase of this study or by report from the child's school), oppositional defiant disorder, conduct disorder, or an internalizing disorder (i.e., an anxiety or mood disorder, excluding bipolar disorder) were included in the study.

Figure 2 provides an overview of the screening and diagnostic process used for families referred to the study. A total of 502 children were referred; 457 of these families were contacted by telephone (45 families could not be reached). Three hundred nine of the contacted families completed the telephone screening and met the initial eligibility criteria for inclusion based on teacher ratings. Two hundred ninety-one of these families completed the diagnostic evaluation, and a total of 241 of these children met eligibility for inclusion and completed informed consent. One hundred thirty-three of these 241 families elected for a medication trial prior to randomization into a treatment group (described in detail in subsequent section). Ninety-three of these 133 families were subsequently assigned to a treatment group, and a total of 199 families overall were randomly assigned to a treatment group.

Procedure

Potential participants were recruited through either parent referrals to the ADHD center at the hospital or from referrals obtained from school and community health providers, such as through primary care clinics and mental health clinics. For potential participants referred through the ADHD center, a review of intake information was used, with parent indication of a request for diagnostic evaluation. Those children who had completed diagnostic evaluations at the ADHD center up to six months prior to the start of the study were reviewed to identify potential participants for inclusion in the initial cohorts. After potential participants from the ADHD

center were identified, the family was contacted by phone by a research assistant to determine interest in participation and to schedule a time to complete additional screening materials. These contact procedures were also used for families who were referred by either community or school providers.

During the screening call, data were collected regarding the child's: (a) current grade; (b) current medications; (c) name and dose of any medications; (d) whether the parent preferred to receive medication during the trial; and (e) parent ratings on the Homework Performance Checklist (HPC). If the child met inclusion criteria on the HPC, parents were then asked to obtain BASC-2 and ADHD-IV teacher ratings. Upon receipt of teacher rating scales meeting inclusion criteria, the family was contacted to schedule a clinic visit for a diagnostic evaluation. This evaluation included the K-SADS-P IVR, which was completed by a licensed psychologist or an advanced trainee in school or clinical psychology that was supervised by a licensed psychologist.

Family-School Success (FSS). The FSS intervention is a family-school intervention that was delivered over 12 weekly sessions and involved content designed to improve parenting behaviors, family involvement in education, family-school collaboration, student academic engagement and productivity (Table 1). Beyond content that is typically included in parent training programs (e.g., effective commands, positive reinforcement, punishment), Conjoint Behavioral Consultation (Sheridan & Kratochwill, 2008) and DRCs were also used. CBC is an indirect service delivery model that is based on problem solving through collaboration across home and school settings. CBC has been shown to be effective in improving psychosocial functioning of students with ADHD (Colton & Sheridan, 1998; Sheridan, Eagle, Cowan, & Mickelson, 2001). Daily report cards are daily school-home notes that can include academic,

behavioral, and social goals that are clearly defined, are evaluated at least once per day, and serve as a daily communication device between home and school. There is ample evidence of the effectiveness of this intervention in changing the behavior of students with disruptive behavior and ADHD (Vannest, Davis, Cole, Mason, & Burke, 2010).

These components were implemented using a combination of group parent meetings (6 sessions), individual parent meetings (4 sessions), and family-school consultation sessions (2 sessions) held at the school. Children attended the 10 parent sessions; during group sessions children were included in the first 15 min of the session to review strategies being taught to parents. Children were included both to provide integration of parent and child learning as well as to provide a recreational activity for the child (see Power et al., 2001).

For each participant cohort, one clinician who was a post-doctoral fellow in psychology was assigned to work with all families. The clinician's responsibilities included conducting group and individual parent session as well as the CBC sessions. Three psychology graduate students were also assigned to conduct the child groups during the time that parents were involved in group sessions. These graduate students ensured that child behavior was managed appropriately and safely during each session.

Intervention sessions were held on a weekly basis; group sessions lasted 90 min each, with the exception of the first session which was held on a Saturday and lasted 3 hours, and individual sessions lasted 60 min each. CBC sessions lasted 45 min. There were also two phone conferences that were held between the clinician and the teacher, each lasting approximately 10 min, to monitor the progress and to make any necessary adjustments to interventions.

To facilitate teacher investment in the intervention (both for FSS and the comparison treatment described in the next section), the following procedures were used: (a) a letter

explaining the study was sent to the building principal and the teacher after parents consented for participation in the study; (b) the clinician contacted the teacher by phone to introduce the study and schedule an in-person meeting; and (c) at this visit, the clinician obtained administration authorization for the teacher to participate in the study, obtain teacher consent, and explain the treatment that the family was randomized to. During this meeting, the clinician built rapport with the teacher and identified the teacher's primary concerns regarding the child's educational functioning.

In total, 13 FSS cohorts were included. The range of families participating was between three and 10, the average number of families per cohort being seven. Seven clinicians conducted FSS groups during the study, six of whom were post-doctoral fellows and one non-licensed school psychologist with 15 years of experience. Ranging from the largest to smallest number of families served, clinicians worked with 20, 18, 16, 14, 9, and 7 families. One of the clinicians also conducted treatment for one cohort in the comparison condition. A total of 88 teachers participated in the intervention; four of these teachers were involved in the study with two children each.

Coping with ADHD to Improve Relationships and Education (CARE). CARE was delivered during 12 sessions administered on a weekly basis. This served as the comparison treatment and was designed to provide support and education regarding ADHD and educational functioning. Content addressed during the CARE program included: (a) discussing the child's progress at home and school; (b) establishing a context for parents to support one another in coping with their difficulties; and (c) providing basic education about ADHD to parents. The topics covered included the features of ADHD and the challenges that may be encountered at home, at school, and with peers.

The primary function of CARE was to control for the nonspecific treatment effects of therapist time and support. There were no specific skills taught or modeled during the CARE sessions, although parents were informed of potentially useful intervention strategies. During CARE sessions, children met in groups while parents attended group training sessions. During the child session, children participated in fun and engaging recreational activities. For each CARE participant cohort, one clinician (doctoral-level psychologist, post-doctoral fellow, or pre-doctoral psychology intern) was assigned to work with the families and three graduate students in psychology served as the assistants for the child group.

In total, 13 participant cohorts completed CARE. The range in number of families per cohort was between five and ten, and the mean was seven families per cohort. Six clinicians conducted the CARE groups: one pre-doctoral level intern in psychology, one post-doctoral fellow in psychology, three licensed psychologists, and one doctoral-level non-licensed psychologist with four years of experience. Three clinicians worked with three cohorts including 25, 22, and 16 families, respectively, one clinician worked with two cohorts comprised of 18 families, and one clinician conducted CARE sessions for one cohort of six families. Ninety-four teachers participated in CARE, two of whom were involved with four children. Two of these children were within the same CARE cohort, and two were in separate cohorts.

Intervention Procedures. A licensed psychologist supervised all of the clinical activities for both FSS and CARE groups. Before the start of each cohort of the intervention, the treatment manuals were reviewed with the clinical supervisor to discuss issues related to program implementation. The graduate student clinical assistants also received approximately two hours of training prior to each cohort and received weekly supervision for one hour. Before each session, clinical assistants met with the parent group leader to discuss any issues related to

implementation of the child group during the previous week's session and to plan accordingly for the upcoming session. Each of the parent sessions (i.e., both group and individual) was videotaped for supervision and integrity monitoring purposes. Meals were provided for families during each session, and children received trinkets contingent upon appropriate behavior during the group sessions.

Integrity Monitoring. Integrity checklists tailored to the content of each FSS and CARE session were completed at the conclusion of each session by the clinician. Each item was rated on the extent to which it was implemented (i.e., 0 = not implemented, 1 = partially implemented, 2 = fully implemented). Videotapes from sessions were used to code for inter-rater reliability of integrity; tapes were selected at random and rated by an independent clinician on an identical integrity rating form. For school sessions, a second rater physically attended the school sessions and completed the integrity checklist.

For FSS individual sessions, 23% of the videotapes were observed by a second rater, inter-rater agreement was 85%, and clinician-rated integrity of sessions was 93%. For FSS group sessions, 30% of tapes were coded by a second rater, inter-rater agreement was 91%, and clinician-rated integrity was 95%. For school sessions, a second rater was present at 13% of sessions, inter-rater reliability was 97%, and session integrity was rated by the clinician at 95%.

For CARE group sessions, 18% of the videotapes were observed by a second rater, inter-rater agreement was 93%, and clinician-rated integrity of sessions was 97%. For school visits, a second rater was present at 14% of sessions, inter-rater reliability was 97%, and session integrity was rated by the clinician at 100%.

Medication Trial Procedures. In an effort to control for the effects of medication, children whose parents elected to have medication treatment concurrent with the psychosocial

intervention were managed by the study medication team, consisting of a patient coordinator and two developmental behavioral pediatricians experienced in the treatment of ADHD. To simulate "real world" practice, families were given the option of participating in the psychosocial intervention with or without medication treatment. If families elected the medication treatment option, the medication trial was completed before the family was randomized to one of the two treatment groups. The controlled, open-label titration of medication followed a modified version of the Texas algorithm (Pliszka et al., 2006), beginning with a trial of Concerta™, and then proceeding to Adderall XR™, and Strattera™ (if necessary). If the child did not respond well to any of these medications, alternative FDA-approved medications were used. The medication trial was designed to be a collaborative process between the family and the physician; if the families disagreed with the medication algorithm and were able to provide a strong rationale for proceeding off-protocol (e.g., clear documentation of a positive response to a specific medication), the team collaborated to modify the protocol accordingly.

Prior to the initial medication prescription, parent and teacher ratings on the MTA SNAP-IV (Swanson et al., 2001) were obtained as a baseline measure of ADHD symptoms. During the dose titration phase, parent and teacher ratings were obtained on a weekly basis (i.e., after the child had been taking a particular dose of medication for approximately seven days). Norms from the ADHD Rating Scale-IV (DuPaul et al., 1998) were used to score the ADHD items from the MTA SNAP-IV in order to make clinical decisions. For children with ADHD, Inattentive Type, response to medication was determined based on ratings of inattentive symptoms. For children with ADHD, Combined Type, medication response was based on the total ADHD symptom score on the MTA SNAP-IV. The dose of medication was considered "effective" if parent or teacher ratings indicated a decrease of at least 15 percentile points on the relevant

factor of the ADHD Rating Scale-IV and there were no significant side effects. Significant side effects were identified through review of parent responses to the Stimulant Drug Side Effects Rating Scale (Barkley, 1981) and discussion between the prescribing physician and the parent.

Once the most effective dose of medication was identified, the parent completed the HPC to determine whether the child continued to experience significant homework problems. If so, the family was randomized to FSS or CARE and enrolled in the next available treatment cohort. If there was no longer evidence of clinically significant impairment on the HPC, then the child was no longer considered eligible to participate in the psychosocial intervention phase of the study. In these cases, the family was offered a two-session educational program, and the study team assisted with referral to other resources.

At the point of parent consent, 133 (54.5%) families opted to start a medication trial prior to the start of the psychosocial intervention. Twenty-three (17.3%) of the 133 children who completed a medication trial were deemed ineligible after the trial because they no longer experienced significant homework problems. Seventeen (12.8%) other families dropped out of study during the medication trial for various other reasons (e.g., time burden, psychiatric complications). Finally, 93 (69.9%) of the 133 children who started a medication trial were assigned to a treatment group. Of these children, 81 (87.1%) entered the psychosocial intervention on medication, 8 (8.6%) families chose to discontinue medication use for the psychosocial intervention, and 4 (4.3%) families withdrew from the study after randomization but before the psychosocial intervention began. Forty-four FSS participants and 41 CARE participants were receiving medication at baseline; these between-group differences were not statistically significant ($p = .775$).

Outcome Measures

For both FSS and CARE participants, measures were included with respect to family outcomes, intervention acceptability, and school outcomes. Only those measures that will be used in the subsequent analyses for the purposes of the current study will be reported.

Family Involvement in Education. Parental self-efficacy was assessed using the 10-item *Parent as Educator Scale* (PES; Hoover-Dempsey et al., 1992). This measure assesses the extent to which caregivers perceive themselves as effective in assisting with their child's education. Each item is rated on a five-point scale (1 = strongly disagree to 5 = strongly agree). In a prior study, the reliability of this scale was found to be high (alpha = .89; Hoover-Dempsey et al., 1992), and in the present study sample, the coefficient alpha was .83. In addition, the *Parent-Teacher Involvement Questionnaire* (PTIQ; Kohl, Lengua, McMahon, & Conduct Problems Prevention Research Group, 2000) was used to assess the quality of the family-school relationship from the perspective of parents and teachers. A factor analysis of this measure uncovered an 11-item Quality of Parent-Teacher Relationship factor consisting of parent- and teacher-reported items. The internal consistency of this factor was found to be high (alpha coefficient = .89). As in previous studies, parent and teacher reports on items pertaining to this factor were aggregated into a composite score for purposes of data analysis. Reliability in the present sample was also high (alpha = .88).

Parent-Child Relationship. The *Parent-Child Relationship Questionnaire* (PCRQ) was used to assess parent perceptions of the quality of the parent-child relationship. This measure was included in the MTA to assess outcomes pertaining to parent-child interactions (Wells, Pelham, Kotkin, Hoza, Abikoff, Abromowitz, …Schiller, 2000). The Positive Involvement (22 items; alpha = .92) and Negative/Ineffective Discipline (12 items; alpha = .83; Hinshaw et al.,

2000) factors were used in the present study. The alpha coefficients in the present study sample were .89 for Positive Involvement and .84 for Negative/Ineffective Discipline.

Classroom Behavior Problems. Teacher ratings on the MTA SNAP-IV (Swanson, Krawmer, Hinshaw, Arnold, Conners, & Abikoff, 2001) scale was used to assess the severity of participants' classroom behavior problems. On this rating scale, teachers rate students' ADHD and oppositional defiant disorder (ODD) symptoms. The MTA SNAP-IV yields three factors: two related to ADHD diagnostic criteria (i.e., inattention and hyperactivity/impulsivity) and one related to ODD symptoms. This measure has been shown to exhibit acceptable psychometric properties (Bussing et al., 2008).

Academic Performance. *The Homework Performance Questionnaire- Teacher Version* (HPQ-T; Power, Dombrowski, Watkins, Mautone, & Eagle, 2007) measures teachers' perceptions of homework performance. The scale includes a Student Responsibility factor and a Student Competence factor. This measure has been shown to have adequate concurrent and discriminant validity in a sample of children with ADHD (Mautone, Marshall, Costigan, Clarke, & Power, 2012). The *Academic Performance Rating Scale* (APRS; DuPaul, Rapport, & Periello, 1991) is a 19-item, teacher-rated questionnaire used to assess academic performance, including three factors of Academic Productivity, Academic Performance, and Impulsivity. The psychometric properties of the APRS are acceptable (DuPaul et al., 1991).

Assessment Procedures

Data were collected at baseline, mid-point (between sessions 6 and 7), post-treatment, and 3-month follow-up. Parent-report baseline measures were collected during the first intervention session, after the clinical team introduced themselves and provided an overview of the FSS or CARE program.. Post-treatment ratings were obtained in person at the conclusion of

the final session, and families were invited to attend a reunion visit 3 school months (i.e., summer months were not counted) after the final intervention session for follow-up data collection. If the family was unable to attend the reunion meeting, measures were mailed to the family with a self-addressed, stamped return envelope. Research assistants followed up with families by telephone to remind them to complete the mailed measures. Parents received a $20 cash stipend for completing measures at each assessment period. Teacher-report measures were collected during each of the data collection periods. Teachers received the measures in the mail with a cover letter requesting that they complete the measures promptly. Teachers received a $20 cash stipend for completing measures at each assessment period.

Data Analysis Plan

The adequacy of the data was first analyzed using SPSS Version 20 (Arbuckle, 2010). These analyses were conducted to determine the percentage of missing data at the case and variable levels, as well as skewness and kurtosis of each variable. Variables with significant skewness and kurtosis were considered for linear transformation. Multicollinearity between observed variables at each time point were also analyzed using bivariate correlations.

Figure 1 shows the hypothesized model that was investigated in the present study. This proposed model of relationships between changes in family involvement in education (FIE), parent-child relationship (PCR), classroom behavior problems (CBP), and academic performance (AP) was tested using SPSS Amos 18 (Arbuckle, 2010). Structural equation modeling (see Schumacker & Lomax, 2010) was used to test the interrelationships between these family processes and educational outcomes. The PES and PTIQ were included as measures of the construct of FIE. The PES yields a single factor which is purported to measure parent role distinction and self-efficacy in being involved with their child's education. The PTIQ also yields

a single factor that relates to global aspects of the parent-teacher relationship regarding collaborating on their child's education. Although there is a unitary factor structure, the items included on the PTIQ appear to address processes related to how welcomed the parent feels in collaborating with the teacher on educational goals (e.g., "You feel comfortable talking with your child's teacher about your child", "You feel your teacher pays attention to your suggestions"). These measures align to two of the three factors of the Hoover Dempsey model of FIE that has been documented to predict parent engagement (Walker et al., 2005). The PES maps onto the parenting role construction and self-efficacy factor and the PTIQ maps onto the perceived invitations to be engagement factor of the Hoover-Dempsey and Sandler model well (Hoover-Dempsey & Sandler, 2005). No measure included in the Power and colleagues (2012) study was administered that can measure the third factor of perceived time, energy, and skills to be involved. However, in the Semke, Garbacz, Kwon, Sheridan, and Woods (2010) study, parent role construction and self-efficacy was the single greatest predictor of FIE behaviors at home, school, and in terms of home-school communication. This suggests that measuring the construct of FIE using the PES and PTIQ was likely to represent the construct well.

Current research in the population of families coping with ADHD suggests that parents of children with ADHD often exhibit ineffective parenting practices, and that these parenting practices are associated with worse child outcomes (Chronis-Tuscano et al., 2011; Harvey, 2000; Wymbs, 2011). The research has also shown that positive parenting practices are associated with improved child outcomes (Rogers et al., 2009). The PCRQ is the measure used to represent the construct of PCR in the present study. The PCRQ yields two factors: negative/ineffective discipline and positive involvement. These factors represent the risk factor of ineffective

parenting practices and the protective factor of positive parenting practices well and are expected to provide an adequate measure of PCR.

With regard to educational outcomes, there is a wealth of research showing that youth with ADHD struggle educationally (Loe & Feldman, 2007; Massetti et al., 2008). As such, classroom behavior problems and AP have been shown to be important educational outcomes of study within the population of school-aged children with ADHD. With regard to CBP, symptom severity has been shown to be a predictor of academic outcomes (DeShazo Barry et al., 2002). The MTA SNAP-IV (Swanson et al., 2001) provides such a metric, and yields factors related to symptoms of ADHD and symptoms of ODD. Teacher ratings on the SNAP-IV were used to comprise the construct of CBP, and both SNAP-IV factors were used. With regards to AP, students with ADHD have often been shown to be impaired in their homework performance (Power et al., 2006) as well as with task completion and accuracy in the classroom (Raggi & Chronis, 2009). The HPQ-T includes a factor related to student responsibility and a factor related to student competence, providing a multidimensional metric of homework performance. The APRS also affords the opportunity to include teacher ratings of academic performance in the classroom throughout the school day. The academic performance, academic productivity, and impulsivity factors of the APRS were used as the third factor comprising the construct of AP.

Stepwise Plan for Model Testing. To test the first research question, an iterative process was used following recommendations made in Farrell (1994). First, the fit of the measurement model at baseline was tested using confirmatory factor analysis (see Hoyle, 1991) procedures by which the latent factors for family involvement in education, parent-child relationship, classroom behavior problems, and academic performance were individually tested for goodness of fit. If necessary, modifications to each latent variable were made to achieve adequate fit. Once the

measurement model was established, comparison of the combined structural model to the saturated model was performed. The hypothesized structural model (see Figure 1) includes measurement of the FIE, PCR, CBP, and AP constructs at baseline, post-treatment, and at 3-month follow-up. This model includes stability paths for each of the four latent variables (Time 1 → Time 2 → Time 3). Eight cross-lagged paths to test reciprocal relationships between these four latent variables are also included: two for Family Involvement in Education, two for Family Relationships, two for Classroom Behavior Problems, and two for Academic Performance. Measurement errors are also correlated for each indicator at each time point, as are each of the latent variables at each time point.

Marsh, Liem, Martin, Morin, and Nagengast (2011) recommend, "…that applied researchers use an eclectic approach based on a subjective integration of a variety of different indices, including the chi square, detailed evaluations of the actual parameter estimates in relation to theory, a priori predictions, common sense, and a comparison of viable alternative models specifically designed to evaluate goodness of fit in relation to key issues." In keeping with these recommendations, several fit indices were used to test goodness of fit. These indices include: a) chi –square likelihood ratio statistic (J□öreskog, 1969); b) root mean square error of approximation (RMSEA; Steiger & Lind, 1980); c) Tucker-Lewis index (TLI; Tucker & Lewis, 1973); d) comparative fit index (CFI; Bentler, 1990); e) incremental fit index (IFI; Bollen, 1989; Marsh et al., 1988); and f) normed fit index (NFI; Bentler & Bonnett, 1980). In assessing adequate fit, the chi-square ratio was set at < 5. Values of ≤ 0.05 and < 0.08 on the RMSEA represented a close fit and reasonably close fit to the data, respectively. Values of ≥ 0.95 and ≥ 0.90 on the CFI, TLI, IFI, and NFI were taken to represent excellent and adequate fit of the structural model to the data (Hu & Bentler, 1999). In all cases, these cutoffs are considered

somewhat arbitrary, as no firm guidelines or empirical evidence exists for detriment to models that do not meet these criteria (West, Taylor, & Wu, 2012). Finally, significance, standardized regression weights, and squared standardized regression weights of parameter estimates will also be used to evaluate adequacy of the models tested and the unique variance explained by each predictor in the model.

Considering the relatively low sample size and complexity of the hypothesized model, a data analysis contingency plan was developed to address any shortfall in the adequacy of the model to be tested in the manner that has been previously described. If confirmatory factor analysis or structural model testing suggests that the latent constructs are adequate, but that the model may be too complex for the sample size based on the fit indices, a difference score model will be used to test the interrelationships between changes in family processes of FIE and PCR and changes in educational outcomes of AP and CBP over time. If this model fails to fit the data adequately, two separate path analyses will be completed using difference scores to represent time in the model. Measures of family processes will be entered as measured variables predicting the latent construct of AP in the first model. In the second model, measures of family processes will predict the latent construct of CBP.

To test the second research question related to the interrelationships between changes in improvements in family processes and educational outcomes, standardized path coefficients representing the relationships among the latent variables were used. Paths with significant associations (i.e., $p < .05$) were reported. To test the third research question, the final structural model that emerges from the procedures listed above for testing the first research question will be used. The differential fit of the final structural model will be tested for participants who completed FSS versus those who completed CARE. The same fit indices will be used to evaluate

the third research question as the first research questions, and the significance of change in fit will be evaluated using the chi-square difference test at the $p < .05$ level.

Chapter 4

Results

Descriptive Statistics

Descriptive statistics were computed using SPSS 20 (Arbuckle, 2010). Means, standard deviations, skewness, and kurtosis of all variables at baseline are shown in Table 2; no variables were found to have skewness or kurtosis values outside tolerable limits of $\left|2\right|$. Bivariate correlations between measured variables were also computed at each time point and were compared as a test for univariate multicollinearity. Malone and Lubansky (2012) suggest any correlations between measured variables that are not hypothesized to be part of the same latent construct in the structural model be considered as potential instances of multicollinearity. Correlation coefficients approaching 1.0 are to be considered strongly as instances of multicollinearity and coefficients ≥ 0.70 are to be considered cautiously. Bivariate correlations at baseline, post-treatment, and follow-up are shown in Tables 3, 4, and 5, respectively. No correlations ≥ 0.70 between theoretically unrelated measured variables were found, indicating issues with multicollinearity are unlikely. Bivariate correlations between theoretically related measured variables were consistently found to be statistically significant across time points. The one exception was that the Positive Involvement and Negative/Ineffective Discipline factors of the Parent Child Relationship Questionnaire were shown to be significantly correlated at baseline ($r = -0.22$, $p < .01$), but not at post-treatment ($r = -0.08$, $p = 0.29$) or follow-up ($r = -0.16$, $p = 0.057$).

Evaluation of Overall Measurement Model

Conducting confirmatory factor analysis (CFA) of all hypothesized latent constructs is the first step in the evaluation of the overall measurement model (Farrel, 1994). The purpose of

the CFA is to test the null hypothesis that all measured variables of a factor do not represent a unitary factor. Due to issues of identification of an underlying factor, at least four measured variables are needed to test this null hypothesis. This is because a latent factor with three measured variables is just-identified (i.e., there are just enough degrees of freedom to estimate factor loadings, but the hypothesis of a single underlying factor cannot be tested). With regard to the hypothesized model, there were only ≥ 4 measured variables for the construct of Academic Performance (AP). The hypothesized constructs of Family Involvement in Education (FIE), Parent Child Relationship (PCR), and Classroom Behavior Problems (CBP) are each comprised of less than four measured variables and therefore cannot be evaluated as unitary factors before being evaluated in the structural model.

The CFA results for the hypothesized model of AP are depicted in Figure 3. These analyses, as well as all subsequent structural equation modeling analyses, were conducted using AMOS 18 (Arbuckle, 2009). Discrepancies were tested using maximum likelihood estimation and estimated means and intercepts to interpolate missing data. Table 6 shows the standardized regression weights and standard errors of measurement for each of the parameter estimates of the AP latent factor. Each of the measured variables was a significant predictor of the latent construct of AP, with more than 36% of the variance in AP accounted for when using the formula:

$$R^2 = \frac{\beta_{ij}^2}{N}$$

where the summation of sqared multiple correlations is divided by the number of squared multiple correlations to produce the squared multiple correlation representing the percentage of variance in AP explained by the CFA. With regard to the overall model fit, the NFI (0.916), IFI (0.930), and CFI (0.928) values exceeded acceptable fit cutoffs, the $\chi 2$ ratio (5.264) approached

the acceptable cutoff, while others did not (TLI = 0.784, RMSEA = 0.147). Considering the small sample size of this study, the propensity of the χ^2 ratio and RMSEA fit indices to penalize for low sample size (Curran, Collen, Chen, Paxton, & Kirby, 2003; Marsh, Balla, & McDonald, 1988), statistical significance of all parameter estimates, four of six fit indices meeting or approaching acceptable cutoffs, and more than 36% of the variance in AP explained by the measured variables used, the hypothesized model of AP was retained for use in subsequent analyses.

Evaluation of Overall Structural Model

The full hypothesized model (Figure 1) was tested, and the results indicate that the model is probably empirically underidentified. That is, although the model is acceptable in that it meets the identification criteria under the two-indicator rule (Bollen, 1989, p. 282), AMOS output indicates that 11 more constraints need to be added for the model to be identified. Empirically underidentified models may occur in many situations (Kenny & Milan, 2012), none of which can be determined in AMOS. Considering that the purpose of testing the fully cross-lagged panel design was to explicitly measure change in these variables over time, it is not consistent with the stated research aims to impose 11 constraints to the model. Instead, it is warranted to follow the data analysis contingency plan of simplifying the hypothesized model by depicting relationships between the observed variables over time represented by difference scores.

Evaluation of Overall Structural Model Using Difference Scores

Variables using difference scores were calculated for each measured variable in the hypothesized model. This was completed by subtracting the score for each participant on each measure at the post-treatment time point from the score for each participant on each measure at the baseline time point. First, the full model was tested (Figure 4). The results indicated that this

model was also empirically underidentified, likely due to issues related to model complexity and sample size. Following the data analysis contingency plan, two models were then tested: (a) a model testing the relationship between changes in measures of family processes and changes in AP; and (b) a model testing the relationship between changes in measures of family processes and changes in CBP. The results of these analyses are reported next.

Family Process Variables as Predictors of AP. The results of the model of interrelationships between changes in measures of family processes and changes in AP are depicted in Figure 5. The fit indices for the model were χ^2 ratio = 5.041, NFI = 0.830, IFI = 0.859, TLI = 0.545, CFI = 0.848, and RMSEA = 0.143. None of the fit indices reached the cutoffs for acceptability, and only the χ^2 ratio was approaching the cutoff. With regard to parameter estimates for the model, only the PES and factor 2 of the PCRQ were significant predictors of AP (Table 6).

Considering the less than adequate fit of the overall model and that two of the four parameter estimates were statistically nonsignificant, comparison of the overall model with a model with all nonsignificant paths constrained was warranted to attempt to improve the fit of the model to the data. Thus, a model with parameter estimates for PTIQ and factor 1 of the PCRQ constrained was compared to the overall model. The χ^2 test of the null hypothesis that there is no difference between the original and constrained model was statistically nonsignificant (2, N = 198) = 0.046, p = 0.977. These results indicate that the null hypothesis should be rejected, and that the constrained model fit the data statistically significantly better than the original model. Fit indices also improved when fitting the constrained model: χ^2 ratio = 1.525, NFI = 0.804, IFI = 0.922, TLI = 0.833, CFI = 0.911, and RMSEA = 0.051. The χ2 ratio indicated good fit, and the RMSEA, CFI and IFI showed adequate fit, and the NFI and TLI did not meet

cutoffs for acceptable fit. Overall, the model including the PES and the factor of the PCRQ relating to parental use of negative and ineffective discipline practices accounted for 3.8 % of the variance in the variance of AP. Considering the statistically significantly different fit from the original model, four of six fit indices with at least adequate fit, and statistically significant parameter estimates for both the PCRQ F2 and PES variables , these results indicate that the constrained model fit the data adequately.

Family Process Variables as Predictors of CBP. As stated previously, the latent model of classroom behavior problems could not be evaluated using CFA procedures due to having only two factors. Therefore, the initial model of change in family process variables and change in CBP was examined using measured variables of family processes and a latent construct of CBP comprised of difference score for measured variables for the ADHD and ODD factors of the MTA SNAP-IV. The results of the analysis of this model indicate that it is empirically underidentified.

The results of the model of the interrelationships between changes in family process variables and changes in CBP (Figure 6) show that this model was a poor fit for the data overall. Only the Negative/Ineffective Discipline factor of the PCRQ was a significant predictor of CBP (Table 9; $\beta = 0.213$, $p = 0.013$); similarly, fit indices did not indicate a good fit to the data. Fit indices were: χ^2 ratio = 5.684, NFI = 0.226, IFI = 0.262, TLI = -3.261, CFI = 0.000, and RMSEA = 0.154.

Evaluation of Differential Fit of Final Models between FSS and CARE Groups

The fit of the final models for predicting CBP and AP were tested for differential fit between both the FSS and CARE treatment groups. For both models, AMOS output indicated that the models were empirically underidentified. It is likely that the complexity of these models

was too great in comparison with the decrease in sample size by half that occurred when assessing differential fit of these models between treatment groups. Because these models were empirically underidentified, no assessment can be made to the differential fit of the hypothesized models between FSS and CARE treatment group participants.

Chapter 5

Discussion

The present study further establishes the importance of understanding the contributions of relational processes to the educational outcomes of youth with ADHD The majority of prior intervention studies targeting educational outcomes within the elementary school-aged population with ADHD have emphasized "what" interventions work rather than "how" interventions work. Understanding mechanisms of action by which interventions bring about meaningful change in salient educational outcomes is an important area of research because misconceptions and limitations in our understanding of how these interventions work may be leading researchers to devote precious resources on strategies that may not optimally improve functional outcomes for all families. To this end, the results of the present study offer a single step in a long journey towards investigating the associations between myriad relational processes and functional outcomes for youth with ADHD.

It is important that these findings be interpreted in context. The measurement of family processes of FIE and PCR were modeled using parent ratings of child behavior, and measurement of AP and CBP outcomes were both modeled using teacher ratings of child behavior. Therefore, the results of the present study should be interpreted in the context of the distal effects of improvements in family processes on educational outcomes, as rated independently by parents and teachers. The results with regard to each research question will be discussed next.

Research Question 1: Does the hypothesized model of interrelationships between family processes and educational outcomes fit the data well?

The initial hypothesized model did not fit the data well. It is likely that this model was too complex to be adequately modeled with the relatively low sample size in this study.

Following the data analysis contingency plan, the next step was to use a difference score model to test interrelationships explaining outcomes on CBP. The results showed that none of the indices used to test the fit of the structural model showed good fit to the data, although reductions in negative and ineffective discipline significantly predicted improvements in CBP over time. The lack of significant model fit may be due to a combination of low sample size and limitations in measurement that will be discussed in a subsequent section. Still, the significant relationship between negative and ineffective discipline and CBP is noteworthy.

When using a difference score model, adequate fit was achieved in the explanatory model of AP. Of the six indices used to test the fit of this model, two were above recommended cutoffs, two were approaching recommended cutoffs, and two were below recommended cutoffs. Considering the relatively low sample size and the propensity of the RMSEA, χ^2 ratio, and NFI to underestimate fit for small sample sizes (Curran, Bollen, Chen, Paxton, & Kirby, 2003; Mars, Balla, & McDonald, 1988), it is reasonable to conclude that the model representing change in AP is at least an adequate fit for the data. For this reason, if this model were to be tested in a larger sample these fit statistics would likely improve.

> Research Question 2: What are the relationships between changes in aspects of family functioning (i.e., FIE and PCR) and changes in educational performance (i.e., CBP and AP) over time?

Change over time in family processes was a significant predictor of change in AP, but not CBP, in the present study. Improvements in parent self-efficacy and role construction (i.e., being involved in their child's education) were found to contribute significantly to change in AP. This finding is consistent with prior research that suggests parent self-efficacy mediates the relationship between parenting stress and family involvement in education for youth with behavior problems (Semke et al., 2010). Parent self-efficacy and role construction appear to be

two worthy targets for family-based intervention within the population of elementary school aged youth with ADHD when improvements in AP are desired. However, it is important to note that interactions between parents and teachers are bidirectional and transactional. Interventions to enhance FIE within this population should also carefully consider the quantity and quality of teacher and school personnel's interactions with families as potential targets for intervention. This could include increasing the explicit invitations for parents to become involved in their child's education, as well as providing tips and strategies to teachers regarding giving balanced and constructive feedback to parents regarding their child's educational performance.

Negative and ineffective discipline practices also emerged as an important family process linked to changes in AP in this sample. Reductions in negative and ineffective parenting practices were related to improvements in AP and ADHD symptoms over time. This finding also comports with extant literature that has shown ineffective discipline practices are associated with higher inattentive symptoms of ADHD and worse academic achievement (Rogers et al., 2009). Negative and ineffective parenting practices have also been shown to mediate the relationship between child disruptive behavior and negative parental communication (Wymbs, 2011). Clearly, the level of negative parenting practices plays a key mediating role in academic achievement and aspects of parental communication. The present study adds to the literature by being the first to show such a relationship exists in the broader context of outcomes related to AP as well as ADHD symptom severity. Thus, it is possible that targeting the reduction or elimination of negative parenting practices within the ADHD population may be helpful when planning interventions to address symptom severity and academic impairment.

> Research Question 3: Is the model fit statistically significantly better for the FSS group compared with the CARE group?

The final difference score models related to AP and CBP did not show a statistically significantly different fit between the FSS and CARE group participants from the Power and colleagues (2012) study. Although the models were empirically underidentified, this does not mean that no differences would be found with a larger sample size. As was the case with the initially hypothesized structural model, it is likely that the low sample size of the current study, when reduced by half to test this exploratory research aim, was too small to test between-group comparisons. There is a theoretical reason to expect that differential fit across these treatment groups would be observed if the analyses were adequately powered due to the specific targeting of the family processes in the FSS intervention. Therefore, a subsequent study with a larger sample size would be necessary to test this research aim.

Limitations

The main limitation of the present study was the relatively small sample size used compared with the complexity of the data analysis plan. As stated previously, an increased sample size would likely have affected model fit and statistical significance of the parameter estimates tested, while also affording an opportunity to test the initially hypothesized model. The cross-lagged panel design in this model had the advantage of being able to parse out the association between factors at each time point with the association of factors across time so that autoregressive effects are controlled for. This allows for increased clarity in interpretation of the unique contributions of family process over time in relation to improvements in educational outcomes. Although this level of analysis still would not approach the quality needed to draw causal inferences, the difference score models employed in the present study lend themselves to interpretations related to associations between the change in processes. Even so, these limitations and the lack of significant findings does not equate to a conclusion that family processes, such as

those measured by the positive parenting practices factor of the PCRQ and ratings on the PTIQ, that were not found to be significantly related to educational outcomes have no bearing on AP and CBP. These constructs, and likely many others, may be shown to meaningfully contribute to educational outcomes for youth with ADHD in research conducted with different measures and larger sample sizes.

Another limitation to the present study is that the measurement of the CBP construct was not multi-method or multi-informant. This relatively narrow conceptualization of the construct of CBP encompassed only diagnostic symptoms of ADHD and ODD. In itself, this would limit generalizability of any statistically significant findings related to this construct to changes in symptoms of these disorders. What the results of the present study suggest is that improvements in relational processes, with the exception of negative parenting practices, are not reliably related to changes in ADHD and ODD symptoms. These results may also suggest that measuring symptom reduction alone when attempting to model functional impairments in behavior is inadequate. In future investigations, multidimensional behavior rating scales may provide a better representation of the construct of CBP. Additionally, explicitly measuring and modeling functional impairments across domains and contexts may represent an alternative construct worthy of future inquiry.

There are also several limitations inherent in the Power and colleagues (2012) study from which the participants of the present study were sampled. To summarize, there are characteristics of the participants and methodology that limit the generalizability of the findings to the population of families coping with ADHD in the greater community. For instance, due to the participants' option to undergo a medication trial prior to entering into the intervention phase of the study, ADHD symptom ratings on the MTA SNAP-IV were lower by 0.3 at baseline

compared with the participants in the MTA study. This relatively lower level of symptom severity may not represent as great of impairment at baseline as a typical family with a child with ADHD. Furthermore, reductions in impairment were based on parent-report alone, which did not account for improvements in functioning that occurred in the school setting due to medication alone. Also, participating families were mostly self-enrolled or had already presented for services at the clinic where the study was conducted, which may represent a sample with more motivation to participate in treatment or who are experiencing fewer barriers to engaging in treatment than is present in the average family affected by ADHD. Finally, the study was conducted in a clinic setting, which compared with a school setting, is a less advantageous setting for impacting educational outcomes that were a primary target of the investigation. It is possible that a school-based implementation of the same treatment conditions would have led to different outcomes due to the opportunity to access resources and intervene in the classroom.

Finally, the use of change scores has been the center of debate related to issues of reliability, validity, and overall utility of this metric in applied research. Classic work in this area argued against the use of change scores and deemed them unreliable measures of change over time (Cattell, 1960; Chronbach & Furby, 1970; Lord, 1963). However, subsequent work in this area has shown that change scores are reliable in measuring intraindividual change across two time points except in extreme cases not likely to be encountered in applied research (see Maxwell & Howard, 1981; Rogosa & Willett, 1983), as is the case in the present study. The original hypothesized model explicitly measured both autoregressive changes in the same measure over time as well as correlations between measures at each time point and at subsequent waves of data collection. This approach afforded the ability to parcel out the autoregressive change over time on a given measure with co-occurring associations between measures both at

the same and subsequent waves of data collection. Considering the purpose of the data analysis contingency plan was to reduce model complexity, simple change scores were selected instead of a latent change score approach, which would also model both observed scores at each time point for each measure and change scores at subsequent waves of data collection. As such, it remains unknown the extent to which regression weights and model fit would be affected in the present study had autoregressive change been accounted for.

Implications for Research and Practice

There is a continued need for more research that goes beyond measuring symptom reduction outcomes by also investigating mechanisms of action through which psychosocial interventions bring about meaningful change in functional outcomes. The present study investigates only a fraction of the potential factors and relational processes that may contribute to educational outcomes within the ADHD population. For instance, there are a host of within-child characteristics (e.g., cognitive ability, comorbid internalizing and externalizing problems, SES) that may serve as factors that mediate or covary with relational processes.

Within the family system, there are also other factors worthy of further research. For instance, the work of Hoover-Dempsey and colleagues (Walker, Wilkins, Dallaire, Sandler, & Hoover-Dempsey, 2005) in understanding the family processes that explain the level of FIE is a promising line of research with direct application to the population of families coping with ADHD. This study only assessed two of the three domains that make up the hypothesized construct of FIE, parent self-efficacy and role construction and parent engagement. Future research should also investigate the extent to which parent perceptions of invitations to be involved and perceived time, energy, and skills to be involved also contribute to educational outcomes for youth with ADHD.

In similar fashion, including varied measurement of family processes would be of added benefit to future studies. For instance, including more observational measures of parent-child interactions in the home and in analog tasks in a laboratory setting may reveal additional detail on how interactions between parents and their children change over time and in turn contribute to changes in child outcomes. In the school, teacher factors are another understudied potential contributor to child educational outcomes. Previous research has shown that teachers' use of gestures, tolerance of classroom behavior, level of training, and views regarding treatment acceptability are correlated with students' performance on instructional tasks, ADHD symptom ratings, and perceived social acceptance (Sherman, Rasmussen, & Baydala, 2008). Additional research to explicate the predictive relationships among these variables is needed.

In order to better understand the ways in which child, family, and school relationships contribute to educational outcomes for youth with ADHD, we need to investigate the dynamics of these interactions. The parent-teacher relationship may represent a target for intervention to determine whether improvements in this relationship are related to increases in FIE, as well as improvements in academic and behavioral outcomes. Similarly, the child-teacher relationship may represent a target for intervention, as relational improvements may lead to growth in educational outcomes.

Finally, more studies using longitudinal designs are needed. Longitudinal research has qualities that can help move the field forward in our understanding of how changing relationships over time contribute to valued outcomes. In particular, following a larger cohort of youth with ADHD, for a longer period of time, with more extensive measurement would be of great benefit to our understanding of ADHD. This approach to subsequent research efforts would be further supplemented by investigating other age ranges of youth with ADHD, and as stated

previously the results of the current study relate only to elementary school aged children with ADHD. For example, this research may reveal differences in the interplay of child, family, school, and family-school processes at different stages of development that warrant varied approaches to treatment. To this end, more research with individuals with ADHD during preschool, middle school, high school, and college are needed.

The results of the present study also have implications for practitioners. The major finding was that reductions in negative and ineffective discipline practices were predictive of improvements in both ADHD symptoms and AP. The primary emphasis of many behavioral parent training programs is to increase positive parenting practices; however, this was not shown to be significantly related to child outcomes in the present study. Although increases in positive parenting practices were not associated with changes in AP or CBP in the present study, it does not suggest that positive parenting makes no difference for youth with ADHD in improving educational outcomes. The distinction to make in this case has more to do with the consistency with which parents use positive parenting practices when interacting with their children with ADHD. When positive parenting practices are used, this parenting behavior is incompatible with engaging in negative and ineffective discipline practices. Nevertheless, parents have a choice to respond to each instance of child problem behavior with either positive parenting practices or negative and ineffective discipline over time. If parents are responding with positive parenting practices intermittently with negative and ineffective discipline strategies to similar child behavior in similar situations, slower operant learning is likely to occur. Therefore, increasing the frequency of using positive parenting practices relative to baseline functioning is not as important as working toward engaging in positive parenting practices exclusively. This consistency in the implementation of positive parenting creates a contrast in the child's

experience between times when they are "getting it right" and times when they are not, which allows for more efficient operant conditioning of child behavior. These findings suggest that when practitioners emphasize the importance of consistency of changing the ways in which parents move away from negative and ineffective discipline practices to using positive parenting practices when interacting with their children, there will be improvements in child outcomes over time.

Conclusions

The present study shows that when parents improve aspects of the relationship with their child and involvement in education, child educational outcomes improve. Specifically, when parents view themselves as a valid and valued stakeholder and feel that their involvement will make a difference in their child's education, children's educational performance improves. Also, when negative parenting practices are reduced over time, this is associated with reductions in classroom behavior problems and improvements in educational performance. With these findings in mind, it is imperative to continue to investigate processes related to within-child, family, school, and family-school systems that also contribute to educational outcomes for the ADHD population. The more we understand about the contributions of relational processes to educational outcomes, the greater the likelihood that we will design and implement effective and efficient interventions to improve functional outcomes for youth with ADHD.

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Table 1.

Description of each session for Family School Success.

Session Title	Session Type	Session Content
1 – Introduction to Family School Success	Group	Introduction to FSS Orientation to the CBC model Using attention to change child behavior
2 – Preparing for Home-School Collaboration	Individual Family	Preparation for first school consultation Use of homework assignment books Use of DRC
3 – Promoting Home-School Collaboration	School Meeting	Establishing collaborative home-school relationship Establishing use of assignment book & DRC
4 – Understanding Basics of Behavior Management	Individual Family	Review school meeting Develop understanding of positive reinforcement and punishment
5 – Introducing the Token Economy	Group	Group discussion of school meetings Establishing a token economy
6 – Understanding the Function of Behavior and Establishing the Homework Ritual	Group	Functional assessment to define homework problems (antecedents and consequences) Establishing the homework routine Guidelines for giving effective instructions
7 – Managing Time and Goal Setting	Individual Family	Time management strategies for homework completion Goal setting approach to homework completion

Session Title	Session Type	Session Content
8 – Managing Time and Goal Setting - 2	Individual Family	Review goal setting strategies with clinician modeling and feedback
9 – Using Punishment Successfully	Group	Group discussion of experiences with goal setting Rationale for using punishment strategically Response cost and time-out Prepare for second school consultation
10 – Collaborating to Refine Strategies	School Meeting	Review use of DRC and modify if needed Use of goal setting in the classroom
11 – Developing Effective Study Skills	Group	Strategies for effective study skills, including incremental rehearsal
12 – Integrating Skills and Planning for the Future	Group	Review and problem solve implementation difficulties Develop individual family "Formulas for Success" End of program celebration

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Note. Session content of Family School Success intervention (Power et al., in press). CBC = Conjoint Behavioral Consultation; DRC = Daily Report Card

Table 2.

Means, standard deviations, skewness, and kurtosis of measured variables.

Measure	Mean	Standard Deviation	Skewness	Kurtosis
SNAP-IV				
Baseline SNAP ADHD	8.065	4.965	0.002	-0.873
Post SNAP ADHD	6.556	5.070	0.283	-1.154
Follow-up SNAP ADHD	21.311	13.187	0.558	0.392
Baseline SNAP ODD	1.296	2.296	1.762	1.966
Post SNAP ODD	1.080	1.906	1.782	1.169
Follow-up SNAP ODD	4.869	6.511	0.558	-0.581
PTIQ				
Baseline PTIQ	17.508	4.548	-0.298	-0.681
Post PTIQ	17.795	5.223	-0.687	0.029
Follow-up PTIQ	17.508	4.548	-0.298	-0.681
HPQ				
Baseline HPQ Responsibility	19.427	7.138	-0.963	0.017
Post HPQ Responsibility	20.666	6.441	-0.134	0.584
Follow-up HPQ Responsibility	20.936	6.856	-1.170	0.603
Baseline HPQ Competence	17.034	5.495	-0.900	0.103
Post HPQ Competence	18.298	4.818	-1.078	1.112
Follow-up HPQ Competence	18.383	4.749	-1.149	1.363

Measure	Mean	Standard Deviation	Skewness	Kurtosis
PES				
Baseline PES	31.550	3.641	-0.193	-0.036
Post PES	34.088	3.356	0.081	0.726
Follow-up PES	33.993	3.500	0.114	1.160
PCRQ				
Baseline PCRQ Positive Involvement	83.949	8.879	-0.376	-0.081
Post PCRQ Positive Involvement	85.626	8.103	-0.233	-0.252
Follow-up PCRQ Positive Involvement	69.675	7.522	-0.620	0.208
Baseline PCRQ Negative/Ineffective Discipline	43.500	6.646	0.226	-0.281
Post PCRQ Negative/Ineffective Discipline	39.186	6.485	-0.059	-0.409
Follow-up PCRQ Negative/Ineffective Discipline	38.295	7.000	0.046	-0.251

Measure	Mean	Standard Deviation	Skewness	Kurtosis
APRS				
Baseline APRS Academic Success	21.588	4.044	0.017	-0.525
Post APRS Academic Success	22.318	3.921	-0.158	-0.021
Follow-up APRS Academic Success	23.309	3.962	-0.525	0.387
Baseline APRS Impulse Control	7.989	1.838	-0.054	0.029
Post APRS Impulse Control	8.114	1.846	-0.461	0.312
Follow-up APRS Impulse Control	8.186	1.780	0.188	0.375
Baseline APRS Academic Productivity	38.941	5.672	-0.515	0.462
Post APRS Academic Productivity	39.553	5.397	-0.771	0.936
Follow-up APRS Academic Productivity	40.838	5.313	-0.720	0.630

Note. SNAP-IV = MTA SNAP-IV Rating Scale; PTIQ = Parent Teacher Involvement Questionnaire; HPQ = Homework Performance Questionnaire; PES = Parent as Educator Scale; PCRQ = Parent-Child Relationship Questionnaire; APRS = Academic Performance Rating Scale.

* = Skewness values $\geq \left|2\right|$, Kurtosis values $\geq \left|3\right|$

Table 3.

Intercorrelations among measured variables at baseline (*N* = 198).

	1	2	3	4	5	6	7	8	9	10	11
1. PTIQ	-										
2. HPQ F1	-0.018	-									
3. HPQ F2	0.041	0.636**	-								
4. PES	0.175*	0.119	0.153*	-							
5. PCRQ F1	0.240**	-0.019	-0.054	0.314**	-						
6. PCRQ F2	0.006	-0.047	0.118	-0.014	-0.216**	-					
7. APRS F1	0.021	0.416**	0.660**	0.215**	0.025	0.105	-				
8. APRS F2	0.031	0.083	0.199*	0.130	-0.126	0.060	0.198**	-			
9. APRS F3	0.038	0.585**	0.524**	0.026	0.100	-0.017	0.605**	0.078	-		
10. SNAP F1	-0.190*	-0.373**	-0.313**	0.008	-0.152	0.052	-0.358**	0.102	-0.592**	-	
11. SNAP F2	-0.184*	-0.240**	-0.125	0.076	-0.036	0.016	-0.162*	0.157*	-0.380**	0.596**	-

Note. PES = Parent as Educator Scale; PTIQ = Parent Teacher Involvement Questionnaire; HPQ F1 = Homework Performance Questionnaire (HPQ) Student Responsibility factor; HPQ F2 = HPQ Student Competence factor; PCRQ F1 = Parent Child Relationship Questionnaire (PCRQ) Positive Involvement factor; PCRQ F2 = PCRQ Negative/Ineffective Discipline factor; APRS F1 = Academic Performance Rating Scale (APRS) Academic Success factor; APRS F2 = APRS Impulsivity Factor; APRS F3 = APRS Academic Performance factor; SNAP F1 = MTA SNAP-IV Attention Deficit Hyperactivity Disorder factor; SNAP F2 = MTA SNAP-IV Oppositional Defiant Disorder factor

* Correlation is significant at the 0.05 level (2-tailed)

** Correlation is significant at the 0.01 level (2-tailed)

Table 4.

Intercorrelations among measured variables at post-treatment (*N* = 198).

	1	2	3	4	5	6	7	8	9	10	11
1. PTIQ	-										
2. HPQ F1	0.021	-									
3. HPQ F2	0.000	0.637**	-								
4. PES	0.223**	-0.167*	-0.026	-							
5. PCRQ F1	0.263**	-0.022	-0.110	-0.295**	-						
6. PCRQ F2	-0.002	-0.209**	-0.081	0.034	-0.083	-					
7. APRS F1	-0.012	-0.419**	0.631**	0.045	-0.054	-0.076	-				
8. APRS F2	0.094	0.098	0.282**	0.114	-0.080	-0.141	0.350**	-			
9. APRS F3	0.048	0.564**	0.502**	-0.010	0.041	-0.204*	0.663**	0.173*	-		
10. SNAP F1	-0.177*	-0.439**	-0.341**	0.100	0.015	0.096	-0.276**	0.104	-0.541**	-	
11. SNAP F2	-0.250**	-0.377**	-0.302**	0.151*	-0.034	0.104	-0.233**	0.078	-0.448**	0.656**	-

Note. PES = Parent as Educator Scale; PTIQ = Parent Teacher Involvement Questionnaire; HPQ F1 = Homework Performance Questionnaire (HPQ) Student Responsibility factor; HPQ F2 = HPQ Student Competence factor; PCRQ F1 = Parent Child Relationship Questionnaire (PCRQ) Positive Involvement factor; PCRQ F2 = PCRQ Negative/Ineffective Discipline factor; APRS F1 = Academic Performance Rating Scale (APRS) Academic Success factor; APRS F2 = APRS Impulsivity Factor; APRS F3 = APRS Academic Performance factor; SNAP F1 = MTA SNAP-IV Attention Deficit Hyperactivity Disorder factor; SNAP F2 = MTA SNAP-IV Oppositional Defiant Disorder factor

* Correlation is significant at the 0.05 level (2-tailed)

** Correlation is significant at the 0.01 level (2-tailed)

Table 5.

Intercorrelations among measured variables at follow-up (*N* = 198).

	1	2	3	4	5	6	7	8	9	10	11
1. PTIQ	-										
2. HPQ F1	0.054	-									
3. HPQ F2	-0.003	0.656**	-								
4. PES	0.068	0.210*	0.189*	-							
5. PCRQ F1	0.157	0.226**	0.041	0.260**	-						
6. PCRQ F2	-0.015	0.011	0.184*	-0.017	-0.155	-					
7. APRS F1	-0.034	0.468**	0.601**	0.160	-0.035	0.091	-				
8. APRS F2	0.170*	0.098	0.182*	0.179*	0.033	0.134	0.312**	-			
9. APRS F3	-0.038	0.628**	0.564**	0.137	-0.035	0.106	0.698**	0.172*	-		
10. SNAP F1	-0.112	-0.568**	-0.410**	-0.093	-0.130	-0.001	-0.422**	0.016	-0.605**	-	
11. SNAP F2	-0.203*	-0.494**	-0.346**	-0.071	-0.102	0.047	-0.295**	-0.004	-0.461**	0.696**	-

Note. PES = Parent as Educator Scale; PTIQ = Parent Teacher Involvement Questionnaire; HPQ F1 = Homework Performance Questionnaire (HPQ) Student Responsibility factor; HPQ F2 = HPQ Student Competence factor; PCRQ F1 = Parent Child Relationship Questionnaire (PCRQ) Positive Involvement factor; PCRQ F2 = PCRQ Negative/Ineffective Discipline factor; APRS F1 = Academic Performance Rating Scale (APRS) Academic Success factor; APRS F2 = APRS Impulsivity Factor; APRS F3 = APRS Academic Performance factor; SNAP F1 = MTA SNAP-IV Attention Deficit Hyperactivity Disorder factor; SNAP F2 = MTA SNAP-IV Oppositional Defiant Disorder factor

* Correlation is significant at the 0.05 level (2-tailed)

** Correlation is significant at the 0.01 level (2-tailed)

Table 6.

Parameter estimates hypothesized model of Academic Performance

Path	β	β^2	S.E.
HPQ F1 → AP	0.721**	0.520	.513
HPQ F2 → AP	0.817**	0.667	.370
APRS F1 → AP	0.771**	0.594	.282
APRS F2 → AP	0.193*	0.037	.148
APRS F3 → AP	0.735**	0.540	.403

Note. β = standardized regression coefficient; β^2 = squared multiple correlation; S.E. = standard error of measurement; HPQ F1 = Homework Performance Questionnaire (HPQ) Student Responsibility factor; HPQ F2 = HPQ Student Competence factor; APRS F1 = Academic Performance Rating Scale (APRS) Academic Success factor; APRS F2 = APRS Impulsivity Factor; APRS F3 = APRS Academic Performance factor.

* Correlation is significant at the 0.05 level (2-tailed)

** Correlation is significant at the 0.01 level (2-tailed)

Table 7.

Parameter estimates of hypothesized difference score model of interrelationships between changes in family process variables and changes in Academic Performance

Path	β	β^2	S.E.
HPQ F1 → AP	0.691**	0.477	.419
HPQ F2 → AP	0.578	0.334	.310
APRS F1 → AP	0.682**	0.465	.220
APRS F2 → AP	0.161**	0.026	.146
APRS F3 → AP	0.716**	0.513	.367

Note. β = standardized regression coefficient; β^2 = squared multiple correlation; S.E. = standard error; HPQ F1 = Homework Performance Questionnaire (HPQ) Student Responsibility factor; HPQ F2 = HPQ Student Competence factor; APRS F1 = Academic Performance Rating Scale (APRS) Academic Success factor; APRS F2 = APRS Impulsivity Factor; APRS F3 = APRS Academic Performance factor.

* Correlation is significant at the 0.05 level (2-tailed)

** Correlation is significant at the 0.01 level (2-tailed)

Table 8.

Parameter estimates of difference score structural model of interrelationships between changes in family process variables and changes in Academic Performance

Path		β	β^2	S.E.
HPQ F1	→ AP	0.463[a]	0.214	-
HPQ F2	→ AP	0.739**	0.546	0.370
APRS F1	→ AP	0.463**	0.214	0.282
APRS F2	→ AP	0.164*	0.027	0.148
APRS F3	→ AP	0.488**	0.238	0.403
PES	→ AP	0.178*	0.032	0.090
PTIQ	→ AP	0.016	0.000	0.083
PPCRQ F1	→ AP	0.007	0.000	0.053
PCRQ F2	→ AP	-0.212*	0.045	0.061

Note. β = standardized regression coefficient; β^2 = squared multiple correlation; S.E. = standard error; HPQ F1 = Homework Performance Questionnaire (HPQ) Student Responsibility factor; HPQ F2 = HPQ Student Competence factor; APRS F1 = Academic Performance Rating Scale (APRS) Academic Success factor; APRS F2 = APRS Impulsivity Factor; APRS F3 = APRS Academic Performance factor.

* Correlation is significant at the 0.05 level (2-tailed)

** Correlation is significant at the 0.01 level (2-tailed)

a = statistical significance and standard error were not computed for this parameter estimate because the regression weight was fixed to 1

Table 9.

Parameter estimates of difference score model of interrelationships between changes in family process variables and changes in Classroom Behavior Problems

Path		β	β^2	S.E.
PES	→ ADHD	0.061	0.004	0.080
PTIQ	→ ADHD	-0.060	0.004	0.075
PCRQ F1	→ ADHD	0.006	0.000	0.049
PCRQ F2	→ ADHD	0.213*	0.045	0.013
PES	→ ODD	0.033	0.001	0.668
PTIQ	→ ODD	-0.064	0.004	0.408
PCRQ F1	→ ODD	0.046	0.002	0.572
PCRQ F2	→ ODD	0.089	0.008	0.022

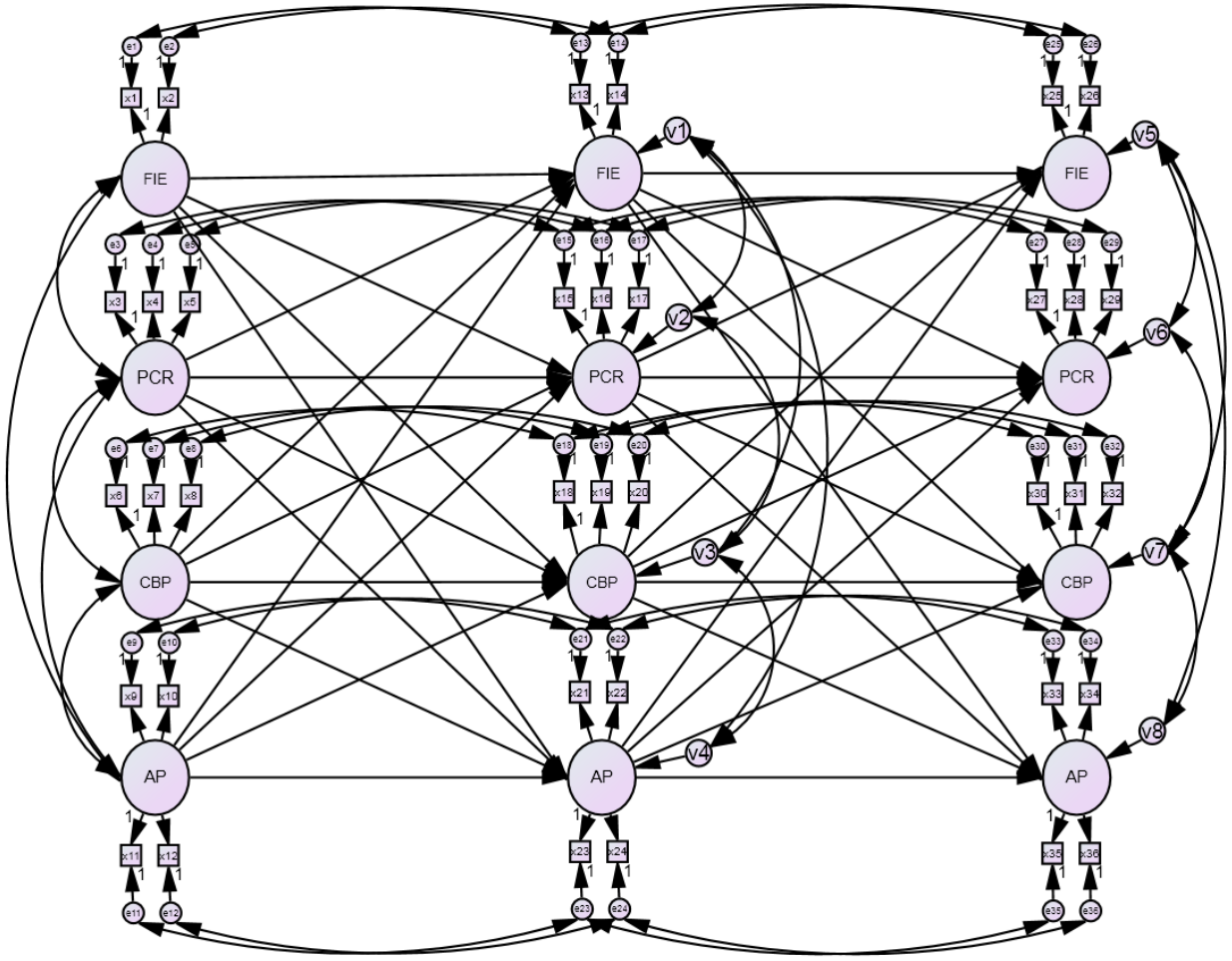
Note. β = standardized regression coefficient; β^2 = squared multiple correlation; S.E. = standard error; PES = Parent as Educator Scale; PTIQ = Parent Teacher Involvement Questionnaire; PCRQ F1 = Parent Child Relationship Questionnaire (PCRQ) Positive Involvement factor; PCRQ F2 = PCRQ Negative/Ineffective Discipline factor; ADHD = MTA SNAP-IV Attention Deficit Hyperactivity Disorder factor; ODD = MTA SNAP-IV Oppositional Defiant Disorder factor

* Correlation is significant at the 0.05 level (2-tailed)

** Correlation is significant at the 0.01 level (2-tailed)

Figure 1.

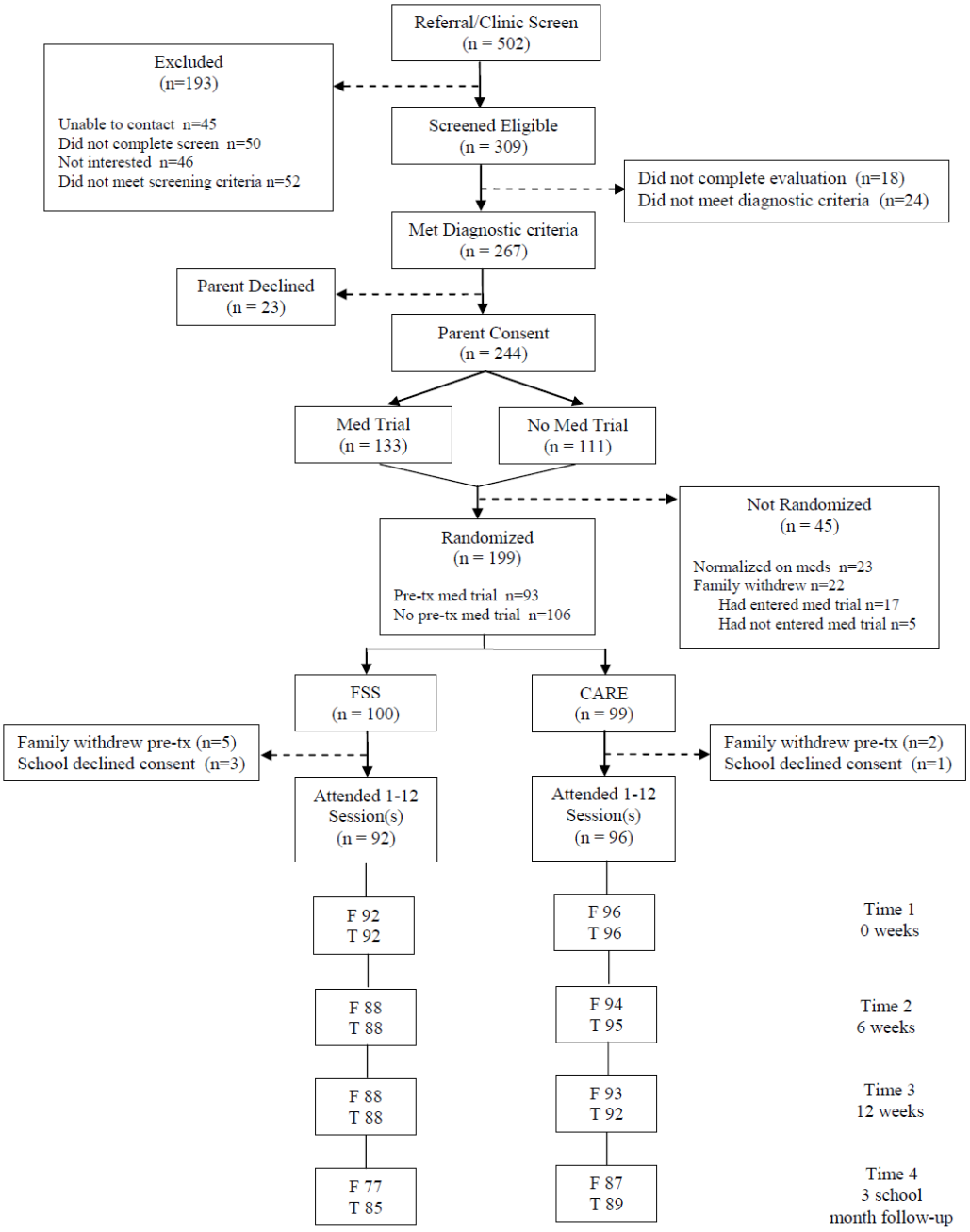
Hypothesized explanatory model of classroom behavior outcomes



Note. FIE = Family Involvement in Education; PCR = Parent Child Relationship; CBP = Classroom Behavior Problems; AP = Academic Performance

Figure 2.

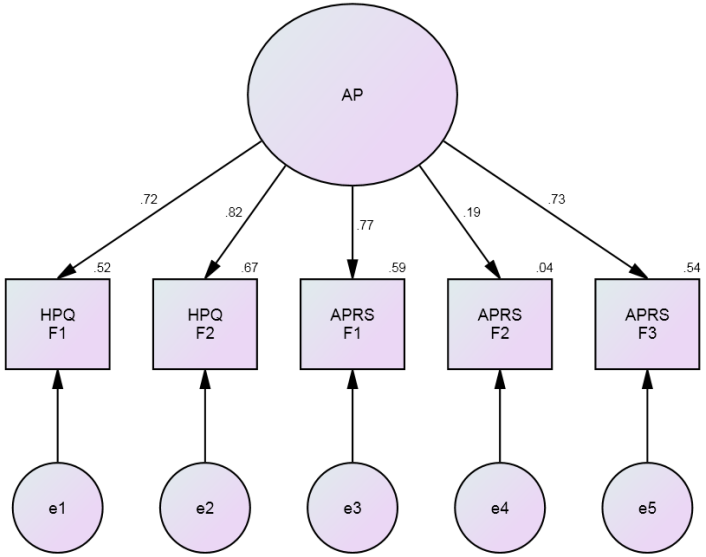
Flow of participants through each stage of the referral and intervention process.



Note. Flowchart of participation from screening to follow-up assessment 3 academic months after treatment (Power et al., in press). FSS = Family-School Success intervention; CARE = Coping with ADHD through Relationships and Education; F = Families completing measures; T = Teachers completing measure

Figure 3.

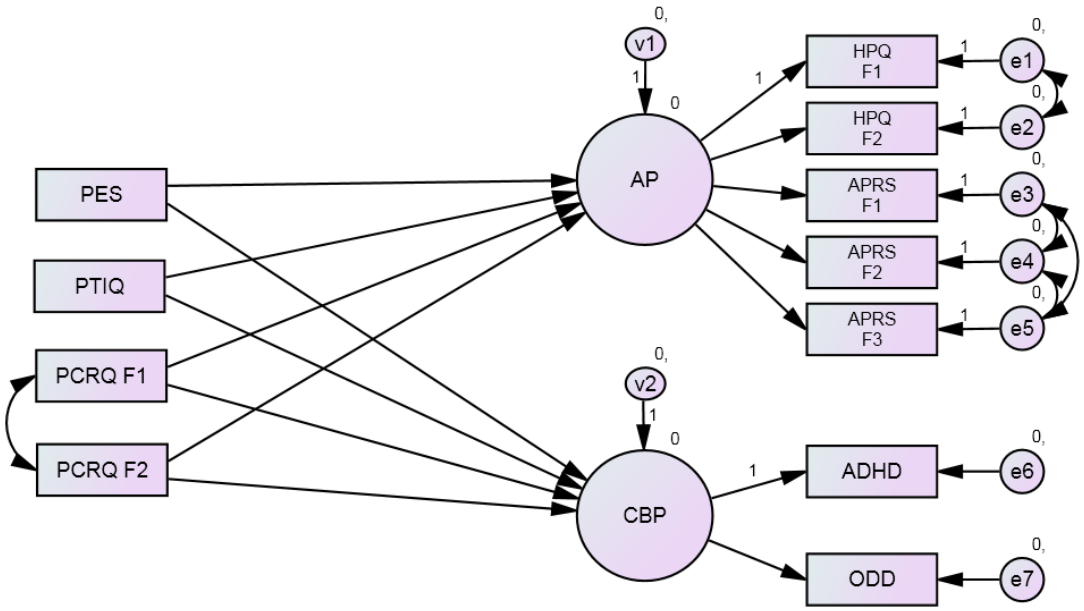
Results of CFA on the hypothesized latent factor structure of Academic Performance



Note. AP = Academic Performance; HPQ F1 = Homework Performance Questionnaire (HPQ) Student Responsibility factor; HPQ F2 = HPQ Student Competence factor; APRS F1 = Academic Performance Rating Scale (APRS) Academic Success factor; APRS F2 = APRS Impulsivity Factor; APRS F3 = APRS Academic Performance factor.

Figure 4.

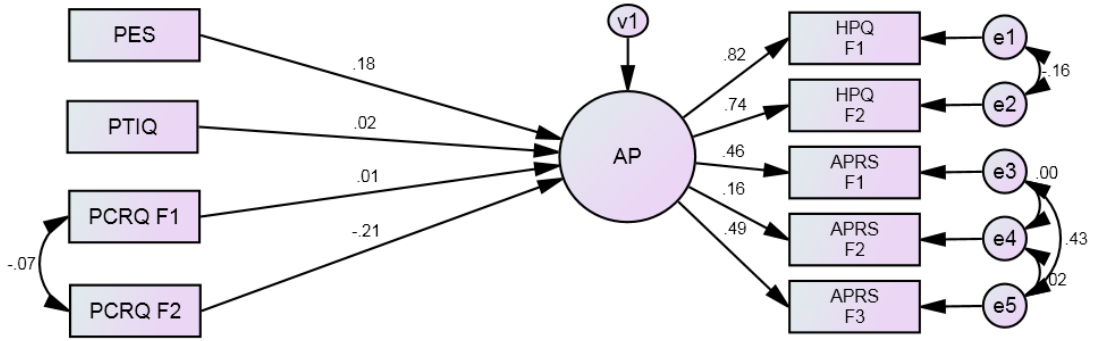
Hypothesized difference score model of changes in family processes and changes in AP and CBP



Note. AP = Academic Performance; CBP = Classroom Behavior Problems; PES = Parent as Educator Scale; PTIQ = Parent Teacher Involvement Questionnaire; HPQ F1 = Homework Performance Questionnaire (HPQ) Student Responsibility factor; HPQ F2 = HPQ Student Competence factor; PCRQ F1 = Parent Child Relationship Questionnaire (PCRQ) Positive Involvement factor; PCRQ F2 = PCRQ Negative/Ineffective Discipline factor; AP = Academic Performance; HPQ F1 = Homework Performance Questionnaire (HPQ) Student Responsibility factor; HPQ F2 = HPQ Student Competence factor; APRS F1 = Academic Performance Rating Scale (APRS) Academic Success factor; APRS F2 = APRS Impulsivity Factor; APRS F3 = APRS Academic Performance factor; ADHD = Attention Deficit Hyperactivity Disorder factor of the MTA SNAP-IV; ODD = Oppositional Defiant Disorder factor of the MTA SNAP-IV

Figure 5.

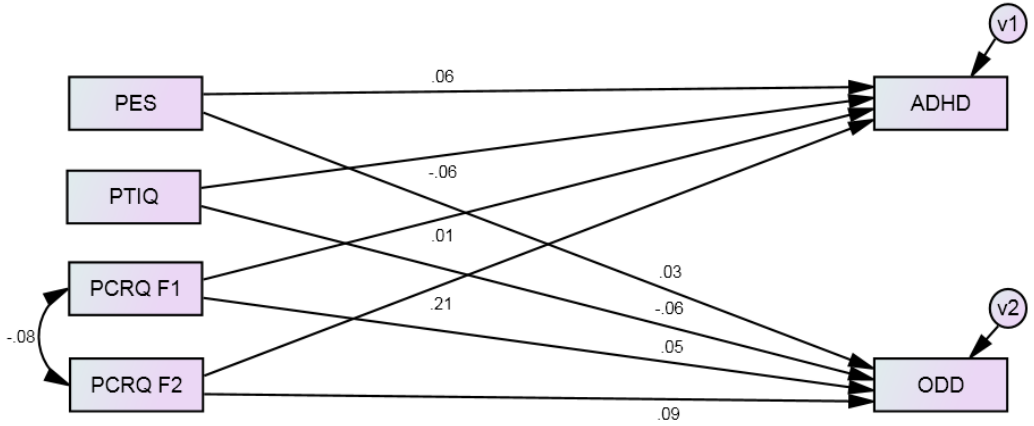
Structural Model and standardized parameter estimates of interrelationship between changes in family process variables and changes in academic performance



Note. PES = Parent as Educator Scale; PTIQ = Parent Teacher Involvement Questionnaire; HPQ F1 = Homework Performance Questionnaire (HPQ) Student Responsibility factor; HPQ F2 = HPQ Student Competence factor; PCRQ F1 = Parent Child Relationship Questionnaire (PCRQ) Positive Involvement factor; PCRQ F2 = PCRQ Negative/Ineffective Discipline factor; AP = Academic Performance; HPQ F1 = Homework Performance Questionnaire (HPQ) Student Responsibility factor; HPQ F2 = HPQ Student Competence factor; APRS F1 = Academic Performance Rating Scale (APRS) Academic Success factor; APRS F2 = APRS Impulsivity Factor; APRS F3 = APRS Academic Performance factor.

Figure 6.

Path model and standardized parameter estimates of interrelationship between changes in family process variables and changes in classroom behavior problem variables



Note. PES = Parent as Educator Scale; PTIQ = Parent Teacher Involvement Questionnaire; PCRQ F1 = Parent Child Relationship Questionnaire (PCRQ) Positive Involvement factor; PCRQ F2 = PCRQ Negative/Ineffective Discipline factor; ADHD = Attention Deficit Hyperactivity Disorder factor of the MTA SNAP-IV; ODD = Oppositional Defiant Disorder factor of the MTA SNAP-IV