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Academic Achievement among High School Students with ADHD and Internalizing Symptoms
and their Response to a Multicomponent Treatment Intervention

by
Maria Elena Golden

A Dissertation
Presented to the Graduate and Research Committee
of Lehigh University
in Candidacy for the Degree of
Doctor in Philosophy
in
School Psychology

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Abstract

ADHD is a common disorder in youth, with core deficits that impair important areas of functioning, most notably academic achievement. Existing school-based interventions may not be as effective in improving long-term academic outcomes for adolescents with comorbid ADHD and internalizing disorders. The purpose of this study was to explore the association between ADHD and internalizing symptoms in adolescents and the impact of anxiety and depression symptom severity on their academic outcomes after engaging in a multicomponent school-based intervention (BEST Project). The BEST Project was implemented in several high schools, with 126 participants included in this study. All participants met DSM-5 criteria for ADHD, were 14-18 years old, and attended public high schools.

A multiple multivariate regression analysis was conducted to investigate if internalizing symptom severity predicts pre-treatment academic performance. Female students were found to have more academic problems. To examine whether pre-treatment internalizing symptom severity predicts post-treatment academic performance and moderates the relationship between the effects of the BEST project and academic performance, a second multiple multivariate regression analysis was conducted. Graphed interactions and Johnson-Neyman results suggest that once student's internalizing symptom scores are above the median, treatment effects on homework problems are stronger for those with anxiety symptoms and weaker for youth with depression symptoms. These findings suggest anxiety may serve as a protective factor in the context of a structured intervention. Limitations and future directions for research and practice are discussed.

Chapter I

Academic success in school requires students to listen and pay attention to lessons, sit still, concentrate, organize their materials and time, and follow directions. As students progress through elementary and middle school and into high school, increasingly more responsibility is placed on them to take an active role in their education and independently manage their assignments and projects, keep track of materials, and study for tests. These academic tasks are all necessary for academic success, yet are also very challenging for many students especially those with Attention-deficit/hyperactivity disorder (ADHD).

Students with ADHD

Attention-deficit/hyperactivity disorder (ADHD); characterized by developmentally inappropriate and impairing symptoms of inattention, hyperactivity, and/or impulsivity; is one of the most common mental health disorders in childhood occurring in about 3-5% of all children and adolescents (Becker, Luebke, & Langberg, 2012; Daviss, 2008). Many children and adolescents with ADHD experience chronic difficulties and impaired functioning across multiple domains, including academics and social relationships (Becker et al., 2012; DuPaul, Eckert, & Vilaro, 2012). It is clear from the literature that students with ADHD experience academic struggles and have an increased risk for academic difficulties throughout their educational experiences (Barkley, Anastopoulos, Guevremont, & Fletcher, 1991; Becker, Fite, Vitulano, Rubens, Evans, & Cooley, 2013; DuPaul et al., 2012; Loe & Feldman, 2007). Loe and Feldman (2007) assert that ADHD is associated with underachievement, poor academic performance and grades, lower reading and math standardized test scores, increased rates of retention, and higher use of school-based services. Further, youth with ADHD continue to struggle academically in

into their high school years (Kent, Pelham, Molina, Sibley, Waschbusch, Yu, Gnagy, Biswas, Babinski, & Karch, 2011).

School-Based Interventions

A wide variety of treatments are used for students with ADHD; however, the current evidence-based treatments include stimulant medication, behavioral interventions, or a combination of those two methods (Chan, Fogler, & Hammerness, 2016; Jensen et al., 2001; Miranda, Jarque, & Tarraga, 2006; Raggi & Chronis, 2006). Several literature reviews regarding effective simple and complex interventions that address the academic impairment of students with ADHD have found that the most frequent intervention components were self-instruction, reinforced self-evaluation, and anger control, with moderate use of parent training, and little utilization of directly teaching students study and test taking skills (DuPaul et al., 2012; Hoagwood, Olin, Kerker, Kratochwill, Crowe, & Saka 2007; Miranda et al., 2007; Raggi & Chronis, 2006). The literature also suggests that self-instruction, and reinforced self-evaluation are effective at reducing behavioral problems and inattention and hyperactivity/impulsivity symptoms; however, their efficacy in improving academic outcomes is not as strong (Evans, Serpell, Schulz & Pastor, 2007; Evans, Owens, Wymbs, & Ray, 2017; Miranda et al., 2006 & Raggi & Chronis, 2006). Further literature suggests that school-based treatments for ADHD are effective in the short term, but generalization over time is limited (Miranda et al., 2006). Unless academic performance and achievement is a direct target of the intervention, these behavioral techniques may be limited in their ability to address the academic deficits associated with ADHD. Additional findings from the Multimodal Treatment of ADHD (MTA) study suggest that the most effective treatment protocol for students with ADHD includes several empirically based interventions such as medication, parent training, school-based interventions, and direct child

interventions (Jensen et al., 2001; Miranda et al., 2006). However, the findings from the MTA study indicate minimal impact of these interventions on academic achievement despite their efficacy at reducing the behavioral symptoms of ADHD (Jensen et al., 2001).

Directly targeting academic deficits and functional impairments in combination with other evidence-based strategies may positively impact academic outcomes for students with ADHD (Raggi & Chronis, 2006). School-based interventions that have been developed to specifically target academic improvement for use with children with ADHD include: task and instructional modifications, organizational skills training, study skills and strategy training, parent training, self-monitoring, and homework management programs (Evans et al., 2007; Langberg, Epsein, Becker, Girio-Herrera, & Vaughn, 2012; Raggi & Chronis, 2006). Each of these intervention strategies has demonstrated some degree of positive impact on students' academic skills; however, these positive outcomes may not last beyond the implementation of selected strategy.

Classroom and instructional modifications. Simple modification to the classroom or instructional materials may be effective in increasing productivity. Reducing task length, chunking tasks into smaller parts, setting goals, and modifying the instructions for tasks all add structure to educational tasks and may promote sustained attention and reduced hyperactivity, thus leading to an increase in productivity (Raggi & Chronis, 2006). Alternatively, these modifications may not generalize to other classes or subjects and their impact may fade once they are no longer in place (Hoagwood et al., 2006; Raggi & Chronis, 2006).

Academic skills training. Modifying instructional techniques can be helpful for students with ADHD, but explicitly teaching students the specific skills they need to be successful academically may have longer term benefits (Miranda et al., 2006; Raggi & Chronis, 2008).

Teaching students the skills of effective note-taking, studying, and test-taking allows them to directly implement these strategies in an academic situation to improve their performance, and can give students a sense of ownership over their academic achievement (Evans et al., 2007; Raggi & Chronis, 2008). This process increases generalizability of the skills if the strategies taught can transfer to a variety of academic situations and subjects (Raggi & Chronis, 2008).

The Challenging Horizons Program (CHP) is an intervention program that has been effective with young adolescents with ADHD. The CHP utilizes psychosocial and educational interventions such as note-taking instruction, individualized study skills, and organizational skills training. Findings from several studies suggest that the CHP program is an effective school-based intervention for addressing the various academic impairments in young adolescents with ADHD (Evans, Serpell, Schultz, & Pastor, 2007; Evans, Langberg, Schultz, Vaughn, Marshall, & Zoromski, 2015). Students also experience long-term benefits and improvements as reported in parent-reported symptoms of ADHD; however, only the more intensive CHP-after school (CHP-AS) program that met twice a week and targeted organization, social function, and academic study skills significantly impacted parent ratings of academic functioning (Evans et al., 2007; Evans et al., 2015). The CHP-AS program provided more comprehensive intervention and skills training than the CHP-consultation or mentoring versions, suggesting that students benefit from the combination of organizational skills training with direct training in social skills and academic study skills as well.

Organizational skills training. One of the important components of the CHP is teaching and direct practice in organizational skills. Students with ADHD often struggle with organizational and time management skills that then directly impact their academic performance (Evans et al., 2007; Evans et al., 2015; Langberg et al., 2012). The Homework, Organization, and

Planning Skills (HOPS) for middle school students with ADHD directly targets the organizational and planning needs of young adolescents with ADHD. Langberg et al. (2012) analyzed the efficacy of the HOPS program when implemented in middle schools by school mental health providers who provided individual supports to participating students. In this study, students in the treatment group met with an educator to receive direct teaching and training in organizing school materials, recording and managing homework, and planning and time management skills. Langberg et al. found significant improvements in parent ratings of organizational skills, materials management, planning skills, and homework completion; however, teacher measures did not show such improvements. Perhaps this is due to parents comparing their own child's progress against the initial levels of impairment, while teachers are comparing the student's progress to the organizational skills of typically functioning children in their classrooms.

The HOPS program was later compared to the Completing Homework by Improving Efficacy and Focus (CHIEF) program, again with both programs being implemented by school personnel with middle school students (Langberg, Dvorsky, Molitor, Bouchtein, Eddy, Smith, Oddo, & Eadeh, 2018). Both programs demonstrated improvements in parent ratings of homework problems and organizational skills. Further, the participants in the HOPS program made greater improvements in both parent and teacher ratings of organizational skills, than the participants in the CHIEF program. Interestingly, this pattern of results was not found on measures of homework problems.

Parent training and homework management interventions. The existing literature provides support that parent training is an effective intervention for students with ADHD, especially when goal setting and contingency management or contracting around homework are

used (Miranda et al., 2006; Raggi & Chronis, 2008). Contracting uses contingency management by making access to a high probably behavior or preferred activity (e.g., access to electronics, free time, or chore pass) contingent on completion of a low-probability behavior (e.g., homework completion). The student has to complete a duration or quantity of homework in order to have access to preferred activities or other rewards. Increasing the structure and routine around homework and targeting specific behaviors such as planning ahead, prioritizing, and filtering out distractions and focusing on one task at a time directly impact homework completion and effectively improve academic performance (Hoagwood et al., 2007; Langberg et al., 2012). Because this method directly involves parents and targets homework completion, this intervention is not necessarily school-based, but represents an intervention component that directly impacts school functioning and academic performance implemented in the home setting.

Self-monitoring. Both self-monitoring and self-reinforcement are widely used to improve the social and academic behavior of students (DuPaul & Stoner, 2014; Raggi & Chronis, 2008). These procedures include setting goals, self-monitoring those goals, and rewarding oneself for successful completion of goals. Evidence suggests that this strategy is effective for improving the attention and academic performance of children and adolescents with ADHD, especially when combined with other evidence-based approaches (DuPaul & Stoner, 2014; Langberg et al., 2018; Raggi & Chronis, 2008). Studies suggest that self-monitoring can increase maintenance of behavioral change and improve generalization as this strategy can be used in diverse settings and promotes independent awareness of one's own behaviors (Miranda et al, 2006; Raggi & Chronis, 2008). Recently it has been suggested that self-monitoring, when coupled with contingency management, can increase students' motivation to complete homework and improve academic functioning (Langberg et al., 2018).

Influence of Anxiety or Depression Symptoms

Child and adolescent emotion and behavior disorders are classified as either internalizing or externalizing problems (Tandon, Cardeli, & Luby, 2009; Zan-Waxler, Klimes-Dougan, & Slattery, 2000). Externalizing problems (e.g., ADHD, oppositional defiant disorder, or conduct disorder) are defined by disruptive behaviors that are directed outward or may be harmful to others (Tandon et al., 2009; Zan-Waxler et al., 2000). Internalizing problems (e.g., anxiety disorders, depression, dysthymia, excessive shyness, or social withdrawal) are defined by over controlled emotional and behavioral reactions and are typically described by an inner-directed pattern of behavior (Tandon et al., 2009; Zan-Waxler et al., 2000). Because students with internalizing behaviors are typically not disruptive or distracting in a classroom, they are often overlooked and receive less services in educational settings compared to students with externalizing problems (Tandon et al., 2009; Zan-Waxler et al., 2000). Even though internalizing symptoms are not always seen as a problem in the school setting, these behaviors can negatively impact student's academic functioning especially when comorbid with other internalizing or externalizing problems. Lower academic functioning has been significantly related to a range of both internalizing and externalizing problems (Bruffaerts et al., 2018).

Internalizing symptoms, such as anxiety and depression, have been linked to academic difficulties, and students diagnosed with ADHD who exhibit significant internalizing symptoms may experience greater impairment in academic functioning compared to students with ADHD alone (Baker, 2006; Becker et al., 2012; Flook, Repetti, & Ullman, 2005; Massetti, Lahey, Pelham, Loney, Ehrhardt, & Kipp, 2008; Schatz & Rostain, 2006). Studies have also shown that students with ADHD and comorbid internalizing symptoms and disorders have lower academic achievement and often require additional academic supports in school (Blackman, Ostrander, &

Herman, 2005; Faraone, Biederman, Lehman, Spencer, Norman, & Tsuang, 1993; Massetti et al., 2008). These studies suggest a link between greater academic risk and ADHD and increased anxiety and depression symptoms.

Little research exists on this diagnostic profile, especially among high school students, and fewer studies have analyzed the impact of the combination of ADHD and either anxiety or depression symptoms on the outcomes of academic interventions. These are two serious gaps in the literature. Co-occurring anxiety or depression symptoms among students with ADHD is common. However, few research studies have been conducted with a sample with this specific diagnostic profile, and of the studies that do exist most of them group students with anxiety and depression together into the same internalizing group. Thus, it is important to study students with ADHD and anxiety symptoms separately from students with ADHD and depression symptoms.

This distinction between both internalizing disorders and clusters of symptoms is important to study because anxiety and depression have different diagnostic profiles, can impact functioning differently, and are associated with different effects on information processing (Beuke, Fischer, & McDowall, 2003). Separating out anxiety and depression symptoms in research is important to promote efficiency, and could help rule out the possibility that differences in effects of anxiety or depression are caused by between-experiment differences in participants (Beuke et al., 2003).

Anxiety and depression are commonly studied as one concept, internalizing problems, even though they include two distinctly different sets of symptoms (Becker, Langberg, Evans, Girio-Herrera, & Vaughn, 2014). Anxiety often involves both external and internal symptoms, such as response to threat or harm avoidance (Merch, 2000). Depression is typically more heterogeneous, with a range of symptoms including negative affect, dysphoric mood, anhedonia,

negative self-worth, and fatigue (Becker et al., 2014). Jensen (2001) specifically recommends that anxiety and depressive symptoms should be separated out when studying co-occurring symptomology. By individually studying anxiety and depression symptoms as opposed to one internalizing category, psychologists can study the specific effects of each disorder in order to better understand any unique effects on functioning (Becker et al., 2014; Blackman et al., 2005).

Examining both anxiety and depression symptoms separately increases the specificity regarding distinct intervention effects for students with commonly co-occurring disorders (Becker et al., 2014). Because anxiety and depression have distinct differences in symptomology and presentation, information about how the symptoms uniquely impact ADHD and response to treatment is necessary. For example, anxiety is often hypothesized as being protective (e.g. inhibiting impulsive or reactive behaviors) for students with ADHD. Although it is suggested that anxiety symptoms can act as a protective factor, others posit that anxiety symptoms co-occurring with ADHD can exacerbate the impairments (e.g. cognitive deficits) associated with each diagnosis (Becker, et al., 2012; Bloemsmas et al., 2013; Hammerness et al., 2010; Humphreys, Katz, Lee, Hammen, Brennan, & Najman, 2013, 2012). Owens et al. (2012) found that students with high levels of anxiety and low working memory skills performed significantly worse on cognitive tasks and obtained lower scores on tests than students with high levels of anxiety and high working memory skills. They hypothesized that increased anxiety can enhance motivation and drive to perform better on tests and academic tasks, but only when students also have strong working memory skills. More information is needed to inform the development of targeted interventions, and could help influence and direct clinical care and future research (Becker et al., 2014).

This distinction between anxiety and depression symptoms is also theoretically important. The psychological community generally accepts that anxiety and depression are two distinct disorders that warrant separate analyses, and specifically related to this study these two disorders impact student's information processing differently (Beuke et al., 2003; Owens, Stevenson, Hadwin, & Norgate, 2012). Additionally, Becker et al. (2014) argue it is theoretically important to understand "why and how" internalizing symptoms impact academic functioning in youth with ADHD. For example, students with depression symptoms and ADHD more typically demonstrate explicit memory bias and interfering thoughts in the form of rumination, while students with ADHD and anxiety disorder symptoms struggle more with selective attention and filtering out interfering stimuli (Beuke et al., 2003; Owens et al., 2012). Co-occurring psychopathology, either anxiety or depression symptoms, can lead to different more targeted treatment goals, which should be informed by research that has analyzed the impact of different treatments on both anxious and depressed students (Becker et al., 2012). Thus, more information is needed to understand the complex relationship between these diagnostic profiles and academic deficits.

As many as one third of children with ADHD have a comorbid diagnosis of an internalizing disorder, and Zan-Waxler et al. (2000) report that ADHD is the second most common comorbid disorder (after depression) in youth with internalizing problems (Barnard-Brack et al., 2011; Jensen et al., 2001). It is also well documented in the literature that anxiety and depression are commonly comorbid, and that nearly 40% of youth with one mental health condition are likely to have comorbid anxiety, depression, or ADHD (Cummings, Caporino, & Kendall, 2014; Garber & Weersing, 2010; Merikangas et al., 2010). The National Comorbidity Study with Adolescents reports an estimated 16-62% of youth with a mental health condition,

have comorbid anxiety and depression. Further, this study suggests that for 10-15% of youth with anxiety disorder also report significant symptoms of depression, and between 15-75% of youth with depression report comorbid anxiety symptoms (Cummings et al., 2014). These co-occurring symptoms place these students at a greater risk for poor outcomes compared to their peers with ADHD or anxiety or depression symptoms alone (Barnard-Brack et al., 2011; Jensen et al., 2001). An increase in anxiety or depression symptoms may impact the manifestation of ADHD and influence treatment outcomes (Jensen et al., 2001; Schatz & Rostein, 2006).

Although it is hypothesized that anxiety can act as a protective factor and positively impact the impulsivity symptoms of ADHD, other studies suggest that comorbid anxiety or depression can exacerbate deficits in other areas, especially cognitive functioning. The literature suggests that a diagnosis of ADHD and increased internalizing symptoms may be associated with greater impairment in working memory and weaker attentional control (Becker et al., 2012, Bloemsme et al., 2013; Lilenfeld, 2003; Shatz & Rostein, 2006).

Further, co-occurring psychopathology may impact the manifestation of the symptoms and disorders (Schatz & Rostain, 2006). Some studies have found that children with ADHD and anxiety perform better than children with ADHD alone on response inhibition tasks, but the students with ADHD and co-occurring anxiety symptoms also show decreased working memory capacity have been shown to make more errors in their work (Manassis, Tannock, & Barbosa, 2000; Schatz & Rostain, 2006; Tannock & Schachar, 1995). Further, students with ADHD and anxiety symptoms may have more specific concerns about their academic performance or test-specific worries, which could intensify their cognitive deficits. Student's concerns about their competency and performance have been found to increase their anxieties concerning their ability to succeed in school because of cognitive insufficiencies (Owens et al., 2012; Schatz & Rostain,

2006). These cognitive deficits may then contribute to the negative academic outcomes associated with co-occurring ADHD and anxiety symptoms. Youth with ADHD and comorbid anxiety have also been found to experience increased social and academic impairment compared to youth with ADHD alone (Klymkiw, Milligan, Lackner, Phillips, Schmidt, & Segalowitz, 2017). Jensen et al. (2001) found that students with ADHD and anxiety were more responsive to treatment, especially with behavioral treatments compared to students with other comorbidities, except in the area of academic interventions. Klymkiw et al. suggest that anxiety comorbid with ADHD might alter attentional processing, which could be an important distinction in understanding the cognitive processing of youth with this comorbidity.

Depression has also been shown to negatively impact the cognitive functioning of students with ADHD, and negative mood states have been shown to impair students' learning at school (Deighton, Humphrey, Belsky, Boehnke, Vostanis, & Patalay, 2017; Flook, Repetti, & Ullman, 2005; Owens, Stevenson, Hadwin, & Norgate, 2012; Pekrun, Lichtenfeld, Marsh, Murayama, & Goetz, 2017). Additionally, Lilenfeld (2003) reports that depression symptoms can decrease one's ability to adjust or adapt to novel situations; adaptability is important in academic settings. Like ADHD, depression is also associated with the inability to concentrate (Deighton et al., 2017; Owens et al., 2012). Intrusive ruminating thoughts can impact the cognitive resources required to sustain attention, and diminished concentration are symptoms of a depressive episode (Owens et al., 2012). Decreased motivation and initiative along with inhibited working memory commonly experienced by students with depression can negatively impact their test performance and academic functioning (Owens et al., 2012). Negative affect in addition with increased worry had the largest impairment on students' cognitive functioning and

biggest impact on academic outcomes, specifically regarding homework problems and test performance (Karustis et al., 2002; Owens et al., 2012).

There is some empirical support to suggest that cognitive deficits associated with depression and repeated academic impairment can lead to an increase in negative self-concept, and thus an increase in the severity of depressive symptoms (Deighton, et al., 2017; Eadeh, Bourchtein, Langberg, Eddy, Oddo, Molitor, & Evans, 2017). Deighton et al., further assert that early incompetence is linked to later internalizing symptoms. Pekrun et al. (2017) suggest a reciprocal and bidirectional relationship between negative emotions and poor academic achievement, postulating that negative emotions (e.g., anger, anxiety, shame, hopelessness) negatively predict grades and poor grades negatively predict an increase in negative emotions. Academic impairments in the school setting are widely seen in adolescents with ADHD and internalizing symptoms, and this can pose unique challenges to the proper treatment of commonly occurring functional deficits (Becker, Fite, Vitulano, Ruben, Evans, Cooley, 2013; Bruffaerts et al., 2018; Daviss, 2008).

The behavioral strategies used to address difficulties associated with the symptoms of ADHD may not be as effective at addressing the unique needs of students with additional internalizing problems (Booster, DuPaul, Eiraldi, & Power, 2010). Less empirical evidence exists describing the functional deficits impacting this population, with co-occurring ADHD and anxiety or depression symptoms. Further investigation into how anxiety and depression symptoms impact the academic functioning of students with ADHD is needed, in addition to more information regarding whether anxiety or depressive symptoms moderate the effects of interventions for ADHD (Daviss, 2008; Elia, Ambrosini, & Berrettini, 2008; Hoagwood et al., 2007; Schatz & Rostain, 2006).

Limitations of Current Literature

Few studies have examined both mental health and educational outcomes from school-based interventions, and even fewer studies have analyzed the impact of school-based interventions on high school students with ADHD and internalizing problems. Several reviews of the empirically-validated school-based mental health programs report that few treatment outcome studies have examined academically focused outcome measures (Hoagwood et al., 2007; Miranda et al., 2006; Roggi & Chronis, 2006). Although a strong literature base exists to support the behavioral benefits (e.g., increased attention or decreased behavioral problems) of empirically based interventions commonly used to intervene with children, much less is known about the efficacy of these interventions on academic and educational outcomes (Hoagwood et al., 2007; Miranda et al., 2006). The few studies that have examined the impact of empirically based comprehensive intervention programs suggest that these strategies may be useful in addressing both behavioral and academic deficits commonly associated with ADHD (Evans et al., 2007; Evans et al., 2015; Langburg et al., 2015).

Additionally, little is known about the delivery of effective academic and behavioral interventions in naturalistic settings where students are able to more easily receive services, such as schools. Many of the intervention studies have been conducted in clinical or community mental health settings, which may have different resources and procedures for implementing interventions (Power et al., 2012). Furthermore, Hoagwood et al. (2007) reported that the majority of intervention studies conducted in school settings were at a universal or preventative level and not an analysis of intensive interventions targeted for students with more specific needs.

In a meta-analysis of school-based interventions for students with ADHD, DuPaul et al. (2012) identified several further methodological limitations in the school-based intervention literature. A limited number of intervention outcome studies that use a between-subjects design with a control group currently exist in the literature. Furthermore, of the between-subjects studies included in the meta-analysis, only two included academic outcomes. However, neither of those studies was with high school students (DuPaul et al., 2012). The majority of the studies were single-subject and within subject designs, with elementary school students. Additionally, the consensus from the meta-analysis suggests that academic interventions or academic interventions in combination with contingency management have the most impact on academic outcomes, but over half of the studies included in the meta-analysis examined the efficacy of contingency management strategies alone (DuPaul et al., 2012).

Though some research has been conducted on the outcomes of school-based interventions for students with ADHD, very few studies exist that include older adolescents (DuPaul et al., 2012; Hoagwood et al., 2007; Miranda et al., 2006; Roggi & Chronis, 2006). In their meta-analysis of school-based interventions for ADHD, DuPaul et al. (2012) reviewed 60 studies; however, none of the studies contained high school participants, and only 12 looked at interventions with middle school participants. The majority of school-based treatment research studies have been conducted with elementary school students, with a few studies focusing on early adolescents or middle school students (Evans et al., 2007; Evans et al., 2015; Langberg et al., 2012). Both the CHP and HOPS interventions have been implemented with middle school students, and the initial findings from treatment outcome studies evaluating these programs suggest that these interventions can improve both the behavioral symptoms of ADHD and beneficially impact the academic functioning of participating students. A recent systematic

review of treatments for ADHD in adolescents indicated medium to large effect sizes for treatments that combined behavioral, cognitive behavioral, and skills training like the CHP and HOPS programs. More specifically, this review found that most programs had inconsistent or minimal effect on academic outcomes; however, the HOPS and CHP afterschool programs had medium to large effects on academic and organizational skills (Chan, Fogler, Hammerness, 2016). Nevertheless, more research is needed to study the impact of multicomponent school-based interventions for high school students with ADHD.

Recently, Evans, Schultz, and DeMars (2014) conducted a pilot study to investigate the efficacy of a school-based treatment intervention for high school students with ADHD. This intervention consisted of CHP coaching sessions, conducted once a week over the course of a school year, and 10 weeks of afterschool groups for parents and students. The parent groups targeted homework management and behavioral contracting at home and the student group sessions focused on interpersonal and social functioning. The findings from this study suggest that CHP coaching and parent training intervention components positively impacted parents' perceptions of their teenager's inattentive symptoms and family relations compared to the students in the control condition. Further analysis suggest that dosage and number of coaching sessions impacts degree of outcomes, especially for academic impairment where Evans et al. (2014) suggest that after 50 coaching sessions 40-56% of participants are likely to experience an improvement in measured outcomes.

Beyond Evans et al. (2014), the literature base thus far includes minimal treatment outcome studies analyzing the impact of an intervention on academic outcomes, and even fewer studies include students in high school or youth with internalizing disorders. Miranda et al. (2006) specifically state that more research is needed to identify how personal characteristics

such as age or comorbid conditions moderate the efficacy of school-based intervention programs designed for children with ADHD. The literature also states that future studies would benefit from analyzing separately students with anxiety symptoms from those with depression (Becker et al., 2012; Beuke et al., 2003; Jensen et al., 2001; Miranda et al., 2006; Schatz & Rostain, 2006). Frequently in the literature, students with anxiety and depression are grouped together as students with internalizing problems; however, each symptom profile should be studied separately so that the unique impact of anxiety or depression symptoms on ADHD and academic functioning can be better explained and examined. The current literature base indicates a clear need to further examine the moderators of treatment responses (Hoagwood et al., 2007; Langberg et al., 2012).

Purpose and Aims of Current Study

The current study aimed to investigate the degree to which anxiety and depression symptoms moderate BEST Project intervention effects on academic outcomes for high school students with ADHD. The BEST Project intervention is a multicomponent treatment program for high school students with ADHD that utilizes academic and organizational skills, social skills training, parent training and use of homework contracting, problem solving through Check & Connect, and self-management strategies. The purpose of the current study was to explore the association between ADHD and internalizing symptoms in high school students and the impact of anxiety and depression symptom severity on their academic outcomes after engaging in a multicomponent intervention (BEST Project).

The ultimate goal of education is to prepare students to be independent and productive members of society, and the BEST project aims to promote competence and adaptation in adolescents with ADHD. To meet these goals, it is important to gain a better understanding of

how anxiety and depression symptoms impact the effects of such an intervention for adolescents with ADHD. This knowledge will add to the literature on the role that anxiety and depression play in the lives of adolescents with ADHD, and further help educators and mental health professionals develop prevention efforts, select effective treatment strategies, and improve intervention planning for these unique student populations.

Specific Research Questions and Hypotheses

1. Does severity of pre-treatment anxiety symptoms or severity of pre-treatment depression symptoms predict pre-treatment academic performance deficits in high school students with ADHD above and beyond predictive impact of gender and parent education (i.e., established demographic predictors of academic performance)?

a. It was hypothesized that both depression and anxiety symptom severity would predict pre-treatment academic performance above and beyond predictive contributions of gender and parent education (i.e., established demographic predictors of academic performance). Additionally, because depressive symptoms have been linked to more serious cognitive deficits, it was hypothesized that pre-treatment depression symptom severity would be a stronger predictor of academic performance deficits than pre-treatment anxiety symptom severity.

2. Does the severity of pre-treatment anxiety symptoms or the severity of pre-treatment depression symptoms predict post-treatment academic performance and moderate the relationship between the effects of the BEST treatment protocol and academic performance for high school students with ADHD?

a. It was hypothesized that increased symptom severity of both depression and anxiety would predict smaller treatment-related gains through the BEST Project (i.e., there would

be a negative regression weight associated with each of these predictors). Further, the interaction between depression symptom severity and group assignment (treatment vs. community care control group) as well as the interaction between anxiety symptom severity and group assignment would significantly predict academic performance outcomes at post-treatment. It was hypothesized that as the severity of depression symptoms increase, the beneficial impact of the BEST treatment protocol on academic performance would decrease. It was also hypothesized that participants with low levels of anxiety symptoms would benefit from their mild anxiety and experience more academic benefits from the BEST treatment protocol, that moderate levels of anxiety symptoms would not impact the effects of the BEST treatment protocol, and high levels of anxiety symptoms would negatively impact the effects of the BEST treatment protocol on academic performance outcomes.

Finally, it was hypothesized that variables including depression symptoms (i.e., baseline depression symptom severity and interaction between depression symptom severity and group assignment) would be stronger predictors of academic performance outcomes than similar variables tapping anxiety symptoms.

Chapter II

Comprehensive Literature Review

High School Students with ADHD

Attention deficit/ hyperactivity disorder (ADHD) is one of the most common mental health disorders in childhood, occurring in 9.5% of children 3-17 years old and 12% of 12-17-year olds in the US (Becker, Luebbe, Langberg, 2012; Chan, Fogler & Hammerness, 2016). ADHD is characterized by developmentally inappropriate and impairing symptoms of inattention, hyperactivity, and/or impulsivity (American Psychiatric Association, 2013). Therefore, it is not uncommon for individuals with ADHD to face a variety of cognitive and academic challenges. Chronic difficulties with attention and hyperactivity/impulsivity can impair children's academic and social functioning (Becker et al., 2012; Kent et al., 2011). Adolescents with ADHD are at an increased risk for negative life outcomes such as impaired physical and mental health (e.g., increased rates of anxiety, substance use, depression) and psychological functioning (e.g., academic underachievement, difficulties with interpersonal relationships, and underemployment) (Chan et al, 2016). Further, adolescents with ADHD commonly struggle in school, and experience academic underachievement (e.g., problems in learning and applying knowledge, earning poor grades and low standardized test scores) and poor academic performance (e.g., completing academic tasks, classwork, and homework) (DuPaul, Eckert, & Vilardo, 2012; Evans, Schultz, & DeMars, 2014; Faraone, Biederman, Lehman, Spencer, Norman, & Tsuang, 1993; Kent et al., 2011; Loe & Feldman, 2007).

The academic deficits experienced by youth with ADHD may be due, in part, to the fact that ADHD negatively impacts learning and one's ability to apply knowledge to general tasks and demands such as completing tasks, displaying self-regulation, and managing stress and

frustration (Loe & Feldman, 2007). Specific educational impairments for youth with ADHD commonly include decreased academic achievement below their typically developing peers on school-based measures of achievement and standardized assessments of reading and math, (DuPaul, Eckert, & Vilaro, 2012; Loe & Feldman, 2007), higher rates of course failure (Kent et al., 2011), increased grade retention, use of school based services, and increases in school discipline problems (Loe & Feldman, 2007), and lower rates of enrolling in honors classes (Kent et al., 2011). Additionally, teachers often report academic dysfunction in school in regard to homework completion, missing assignments, poor test grades, lack of motivation, inattention, procrastination, class avoidance, and poor academic achievement (Chan et al., 2016).

Not surprisingly, youth with ADHD struggle with paying attention in class, and teachers often report these students have difficulty sustaining attention when reading, or completing classwork or homework (Chan et al., 2016; DuPaul, et al., 2012). Further, challenges with inattention can also lead to poor concentration and task persistence when engaging in more cognitively taxing academic tasks (Chan et al., 2016). Students who are inattentive also have difficulty finishing tasks, are easily distracted, are frequently forgetful, and may appear scattered or disorganized in their work (Chan et al., 2016; Kent et al., 2011; Langberg, Epstein, Becker, Girio-Herrera, & Vaughn 2012).

The core ADHD symptoms of inattention and hyperactivity/impulsivity negatively impact students' organizational and planning skills (Chan et al., 2016; Langberg et al., 2012). In regards to academic needs, students may frequently misplace items (e.g. pens, pencils, books, their homework, or academic planner) necessary to complete academic tasks, and often procrastinate or have poor time management skills. Task completion is also inhibited by the fact that youth with ADHD also tend to self-select activities that are easier or more enjoyable and

avoid more challenging tasks. Further, these students have poor problem-solving capabilities, often they are easily overwhelmed or engage in impulsive decision making. The combination of inattention and impulsivity, with poor organization, planning, and time management skills has been shown to be detrimental to the learning and academic achievement of students with ADHD (Chan et al., 2016; Langberg et al., 2012).

Youth with ADHD also commonly experience impairments in social skills. Again, the core symptoms of inattention and hyperactivity/impulsivity negatively impacts children's abilities to interact with their peers and develop positive peer relationships. This population tends to have problems with peer relationships; they are less popular than their peers without ADHD, and they experience greater peer rejection compared to their typically developing peers (Becker et al., 2012). Unfortunately, children with ADHD often continue to have negative peer interactions into adolescence and young adulthood, even after they have received intervention (Becker et al., 2012; Evans et al., 2014). Recently, Inagaki and Wake (2017) demonstrated through six case studies that students with ADHD who were not diagnosed until high school had decreased motivation and lower self-esteem compared to students who were diagnosed in elementary school.

ADHD and Co-occurring Internalizing Symptomology

Prevalence of ADHD and co-occurring internalizing symptomology. Often ADHD does not occur in isolation; many individuals with ADHD also have one or more comorbid diagnoses or co-occurring symptomology. Specifically, ADHD is commonly comorbid with internalizing disorders (e.g. anxiety and depressive disorders) (Barnard-Brak, Sulak, & Fearon, 2011; Jensen, et al., 2001). As many as one third of children with ADHD have a comorbid diagnosis of anxiety, with an estimate of between 15%-35% of children with ADHD who also

exhibit significant anxiety symptoms (Shatz & Rostain, 2006). Youth with ADHD are also at an increased risk for major depression or dysthymia (even when controlling for age, sex, and maternal depression) (Chronis-Tuscano et al., 2010). Major depressive disorder occurs in 8% of adolescents (Daviss, 2008) and about 16-37% of clinically referred youth with ADHD have comorbid depressive symptoms (Chronis-Tuscano et al., 2010). Finally, because anxiety disorder and depression are commonly comorbid, it is not surprising that youth with ADHD are also at an increased risk of having comorbid anxiety and depression (Cummings et al., 2014; Garber & Weersing, 2010; Merikangas et al., 2010). A longitudinal study of adults with ADHD reported 22.7-26.1% of respondents reported comorbid anxiety disorder and depression over the course of four years (Michielsen, Comijs, Semeijn, Beekman, Deeg, & Kooij, 2013). A study of elementary school children with ADHD in Shanghai reports that 15% of their sample of youth with ADHD had comorbid anxiety disorder and depression (Xia, Shen, Zhang 2015).

Impairment with co-occurring symptomology. Not surprisingly, youth with ADHD and co-occurring symptoms of anxiety disorder and/or depression experience greater levels of impairment (Cummings et al., 2014; Jensen et al., 2001). Cummings et al. report that youth with comorbid anxiety disorder and depression have greater impairment than youth with either anxiety disorder or depression alone, and youth with primary anxiety disorder and comorbid depression have even higher rates of symptom severity. Youth with primary anxiety disorder and comorbid depression exhibited lower levels of functioning including decreased social functioning, lower mood, more feelings of ineffectiveness, and anhedonia. Children with comorbid diagnoses are at a greater risk for poorer outcomes compared to their peers with only one disorder (Barnard-Brak, Sulak, & Fearnon, 2011), and this pattern of impairment appears to continue into the college years (Bruffaerts et al., 2018). Therefore, it is important to examine

how internalizing symptoms impact youth with ADHD in an effort to increase specificity related to distinct interactions of each symptomology and reaction to intervention efforts.

Impairment associated with co-occurring depression and depressive symptoms.

Given the high rate of comorbidity between ADHD and depression, especially among children with the inattentive versus combined presentation, it is important to understand the impact of depressive symptoms on the academic functioning of students with ADHD (Ostrander & Herman, 2006). Even with the high rates of co-occurring symptomology, depression has been studied less often perhaps because the symptomology is less pronounced in younger children. However, when children grow into adolescence, symptoms of depression are more common and more pronounced (Becker, Langberg, Evans, Girio-Herrera, & Vaughn, 2014; Eadeh, et al., 2017). Daviss (2008) hypothesized that the cumulative effects of ADHD impairment and the negative environmental circumstances associated with ADHD diagnosis may even lead adolescents with ADHD to eventually develop depressive symptoms, and Eadeh et al. report that youth with ADHD are nearly six times more likely to develop depression.

Biederman et al. (2008) analyzed the relationship between ADHD and major depressive disorder (MDD) in females with ADHD at baseline and then again at a 5-year follow-up. MDD in females with ADHD was associated with an earlier age of onset for depression, greater duration of depressed episode, and increased treatment needs (counseling, meds, hospitalization, combination). Further, comorbid MDD and ADHD predicted decreased functional outcomes at the 5-year follow-up holding IQ, Global Assessment of Functioning (GAF), social adjustment inventory constant (Biederman et al., 2008). This study suggests the detrimental impact of comorbid ADHD and depression on depressive symptoms, and points to the need to further

examine the functional impact of co-occurring symptoms and what types of interventions would be beneficial for this population of students.

ADHD or an internalizing disorder alone is associated with negative long-term impacts, but adolescents with comorbid ADHD and depression display greater levels of psychosocial impairment than youth with either disorder alone. (Crawford, Kaplan, & Dewey, 2006; Daviss, 2008). Additionally, Blackman et al. (2005) reports that ADHD and depression present differently in adolescents, with youth with comorbid ADHD and depressive symptoms having different outcomes than youth with either disorder alone. Further, few studies have examined the characteristics of ADHD and depressive symptoms, and those that have assessed these characteristics found functional differences and more negative outcomes, thus it is important to differentiate symptoms of depression from other comorbid diagnoses with students with ADHD.

Students with ADHD and symptoms of depression have decreased academic functioning and adverse effects of school performance associated with those negative academic outcomes (Blackman et al., 2005; Corrier, 2013). Depression is associated with lower GPA, decreases in GPA over time, difficulties in concentration, decreased self-efficacy in school performance, and has been linked to lower reading and writing performance (Biederman et al, 2008; Blackman et al., 2005). Decreased motivation, concentration, initiation, and self-efficacy are all core symptoms of depression, which can negatively impact a student's ability to complete academic tasks.

Some hypothesize that the symptoms of ADHD and depression can interact and exacerbate the negative outcomes associated with each disorder (Daviss, 2008; March et al., 2000). The impaired ability to cope with academic responsibilities combined with decreased motivation, inattentive and hyperactive symptoms negatively impacts a child's self-efficacy and

could therefore exacerbate both depressive symptoms and the academic impairments associated with ADHD (March et al., 2000). Owens, Stevenson, Hadwin, Norgate (2012) report that decreased motivation, either from diminished initiation or low self-efficacy, impacts both working memory and concentration, two cognitive skills negatively impacted by ADHD. Alloway and Alloway (2010) discuss the importance of working memory for academic achievement, especially in regards to numeracy and literacy, and show that working memory is predictive of academic achievement and involved in several academic skills like reasoning and verbal comprehension.

Impairment associated with co-occurring anxiety and ADHD symptoms. Youth with ADHD and co-occurring anxiety symptoms also experience difficulties in academics beyond what would be expected for ADHD or anxiety alone (Becker, Fite, Vitulano, Ruben, Evans, Cooley, 2013; Pekrum et al., 2017). Findings from the MTA study found that youth with ADHD and anxiety displayed more impairment at baseline, specifically in regards to academic performance and an increased likelihood of a learning disability (Jensen et al., 2001). Youth with both ADHD and anxiety also had decreased academic functioning compared to all other diagnostic categories, and these students had a lack of teacher-reported improvements (Jensen et al., 2001).

Schatz and Rostein (2006) argue that the cooccurrence of ADHD and anxiety symptoms may impact the manifestation and symptom expression of both disorders. Others have also proposed that ADHD when comorbid with internalizing disorders, is unique with respect to its clinical implications, etiology, developmental course, and outcomes (Jensen et al., 2001; Klymkiw et al., 2017). Klymkiw et al. studied the neural differences between adolescents with ADHD and adolescents with ADHD and anxiety, finding that youth with ADHD and anxiety had

larger N2 amplitude to no-go stimuli and larger EFP amplitude to target stimuli, which may indicate those with ADHD and anxiety have better differentiation between target and non-target stimuli and inhibit responses to no-go stimuli more strongly than youth with ADHD alone. These findings suggest youth with ADHD and anxiety exhibit different attentional processing than youth with ADHD alone, and that the comorbidity of anxiety with ADHD may serve as a protective factor. Jensen et al. further specified that these co-occurring symptoms have “unique clinical profiles” (p. 149) and could constitute “diagnostically meaningful subtypes” (p. 148). Even though it has been suggested that cooccurring ADHD and anxiety symptoms may constitute a unique subtype of ADHD, there is limited research on the interaction of these disorders (Jensen et al., 2001; Schatz & Rostein, 2006).

Although there are negative implications of co-occurring ADHD and anxiety symptomology, some research has suggested that anxiety symptoms may act as a protective factor for ADHD by reducing the risk of some of the negative outcomes typical of the disorder (Bloemsa et al., 2013; Hammerness, Geller, Petty, Lamb, Bristol, & Biederman, 2010; Humphreys et al., 2013). Becker et al. (2012) posited that anxiety inhibits impulsive, reactive behaviors, and reduces disinhibition. Literature reviews on comorbid ADHD and anxiety found that much of the research suggests that people with ADHD and comorbid anxiety may exhibit lower levels of impulsivity and hyperactivity than those with ADHD alone (Jensen et al., 2001). Additionally, empirical studies suggest that anxiety symptoms can help students with ADHD inhibit impulsivity and improve their response inhibition deficits (Manassis, Tannock, & Barbosa, 2000). Shatz and Rostain (2006) found that children with ADHD and anxiety exhibited better response inhibition on a stop task compared to those with ADHD alone. Collectively these sources suggest that anxiety can play a protective role for youth with ADHD.

Alternatively, increased anxiety symptoms can also decrease one's ability to adjust or adapt to novel situations and can exacerbate cognitive functioning deficits associated with ADHD (Bloemsma et al., 2013; Hammerness et al., 2010; Humphreys et al., 2013; Lilenfeld, 2003). Anxiety and ADHD are each associated with different impairments and their co-occurring symptomology may exacerbate the negative effects of the other. The literature suggests that a comorbid diagnosis of ADHD and internalizing disorders may be associated with greater working memory impairment (Tannock & Schachar, 1995; Van, 2001; Owens et al., 2012).

Impact of internalizing symptoms on working memory capacity. Working memory refers to one's ability to hold information and manipulate it toward problem solving or a desired outcome (Van Ameringen, Manicini, & Farvolden, 2003). Owens et al. (2012a) found that students with increased levels of anxiety and decreased working memory capacity had lower cognitive test performance compared to students with increased levels of anxiety and higher working memory capacity. This relationship was especially true for subjects, like mathematics, that require more working memory. Further, students with symptoms of ADHD and anxiety were found to make more errors in digit recall tasks, especially when digits were presented at longer intervals (Tannock & Schachar, 1995).

In an additional study, Owens, Stevenson, Hadwin, and Norgate (2012b) proposed a moderation model where the level of working memory ability moderates the relationship between anxiety and cognitive test performance (measures of working memory). Increased trait anxiety predicted adverse effects of cognitive functioning, specifically in tasks that have high cognitive demands such as mathematics. In their study of 96 12 to 14-year-olds, Owens et al. (2012b) found that the relationship between anxiety and working memory explained a significant amount of variance in cognitive test performance (controlling for gender, age, and time of

testing). No relationship was found between cognitive performance and average working memory capacity; however, increased anxiety was related to poorer test performance for students with lower working memory capacity and higher test performance for students with higher working memory capacity.

Motivation also plays a role in how anxiety impacts students with ADHD, and whether or not anxiety serves as a protective factor. If a student is motivated to increase test performance, the anxiety surrounding test performance or perceived failure may serve as a driving factor to increase academic performance (Owens et al., 2012a; Van Ameringen et al., 2003). Thus, the increased anxiety could increase motivation and effort which directly impacts a student's academic functioning and test performance. However, the negative influence of anxiety on working memory could also hinder a student's level of concentration and academic functioning (Owens et al., 2012b). If anxiety serves to increase a student's motivation to succeed and effort put into school activities, it can help a student overcome working memory difficulties associated with ADHD, but if not it will serve as an additional detriment to the ADHD symptoms (Owens et al., 2012b; Van Ameringen et al., 2003).

Although it can be argued that anxiety symptoms can act as a protective factor, increasing effort and motivation to avoid negative performance or evaluation, it can also negatively impact cognitive functioning and decrease working memory capacity. A significant positive relationship between anxiety and test performance was only found in Owens et al.'s (2012b) study with students who scored within the top third of working memory scores. Ashcroft and Krause (2007) also found a similar relationship with increased math anxiety, working memory capacity, and math performance. Perhaps because the students with the top third highest levels of working memory have the cognitive capacity to cope with the stress of anxiety, they can simultaneously

cope with their stress and perform the cognitive functions required for the tasks. Alternatively, high trait anxiety, even with increased working memory capacity, can still be detrimental. Crawford, Kaplan and Dewey (2006) cites that students with high levels of anxiety and high working memory may be less efficient, requiring more time and effort to complete tasks, than their peers with low levels of anxiety. Therefore, methods for earlier identification and treatments in school settings are needed that can target the implications of anxiety and depression on ADHD (Van Ameringen et al., 2003).

Treatment response and outcomes. ADHD with co-occurring anxiety and depressive symptoms may impact treatment and outcomes. Becker et al. (2012) suggest that co-occurring psychopathology (e.g. anxiety or depression) can lead to different, targeted treatment goals. Some research suggests that psychopharmacological medications often used for ADHD are less effective for youth with ADHD and comorbid anxiety (Houghton, Alsalmi, Tan, Taylor, & Durkin, 2017). The MTA study found qualitatively different treatment responses in youth with ADHD and anxiety compared to youth with ADHD and no anxiety (Jensen et al., 2001). Further, the behavioral treatment effects from the MTA study for this subgroup (ADHD and anxiety) were over and above the main effects of treatments for the entire population (including students with ADHD, ADHD and externalizing comorbidities, and ADHD and internalizing comorbidities) for measures of inattention, internalizing symptoms, WIAT overall composite and WIAT Spelling. This finding suggests that the behavioral treatment benefits for participants with ADHD and anxiety were greater than the behavioral treatment benefits for the sample. In their 4 group parallel design study, 579 children were randomly assigned to one of four treatment groups (medication along, behavioral therapy alone, medication and behavioral therapy, and a community comparison group). Results indicated that students with ADHD and anxiety (as

measured by parent responses on the DISC at baseline) were responsive to the behavioral treatments, except in the area of academic performance. Jensen et al. hypothesize that this is due to the etiological differences and developmental trajectories for students with co-occurring ADHD and anxiety. The authors note that anxiety may have some positive benefits of decreasing the core behavioral symptoms associated with the hyperactivity/impulsivity presentation of ADHD which may be reflective in the behavioral intervention outcomes, but also have a negative impact on the attention and focus of these students ultimately leading to more academic difficulties.

Impact of ADHD and Internalizing Symptoms on Academic Performance

Children with ADHD and cooccurring internalizing symptomology display poorer overall functioning compared to children with ADHD alone (Booster, DuPaul, Erialdi, & Power, 2010; Bruffaerts et al., 2018). Untreated mental health needs negatively impact academic performance, suggesting school based interventions are important (Wegmann, Powers, Swick, & Watkins, 2017). Research suggests that a diagnosis of ADHD and co-occurring internalizing symptoms may exacerbate cognitive deficits, despite some of the symptoms of anxiety serving as a protective factor (Schatz & Rostain, 2006; Owens et al., 2012b). Difficulties with ADHD (i.e., attention, motivation, and compliance) can be exacerbated by additional difficulties from symptoms of anxiety or depression (e.g., performance anxiety, hopelessness, anhedonia) (Booster et al., 2010; Perkun et al., 2017). Both anxiety and depression can decrease one's ability to adjust or adapt to novel situations, which are skills necessary for healthy development and academic achievement (Lilienfeld, 2003). Additionally, negative mood states, more commonly experienced by students with internalizing disorders, may adversely impact several domains of

functioning and interfere with students' learning at school (Flook, Repetti, & Ullman, 2005; Liliensfeld, 2003).

Academic and social impairments in the school setting are widely seen in adolescents with ADHD and comorbid internalizing disorders (Barnard-Brak et al., 2011; Daviss, 2008; Flook et al., 2015; Hammerness et al., 2010;). Students' social-emotional functioning and academic success are clearly related, and students with a combination of low subjective wellbeing and elevated psychopathology are at risk for lower GPA (Suldo, Gormley, DuPaul, & Anderson-Butcher, 2013). Higher levels of anxiety and depression symptoms are associated with lower academic performance, and some suggest that worry and anhedonia, key internalizing symptoms, may contribute to the social and academic impairment experienced by students with elevated symptoms of anxiety and depression (Jaycox et al., 2009; Liliensfeld, 2003). Pekrun et al. (2017) describe a bidirectional relationship between negative emotions and negative academic performance, where negative emotions such as anger, anxiety, shame, and hopelessness, can predict lower grades and poor grades can predict the development of negative emotions. Wood (2006) reports that students with high levels of anxiety may perform below their ability level and receive lower report card grades. This comorbidity can pose unique challenges to the proper treatment of commonly occurring functional deficits that may result from chronic environmental and genetic factors (Barnard-Brak et al., 2011; Becker et al., 2013; Daviss, 2008; Hammerness et al., 2010).

Internalizing symptoms have been shown to predict academic underachievement in youth with ADHD (Masseti et al., 1993). Booster, DuPaul, Erialdi, and Power (2010) examined the impact of comorbidities on the academic and social functioning of 416 children, between the ages of 5 and 16 years old who met DSM-IV criteria for ADHD. Findings revealed higher levels

of homework problems among children with ADHD and internalizing symptoms, especially for secondary students (i.e., those ages 12 to 16 years old). Further, Karustis, Power, Rescorla, Eiraldi, and Gallagher (2000) found similar academic deficits and increased homework problems in children with ADHD and depression. In addition to homework problems, Jensen et al. (2001) found that children with ADHD and increased symptoms of anxiety had lower math and spelling achievement scores compared to students with ADHD and other comorbidities (e.g. ODD or CD). These studies suggest that students with ADHD and internalizing symptoms are at greater academic risk and that the co-occurring symptomology places them at even more risk compared to their peers with one disorder.

Beyond homework problems and decreased academic performance, students with co-occurring symptomology are more often referred for special education services (Hammerness et al., 2010). Data analyzed from a sample of 253 children with anxiety disorders with and without comorbid ADHD revealed that school functioning was negatively impacted by the presence of ADHD in students with anxiety (Hammerness et al., 2010). Students with anxiety and ADHD received twice as many placements in special education classes, and received significantly more tutoring (Hammerness et al., 2010) than those with anxiety alone.

Impact of working memory and internalizing disorders on academic achievement.

Studies have indicated that anxiety and depression are associated with increased worry which can interfere with a person's complex working memory capacity which is related to academic performance. Owens et al. (2012a) propose a mediation hypothesis where central executive processes (specifically phonological and visual spatial working memory) mediate the relationship between negative affect and academic performance. Using self-report measures for anxiety, depression, and levels of trait anxiety with 80 12 to 13-year olds, Owens et al. found that

anxiety and depression were associated with increased levels of worry, and that increased worry was related to decreased academic performance.

Owens et al. (2012a) also discovered that working memory, measured by digit and special span and neuropsychological testing, moderated the relationship between levels of worry and academic performance (measured by spelling and math subtests on achievement tests). Higher levels of working memory capacity were associated with better academic test performance; however, increased negative affect predicted decreased working memory capacity for students with anxiety and depression (Owens et al., 2012a). Further, anxiety and depression were similarly related to increased trait anxiety and worry. Thus, working memory impacts the relationship between internalizing symptoms and academic performance. When working memory is strong, anxiety can serve as a protective factor for academic outcomes, but when working memory capacity is low a student's high levels of negative affect can further hinder their ability to succeed academically.

Current Interventions for Academic Functioning

The most common interventions for students with ADHD include medication, behavior modification strategies, and cognitive behavioral strategies, with the most effective treatments including a combination of medications and behavior modification strategies (Chan et al., 2016; DuPaul et al., 2012; Jensen et al., 2001). However, it is important to note that the MTA cooperative group (2001) found that even though stimulant medications can help decrease the behavioral symptoms of ADHD, there is little direct impact on students' school-based impairment especially regarding academic achievement (DuPaul et al., 2012). Contingency management and academic interventions were equally impactful on behavioral symptoms of ADHD and both have been found more effective compared to cognitive behavioral therapy

(DuPaul et al., 2012; MTA cooperative group, 2001). In addition, Evans et al. (2017) report behavioral parent training, behavioral classroom management, organization training, and behavioral peer interventions are well-established treatments. Further, Chan et al. found that treatments combining behavioral, cognitive-behavioral, and skills training techniques demonstrated small to medium effects, with stronger effect sizes for improvements in academic and organizational skills like homework completion and academic planner use.

School-based academic interventions for students with ADHD. Academic interventions, such as instructional and classroom modifications, are designed to manipulate antecedent conditions in order to help students with ADHD experience more academic success. Examples of these types of intervention strategies include reducing task length, dividing tasks into smaller steps, setting goals, using shorter time intervals, increasing the stimulation of the task, and modifying the instructions (Miranda, Jarque, & Tarraga, 2006; Raggi & Chronis, 2006; Reid, Trout, & Shartz, 2005). Overall these strategies aim to increase the structure and organization of the learning environment and educational task (Raggi & Chronis, 2006). Research on these methods has shown that they promote increased or sustained attention, reduce student activity levels, and reduce off-task behaviors (Miranda et al., 2006; Raggi & Chronis, 2006). However, it is important to note that most of the research done in this area has been with the use of single case design and with elementary school aged students which limits the generalization of the findings.

Skills Training Interventions. Other academic interventions go beyond manipulating the environment, to directly teaching a specific skill to students that they can implement in an academic situation in order to improve their understanding of content or performance with an academic task (Langberg et al., 2012; Raggi & Chronis, 2006). These skills training strategies

usually focus on specific organizational skills (e.g. organizing a folder or backpack, utilizing a homework planner) or academic skills (e.g. note taking, study skills, or test taking strategies). Raggi and Chronis (2006) describe this intervention strategy as more direct and concrete, impacting the specific skill set but have less impact on memory testing, math achievement testing, or teacher rating scales of behavior. Skills training interventions increase the role of the student, providing more responsibility and ownership to the student, which is well matched to the developmental stage of adolescence.

Parenting group and homework management interventions. A third commonly reported intervention used to target the academic skills of students with ADHD is providing direct intervention for their parents. Often parenting groups focus on psychoeducation related to ADHD and child development, and/or contain homework-focused interventions. Because homework completion and accuracy are two important targets for adolescents with homework difficulties and parental involvement in supporting homework activities and structuring homework routines results in academic gains, this form of academic intervention makes logical sense (Raggi & Chronis, 2006). However, few studies have specifically examined the effectiveness of these strategies for adolescents with ADHD (Evans, et al, 2014; Langberg et al., 2012).

The existing literature on homework-focused interventions suggests including goal setting, contingency contracting, and parent training in structuring the home environment and creating a homework routine (Axelrod, Elizabeth, Haugen, & Klein, 2009; Miranda et al., 2006). Power et al., (2012) evaluated the efficacy of a family-school intervention for 199 children (in grades 2-6) with ADHD. This intervention consisted of six parent group and child group meetings, four sessions of individual family therapy, and two sessions of family-school

consultations. The aim of the intervention was to strengthen the family-school partnership and promote family involvement via systematic homework interventions. Of specific interest, the homework interventions addressed both antecedents (e.g. creating an optimal time for completing homework) and consequences (e. g. goal setting, evaluating performance in relation to goals and administering rewards contingent upon achieving the goal). This family-school intervention had a significant impact on participants' homework performance (measured by the Homework Problem Checklist and Homework Performance Questionnaire- Teacher Version) as well as parenting behavior and family-school relationships (Power et al., 2012).

Axelrod et al. (2009) also found increasing structure in the home and utilizing self-management strategies to be effective. Findings from this study suggest that a structured self-management intervention, implemented in the home setting, increased student homework on-task behaviors and frequency of homework completion. Structuring the homework process has also been found effective in the intervention literature for typical students with academic problems (Miranda et al., 2006; Raggi & Chronis, 2006). Increasing the structure and routine around the homework process has improved both teacher and parent reports of homework problems and has increased homework accuracy and completion rates (Axelrod et al., 2009; Langberg et al., 2012; Raggi & Chronis, 2006).

Contingency management strategies. Contingency management strategies, (i.e. using reinforcement or punishment to establish routines and reduce undesired behaviors) can also be used with students with ADHD. Goal setting and contracting are key components of this intervention strategy that starts with students setting a goal, and then comparing their current performance level with their goal (Reid et al., 2005). Goal setting combined with contingency contracting can be effective by including performance-contingent rewards to increase the student

motivation and effort (Reid et al., 2005; Miranda et al., 2006; Raggi & Chronis, 2006). In a single subject study, Fabiano and Pelham (2003) analyzed an intervention that made participation in a preferred activity contingent on on-task and appropriate behavior. The findings from this study suggest that contingency management intervention was able to decrease the disruptive behaviors and increase the on-task behaviors for an 8-year-old student with ADHD (Fabiano & Pelham, 2003).

Cognitive behavioral interventions. Developing self-control and problem-solving skills can be facilitated with the use of cognitive behavioral strategies. In the classroom setting, self-management and self-reinforcement can be utilized to help children learn how to set goals regarding their classwork completion or accuracy, monitor their progress toward these goals, and self-administer rewards depending on successful completion of their goals (Reid et al., 2005). This strategy has increased generalization compared to parent- or teacher-directed interventions, because students are directly monitoring their own actions and progress toward their goals (Reid et al., 2005; Miranda et al., 2006; Raggi & Chronis, 2006). Axelrod et al. (2009) found that self-management strategies were effective in increasing on-task behavior while completing homework and in increasing homework completion in adolescent students. Miranda et al. and Raggi and Chronis review several studies analyzing the impact of self-monitoring interventions, most of which only utilized elementary age students, and found that this strategy was beneficial at increasing on-task behavior and reducing disruptive behavior in students with ADHD, emotional disturbance, developmental delays, and depression, especially with the use of self-evaluation. In combination with medication, the literature suggests that self-monitoring strategies are beneficial for improving attention and academic performance of students with ADHD,

especially when combined with reward systems (Raggi & Chronis, 2006; Reid et al., 2005; Sprich, Safren, Finkelstein, Remmert, & Hammerness, 2016).

In addition to self-management strategies, students with ADHD have benefited from specific instruction in problem-solving skills (Kofler, Larsen, Sarver, & Tolan, 2015). Kofler et al. studied the benefits of a social-cognitive problem solving intervention for 178 middle school students with ADHD. They found that teaching positive social skills and problem-solving strategies to students with ADHD increased student use of goals and strategies supporting positive social interaction and frequency of prosocial behaviors. Additionally, Sprich et al. (2016) found that a CBT intervention implemented with 46 adolescents (ages 14-18) with ADHD decreased teens' symptom severity. This study demonstrated that a CBT intervention was also able to reduce impairment and distress related to ADHD, suggesting efficacy for CBT with adolescents with ADHD.

School-based interventions for students with ADHD that utilize multiple components. Interventions that contain a combination of the aforementioned strategies are more effective at improving academic functioning (Miranda et al., 2006). Raggi and Chronis (2006) report that the common finding from their literature review suggests that a multimodal approach combining medication with several academic interventions (such as skills training, self-monitoring and a reward system) may be the most effective practice in improving academic performance. The most common components in more complex multicomponent interventions observed by Miranda et al. were behavior modification procedures such as self-instruction, self-management, and anger control. Miranda et al. also noted that teaching study skills like note taking, writing strategies, and organizational skills and parent training were not as frequently included in interventions designed to target the academic functioning of students with ADHD.

Manualized intervention programs. *Homework, Organizational, and Planning Skills (HOPS)*. The Homework, Organization, and Planning Skills (HOPS) program is a manualized intervention that has been implemented in the school setting with middle school students with ADHD (Langberg, Epstein, Becker, Girio-Herrera, & Vaughn, 2012). This intervention was implemented by school based mental health professionals with middle school (6th-8th graders) students for 16 sessions lasting approximately 20 minutes each (Langberg et al., 2012). The mental health professional served as mentors and met with the parents of the students in the treatment group twice for an hour each time, once at the start of the intervention and once at the end of the intervention to help transition the parents into the role of mentor by teaching them how to check in with the students regarding their planning and organization and how to monitor their child's progress (Langberg et al., 2012). Within each session the mentors taught specific skills or organizational strategies related to organizing school materials, recording and managing their homework assignments, and utilizing planning and time management skills. Empirical findings suggest that this intervention can successfully improve parent reported measures of organization, materials management, planning, and homework completion, as well as significantly increase grades for students who participated (Langberg et al., 2012).

The HOPS program was also compared to the Completing Homework by Improving Efficacy and Focus (CHIEF) program when implemented in the school setting with 280 middle school students with ADHD (Langberg et al., 2018). Teacher and parent measures collected at pre-treatment, post-treatment, and 6 months following the interventions. Parents rated improvements in homework problems and organizational skills or students in both programs with large effect sizes. The students in the HOPS intervention also demonstrated moderate effect sizes for improvements in their materials management and organization behaviors based on teacher

ratings. This study supports the idea that school-based interventions for youth with ADHD can be effective.

The Challenging Horizons Program (CHP). The Challenging Horizons Program (CHP) is another manualized school-based intervention for students with ADHD. The CHP-Coaching (CHC-C) model utilizes a school based consultation and monitoring model to teach academic and social skills (Evans, Serpell, Schultz, & Pastor, 2007). Evidence suggests that direct skill training in academic skills such as note-taking, tracking assignments, and organizational skills is an effective way to target academic performance in students with ADHD (Evans et al., 2007; Raggi & Chronis, 2006). Additionally, the CHP-C program also targets social skills through teaching students how to problem solve and engage in effective communication and conversation with peers (Evans et al., 2007).

Raggi and Chronis (2006) reviewed the CHP program for middle school students with ADHD which combined direct note-taking skills training with parent and social skills groups, and report that the note-taking intervention was able to increase on-task behavior and improve scores on daily assignments and resulted in participants taking better notes. The note-taking intervention may be most effective when combined with other educational interventions to address the behavior and academic achievement of adolescents with ADHD (Evans et al., 2007; Raggi & Chronis, 2006).

Evans et al. (2007) examined the effects of the CHP-C program on middle school students in a treatment group compared to a community care control group. The intervention was implemented in the school by an academic mentor in 15 coaching sessions, and findings from the study found improved parent reports of ADHD symptoms and social functioning (Evans et al.,

2007). Although no significant academic benefits were found, within-year analysis found an upward trend in students' grade point average (GPA) (Evans et al., 2007).

In their review of this program, Raggi & Chronis (2006) reviewed several studies of the CHP program and on average, found large effect sizes on measures of inattention and school functioning and small to moderate effect sizes for grades. In one study (Evans, Axelrod, & Langberg, 2004) the students exposed to the CHP intervention obtained significantly higher GPA than the community care group in their second semester (Raggi & Chronis, 2006). Further Miranda et al. (2006) reported significant improvements in grades for students exposed to the CHP program after school program which had a higher dosage than the in school coaching model. These findings suggest that this multi-component intervention may be effective at intervening with adolescents with ADHD who have academic impairments.

Pilot study of a multicomponent intervention for high school students with ADHD.

In the pilot study conducted by Evans, Schultz, and DeMars (2014), the efficacy of a school-based intervention program for high school students with ADHD was examined. In their investigation, two academic coaches (paraprofessionals) provided the intervention to the students in the treatment group through one-on-one coaching sessions. Parents of the teens in the treatment group also attended 10 weekly parent groups targeting homework management while the teens attended groups targeting social skills. Although the intent-to-treat analysis found little statistically significant benefit of the CHP-Coaching intervention compared to the community care group, effect sizes between the two groups differed and varied over time (Evans et al., 2014). Effect sizes suggest moderate improvements in parent reports of inattention, relationships with peers, academic impairment, and family functioning.

Additionally, the number and duration of coaching sessions (i.e. dosage of the intervention received) impacted the participants' outcomes, suggesting the more sessions attended the stronger the benefits of the program (Evans et al., 2014). Evans et al. report that the relationship between dosage and academic impairment (greater than 50% chance of reliable improvement with 50 coaching sessions) is promising. Findings for the after school version of the CHP program (which has a higher dosage) show greater benefits to students compared to the in school coaching model prompting the authors to suggest increases in the dosage received in the in-school coaching version may result in clinically significantly increased academic improvement (measured by school grades and the Classroom Performance Survey) (Evans et al., 2014; Miranda et al., 2006).

Limitations of Interventions on Academic Outcomes

The efficacy of many of these interventions, especially the individual strategies, is variable. Many of the individual strategies are effective in the short term, but often when the intervention is withdrawn there are limited long-term effects (Miranda et al., 2006). Based on the current literature, the typical treatment effects of school-based interventions are greater for behavioral outcomes than for academic performance, with typically only small effects on academic performance (DuPaul et al., 2012; Miranda et al., 2006). Additionally, school-based intervention efficacy is less clear compared to the literature for behavioral outcomes (DuPaul et al., 2012; Miranda et al., 2006). In a meta-analysis, DuPaul et al. (2012) reported that effect sizes for academic outcomes were positive but not significant in between-subjects and within-subjects designs, but were positive and significant for single-subject design studies. In conclusion, academic interventions may only minimally impact academic functioning, but have been shown

to positively and significantly impact the behavioral symptoms of the disorder (DuPaul et al., 2012; Miranda et al., 2006; Raggi & Chronis, 2006).

Effective components of evidence based interventions. A general consensus in the literature is that a multimodal treatment combining medication and an academic intervention may be the most effective in improving academic functioning in students with ADHD (Chan et al., 2016; DuPaul et al., 2012; Jensen et al., 2001; Raggi & Chronis, 2006). Findings from the MTA study suggest that a comprehensive behavioral intervention in combination with medication may more beneficial than one treatment method, and offer additional benefits beyond the effects of medication alone (Raggi & Chronis, 2006). Medications have been shown to be effective in reducing the core symptoms of ADHD, but there is a need in the literature for specific interventions to close the gaps in academic functioning (Chan et al., 2016; DuPaul et al., 2012; Jensen et al., 2001; Raggi & Chronis, 2006). School-based interventions have been shown to at least moderately improve academic functioning suggesting this as an important intervention component to study and further investigate (Chan et al., 2016; DuPaul et al., 2012).

Raggi and Chronis (2006) report that interventions that are able to increase active engagement, decrease distractions, provide immediate feedback, break larger tasks into smaller chunks, and help students develop effective decision making skills to increase their responsibility and independence have been the most effective. For example, multi component interventions including self-evaluation have been shown to help decrease disruptive behaviors (Hoagwood, Olin, Kerker, Kratchowill, Crowe, & Saka, 2007; Miranda et al., 2006). Further, academic interventions with contingency management were found to be the most effective classroom interventions (DuPaul et al., 2012). In addition to the specific strategies included in the intervention, duration and intensity are key factors that predict academic improvement.

Hoagwood et al. suggest that the most effective interventions have lasted one or more school years, have directly targeted the skills or content areas of concern, and included parent and teacher intervention components.

In a 3-year treatment outcome study of CHP, Evans et al. (2007) analyzed the efficacy of a training and consultation model for the CHP program that would allow school mental health professionals and educators to implement the intervention components in the school setting. While there were not cumulative academic benefits for this coaching model of the CHP, there were long-term benefits for the treatment group on parent ratings of ADHD symptoms and social function. Students benefited the most when there was explicit skills training and students had the opportunity to practice those skills in the academic setting or context. Further, the amount of exposure to the intervention components showed a promising trend in the relationship of dosage and academic outcomes. Evans et al. suggest that over 50 coaching sessions would be needed to see significant academic improvement.

Evidence suggests a multicomponent treatment program would lead to the most ADHD related functional improvements (Chan et al., 2016; DuPaul et al.; Jensen et al., 2001; Raggi & Chronis, 2006). In one of the most recent comprehensive literature reviews, Chan et al. (2016) conclude that treatment programs should include training skills beyond behavior management alone to best target the impairments experienced by adolescents with ADHD. Most promising, Chan et al. assert that psychosocial treatments utilizing skills training are associated with medium to large effect sizes on organizational skills, a key competent of academic functioning. The review also found medium to large improvements in organizational skills or executive functioning for students who participated in the HOPS or CHP after-school programs, as well as improvements in parent reported homework completion (Chan et al., 2016).

Components included in the Bridges to Educational Success for Teens (BEST) Intervention

The BEST Project is a multicomponent intervention program containing effective components described in the literature, and especially those included in the CHP-C program which was a pilot for the BEST Program (Evans et al., 2014). There are 10 parent groups and 10 student Interpersonal Skills Groups (ISG) held over the course of the school year. The parent groups provide parents with basic information about ADHD, adolescent development, effective communication, problem solving, and contracting. The parents also are guided through creating a homework management contract with their teens and implementing contingency management strategies at home. In-school coaching sessions occur twice a week for the duration of the school year, providing students with direct skills training in study and test-taking skills, organizational skills, and problem-solving skills. Further, the coaching component of the intervention allows for the academic coach to additionally implement a Check & Connect intervention each month to help monitor students on key indicators of academic risk. In the pilot study, Evans et al. (2014) describe the need for more than 50 coaching sessions; a dosage that is feasible within the school setting over the course of the school year. Additionally, the literature recognizes the benefit of integrating interventions into students' regular routines which, because this intervention is implemented in the school setting, could more easily integrate coaching sessions into the student's weekly scheduled compared to a clinic-based intervention.

Conclusions

The literature supports the findings that a combination of behavioral interventions and medications is the best methods for the improving and controlling the main symptoms of ADHD (hyperactivity, impulsivity, inattention), disruptive behavior, and off-task behaviors; however, the research shows that medication alone does not adequately address children's educational

needs (Chan et al., 2016; Daviss, 2008; DuPaul et al., 2016; Jensen et al., 2001; Raggi & Chronis, 2006; MTA Cooperative Group, 2001). The MTA study found that although stimulant medications can decrease the behavioral symptoms of ADHD, there is little impact on school-based impairment especially regarding academics (DuPaul et al., 2014). Further, the MTA study found that while academic and behavioral interventions significantly improved the behavioral symptoms of ADHD, treatment impact on academic functioning was limited.

The literature also supports the connection between ADHD and academic underachievement (DuPaul et al., 2012; Raggi & Chronis, 2006). There is strong empirical support to suggest that the current evidence based interventions impact the behavioral symptoms of ADHD, but the efficacy of these interventions on improving academic outcomes is less clear (Raggi & Chronis, 2006). The limited number of treatment outcome studies for students with ADHD that have incorporated components to specifically target academic outcomes, and have suggested that these components may be beneficial (Raggi & Chronis, 2006).

Areas of need for future research. There is a clear demonstration of impairment for teens with ADHD, yet the psychosocial treatment literature for this specific population is lacking (Evans et al., 2014). Available intervention studies with students with ADHD also likely include students with internalizing issues, unless they were explicitly screened out or excluded. Additionally, many studies only include one group of students with internalizing disorders instead of separately identifying students with anxiety symptoms from those with depression symptoms. This combining of internalizing disorders into one category does not give a clear picture of how students with either type of co-occurring symptomology function in an academic setting, or how their symptoms manifest or impact intervention outcomes.

Daviss (2008) recommends a biopsychosocial approach to interventions where specific treatments can be individualized to target specific functional deficits as well as environmental factors likely contributing to the students ADHD symptoms and co-occurring internalizing symptoms. Most randomized control trial studies of multicomponent intervention packages do not distinguish the effects of individual techniques from the overall packaged intervention, but there is some evidence to suggest that these interventions could be effective for adolescents with conditions commonly comorbid with ADHD (e.g. anxiety and depression) (Chan et al., 2016). Thus, it is important for future research to analyze the efficacy of multicomponent interventions for students with symptoms of anxiety and depression in order to better address the academic deficits associated with these commonly occurring symptoms in the school setting.

Ostrander and Herman (2006) also argue for the inclusion of parenting groups when treating students with ADHD, and suggest that parenting behaviors may impact the development of child cognitive styles. They further argue that cognitive and behavioral dysregulation (typical in youth with ADHD and depression) may lead to negative interactions with parents which can then adversely impact the parent's willingness to engage in homework management, contingency intervention, and other academic related tasks (Ostrander & Herman, 2006). Ostrander and Herman suggest that effective interventions to treat or prevent depression in children with ADHD may depend on the child's age, and need to be adjusted to meet the needs of older children. More research is needed on parent management training to promote consistency, structure, and monitoring for teenagers with co-occurring ADHD and internalizing symptomology. Chan et al. (2016) and DuPaul et al. (2012) argue that it would be beneficial to investigate ways of adapting effective intervention techniques for the treatment of ADHD in

adolescence and Ostrander and Herman state that the “study of comorbidity is the most pressing issues in child psychopathology research and practice” (p. 89).

Current Gaps and Limitations in the Intervention Literature

Limited research done with adolescents. In several empirical studies, literature reviews and a meta-analysis of school-based interventions, a consistently cited limitation is the lack of teenage participants (DuPaul et al., 2012; Evans et al., 2014; Hoagwood et al., 2007; Langberg, 2012; Miranda et al., 2006; Raggi & Chrois, 2006). The majority of available studies are focused on elementary age students, with a few studies using middle school or early adolescent students in their studies (DuPaul et al., 2012; Evans et al., 2014; Langberg et al., 2012). Only one study thus far has analyzed the efficacy of a school-based intervention for high school students with ADHD, the pilot study conducted by Evans et al. (2014). This limitation is of particular concern as functional impairments can get worse as students get older, and impact adolescents’ academic performance more than for younger children (Booster et al., 2010). Continued intensive intervention through the adolescent years is be appropriate for youth with academic difficulties, especially organizational and homework difficulties, thus more research is needed in this area with high school students.

Limited research done with school-based interventions. Limited research exists for treatment outcome studies conducted within the school setting (DuPaul et al., 2012; Hoagwood et al., 2007; Miranda et al., 2006). Further, in the school-based intervention literature, most of the studies have analyzed the impact of contingency management interventions (DuPaul et al., 2012). Hoagwood et al. also points out that most of the school-based research for academic and mental health interventions is done at the universal level, or as a preventive measure, with little research done with secondary interventions or treatment programs, especially at the high school

level. Interventions that are implemented in a more naturalistic setting or that are able to be incorporated into students' regular routines have shown greater lasting impact (Evans et al., 2014; Miranda et al., 2006). Miranda et al. also points to the lack of generalization for interventions implemented in clinical settings, perhaps due to shorter duration or lower intensity of the interventions.

Impact on academic functioning. Even though the target of most academic interventions is to improve the academic functioning of students, academic interventions may only minimally impact academic functioning (DuPaul et al., 2012). However, academic interventions have been shown to positively impact behavioral symptoms of ADHD (DuPaul et al., 2012). More specifically, DuPaul et al. found that the impact of school-based interventions, such as self-monitoring and contingency management, was stronger for behavioral outcomes than for academic ones. More research is needed to study the impact of school-based academically targeted intervention on specific academic outcomes especially with high school students.

Limited research with co-occurring ADHD and internalizing symptoms.

Additionally, limited research exists on youth with ADHD and co-occurring internalizing symptoms. A strong association exists between ADHD and internalizing disorders, but less is known about the mediators and moderators of this relationship and comorbidity (Ostrander & Herman, 2006). Future studies should include students with ADHD, ADHD and comorbid internalizing symptoms and children with neither disorder (Schatz & Rostain, 2006). Schatz and Rostein also suggest that parent and teacher reports of anxiety symptoms may not fully capture all symptoms, and may be picking up on more negative affectivity of depression or underestimate system prevalence. Thus, it is important to study the implications of co-occurring

anxiety symptoms separately from those of co-occurring depressive symptoms, and clearly differentiate the impact on treatment outcomes of these two symptom dimensions.

The behavioral strategies used to address difficulties associated with the behavioral symptoms of ADHD (which are very effective) may not address the unique needs of students with additional internalizing problems (Booster et al., 2010). Further research is needed regarding the functional deficits and relevant environmental factors impacting this population, and how to best address the academic impairments with effective treatments and interventions. (Daviss, 2008). Of the studies Hoagwood et al. (2007) included in their literature review of school-based interventions for academic and mental health needs, very few examined the impact of these interventions with students with internalizing problems. The impact of school-based interventions on both academic and mental health outcomes is also understudied (Hoagwood et al., 2007). As the impact of anxiety and depression is well documented (Biederman et al., 2008; Hoagwood et al., 2007; Wood, 2006), more research is needed to further the understanding of how internalizing disorders impact academic functioning and the efficacy of school based academic interventions.

It is beneficial to examine how these disorders or co-occurring symptoms work together to impact high school students and their academic functioning. Miranda et al. (2006) argue that further research is needed to identify the personal characteristics, such as age or comorbid conditions that have a “modulating effect on the efficacy of the school-based programs directed toward children with ADHD” (p. 50). Deficits in academic and social functioning in the school environment are common among students with ADHD and increased internalizing symptoms, thus should be the target of psychosocial interventions (Daviss, 2008). Therefore, it is important to study the impact of internalizing symptomology on academic outcomes for students with

ADHD. This will allow clinicians and researchers to more fully understand the moderators of treatment outcomes so that practitioners and researchers alike can learn more about the differential treatment effects of academic interventions and to effectively intervene or provide academic support to these students (Booster et al., 2010; Chan et al., 2016)

Limited use of randomized control trial between-subjects design. Finally, DuPaul et al. (2012) analyzed 60 school-based intervention studies for students with ADHD. Findings showed out that most of the studies included in their meta-analysis used single-subject designs or within-subjects designs to analyze the impact of interventions. Thus, between-subject designs are needed to test the impact of comprehensive programs that integrate several approaches such as parent training, homework management, and academic skills training (Raggi & Chronis, 2006).

How the BEST Project could be used to address the research gaps. The BEST Project and this proposed study help address several of the gaps discussed in the literature. The BEST Project is a school-based intervention for high school students with ADHD. This intervention is designed for and implemented with adolescents in the high school environment. The larger project also utilizes a between-subjects design, with participants randomly assigned to community care control and treatment groups. Previously, there have been two between-subject studies that have included academic outcomes (DuPaul et al., 2012).

Further, the BEST intervention combines several effective strategies and practices including academic and organizational skills training, interpersonal skills training, a parenting group focusing on homework management and contracting with contingency management, and Check & Connect with self-monitoring. Information from the pilot study suggests that this intervention can positively impact parental ratings of ADHD symptoms and behaviors (Evans et al., 2014). Further, there is evidence from the pilot study to suggest that an adequate dosage of

this intervention (i.e., 50 sessions or more) will have a positive impact on students' academic outcomes.

This study analyzed the impact of co-occurring anxiety and depressive symptoms on the academic outcomes from the BEST intervention with high school students with ADHD. It is helpful to analyze the impact of anxiety and depressive symptoms separately from each other, as this distinction is lacking in the literature. Finally, studying the impact of co-occurring symptomology on the academic outcomes from this intervention contributes to the literature on academic outcomes from school-based interventions specifically for students with co-occurring ADHD and internalizing symptoms.

Purpose

The purpose of this study was to analyze the impact of co-occurring anxiety and depression symptoms on the academic outcomes from the BEST intervention. This study analyzed the degree to which the severity of anxiety symptoms and severity of depression symptoms moderated treatment effects on academic outcomes for adolescents in the project.

It is important for clinicians and researchers to know how internalizing symptoms impact the effects of this intervention for adolescents with ADHD. This study provides more information about the role anxiety and depression symptoms play in the manifestation of ADHD symptoms and academic impairments and the degree to which these symptoms moderate treatment response in high school students. This knowledge can contribute to improved selection of prevention, intervention, and therapeutic strategies and techniques, and help clinicians, educators and parents make more informed decisions when treatment planning. A better understanding of the moderators of treatment outcomes can help us better understand the differential treatment effects (Chan et al., 2016). As psychologists and educators, our ultimate

goal is to promote competence and adaptation in all adolescents, and this study will help further this goal specifically for students with ADHD and co-occurring internalizing disorders.

Chapter III

Method

Participants

Demographic characteristics. Participants ranged in age from 14-18 years old, attended public school in grades 9th -11th, and met DSM-5 diagnostic criteria for ADHD (American Psychiatric Association, 2013). In this study, 142 participants were targeted from the overall sample of participants from the BEST Project, recruited across two sites (in Ohio and Pennsylvania) in two years. Recruiting participants across two sites increased diversity in the sample with respect to geographical location, race, gender, SES, and type of high school (i.e. urban, suburban, and rural) and symptom severity.

The high schools that participated at the Ohio site varied from rural to urban settings and high school students from the Pennsylvania (PA) site consisted predominantly of suburban settings. Student participants were recruited from several different high schools across two states and cover urban, suburban, and rural areas. Collectively, these student populations from the Pennsylvania schools consisted of a student body that was approximately 85% White, 5% Hispanic, 5% African American, and 5% Asian, and approximately 82.5% White, 7% Hispanic, 6.5% African-American, 4% multi-racial and 1.5% Asian from the Ohio Schools. On average in Pennsylvania, 34 % of students qualify for free or reduced-proceed lunches, whereas about 18% of students at these high schools were eligible for this program (U.S. Department of Education, National Center for Education Statistics, 2015). On average in Ohio, 40.7% of students qualify for free or reduced-proceed lunches, whereas about 61.5% of students at these high schools were eligible for this program (U.S. Department of Education, National Center for Education

Statistics, 2015). See Table 1 for a more detailed description of demographic information from each school.

Number and selection method. Participants were recruited for the BEST Project and included based on project inclusion and exclusion criteria. Inclusion criteria included a diagnosis of ADHD, an IQ of 75 or above, and an attendance rate of 80% or more school days spent in school. Exclusion criteria included a diagnosis of Bipolar, Schizophrenia or psychosis, or Obsessive Compulsive Disorder. No additional inclusion criteria were utilized. For the purposes of this specific study, participants with missing data were excluded. Missing data indicates that a participant did not complete all data collection points and had missing questionnaire data. Missing data is not a measure of treatment fidelity or the dosage of treatment a participant received.

Power Analysis. An a priori power analysis was conducted for a multivariate multiple linear regression analysis with a specific focus on the interaction between symptom severity and group (BEST protocol vs. community care control). The purpose was to determine the necessary sample size to test moderating effect of anxiety and depression symptoms on academic outcomes at post-treatment. The text and tables used were from Cohen (1988) and Faul, Erdfelder, Lang, and Buchner (2007). With seven predictors (group assignment, the main effect of anxiety, the interaction between anxiety and group assignment, the main effect of depression, the interaction between depression and group assignment, gender and parent education), an effect size of $f = 0.25$, $R^2 = .18$, and an α error probability of 0.05, the estimated required total sample size was 142 participants with an actual power of .80.

Measures

Multiple measures and forms of assessment were utilized throughout the BEST Project. The following measures were examined for the purposes of this proposed study, see also Table 2.

ADHD. The *Parent Version, Children's Interview for Psychiatric Symptoms (P-ChIPS)* is a clinical interview for parents of children ages 6-18 years old, based on DSM-IV criteria to screen for conditions such as ADHD, conduct disorder, oppositional defiant disorder, anxiety disorders, mood disorders, and schizophrenia (Weller, Weller, Fristad, & Rooney, 1999). The P-ChIPS interview has moderate levels of agreement between parent and child ($Kappa = .41$) and between diagnose from the P-ChIPS and clinical diagnosis ($Kappa = .49$) (Fristad et al., 1998). Adapted to address DSM-5 criteria for the BEST project, the P-ChIPS has nine questions for inattentive symptoms and nine for hyperactivity/impulsivity, and six symptoms need to be endorsed to meet diagnostic criteria, along with diagnostic criteria for duration and impairment (Weller et al., 1999).

The *ADHD Rating Scale- 5 (ARS-5): Home Version and School Version* are rating scales to assess DSM-5 criteria for ADHD (DuPaul et al., 2016). Both versions include two symptom subscales, Inattention and Hyperactivity-Impulsivity comprised of nine items. Both the home and school versions also assess six domains of impairment commonly experienced by students with ADHD (at School, Home, and with Peers). Alpha coefficients for the internal consistency of symptoms ratings for Inattention, Hyperactivity-Impulsivity, and Total scales are high (.89-.96). Test-retest reliability for the Home Version over 6 weeks ranged from .80-.87, and .90-.93 for the School Version (DuPaul et al., 2016). The two-factor structure of the ARS-5 (Inattention, Hyperactivity-Impulsivity) is supported by a confirmatory factor analysis for both the home and school versions. Concurrent validity was assessed with correlations between the ARS-5 and the

Conners 3 rated by parents and teachers (Power, Watkins, Anastopoulos, Reid, Lambert, & DuPaul, 2015).

Internalizing Symptoms. The *Reynolds Adolescent Depression Scale, Second Edition, short form* (RADS2-SF; Reynolds, 2002) is 30-item self-report rating assessing depressive symptoms in adolescents ranging in age from 11-20 years. It measures four basic dimensions of depression: Dysphoric Mood, Negative Affect, Negative Self-Evaluation, and Somatic Complaints. Students choose response options arranged on a 4-point Likert scale where 1= “almost never”, 2= “hardly ever”, 3= “sometimes”, and 4= “most of the time”. The RADS2-SF standard scores provide an indication of the clinical severity of an individual’s depressive symptoms. *T*-scores of 60 or above indicate level of symptoms associated with clinical depression. The scale is widely used and has good reported overall psychometric properties with internal consistency ranging from .92 to .94 and test-retest reliability at .89 (Reynolds, 2002). For this study the self-reported total *T*- score was used to measure depression symptom severity.

The *Beck Youth Inventories- Second Edition, Anxiety Inventory (BIY-A)*, is a 20 item self-report measure assessing youth’s anxiety traits, fears, worries, and physiological symptoms associated with anxiety in youth ages 7- 18 years old (Beck et al., 2005). It measures anxious cognitions and emotions, somatic symptoms, social anxiety symptoms, concerns about physical and psychological integrity, and specific fears. Students choose response options arranged on a 4-point Likert scale where 0= “almost never”, 1= “sometimes”, 2= “often”, and 3= “always”. The BYI-A standard scores provide an indication of the clinical severity of an individual’s anxiety symptoms. *T*-scores of 60 or above indicate level of symptoms associated with moderately elevated anxiety, and *T*-scores of 70 or above indicate a level of symptoms associated with extremely elevated anxiety. The scale has strong overall psychometric properties

with internal consistency ranging from .89-.92 and test-retest reliability at .84-.87 (Beck et al., 2005). For this study the self-reported total T- score was used to measure pre-treatment anxiety trait symptom severity.

Academic Functioning. *Grade Point Average (GPA)*, is an average of the grades earned for each course, with an A = 4, B = 3, C =2, D =1 and an F =0, and possible scores ranging from 0.00-4.00. Cumulative GPA for the end of the year prior to treatment and the end of the year of intervention will be used to measure distal outcomes related to the innervation. Cumulative GPA was collected for the four core content areas (e.g. English, Mathematics, Science, and History) and data were collected directly from each of the participating schools from the students' official academic transcripts. It is important to note the limitations of using GPA as a measure of academic performance across schools. Grading policy and how teachers assign points and letter grades may differ across schools and districts which could raise concerns regarding the reliability and validity of GPA (Allen, 2005; Dickinson & Adelson, 2016). However, GPA is commonly used in education to gauge a student's academic performance and typically is used to make graduation and college admissions decisions (Allen, 2005; Duckworth & Seligman 2005). GPA was included in this study as a distal measure of academic performance.

The *Children's Organizational Skill Scale (COSS)* is a rating scale measuring children's organizational skills intended for children ages 8-13 years old. The COSS has three response versions, a self-report measure (63 items), parent version (66 items), and teacher version (42 items) (Abikoff & Gallagher, 2008). The *COSS* has three subscales including Task Planning, Organizes Actions, and Memory and Materials Management (Abikoff & Gallagher, 2008). The COSS is specifically designed to measure organizational skills and has adequate psychometric properties overall with internal consistency ranging from .70- .98 and two and four-week test-

retest reliability coefficients from .88-.99 (Abikoff & Gallagher, 2008). For the purposes of this study, the total score from the parent report was utilized to measure overall organizational, planning, and time management skills.

The *Homework Problems Checklist (HPC)* is a parent report scale measuring students' homework preparation and completion. The *HPC* has 20 items measuring the frequency of typical problem behaviors related to homework completion (Anesko, Schoiock, Ramirez, & Levine, 1987). Parents respond regarding the frequency of each item on a 4-point Likert scale (0 = "never", 1 = "at times", 2 = "often", 3 = "very often"). The *HPC* has strong internal consistency (.90-.92) and corrected item-total correlations (.31-.72) (Anesko et al., 1987). Power, Werba, Watkins, Angelucci, and Eiraldi (2006) found two distinct factors in the *HPC*, Inattention/ Avoidance of Homework and Poor Productivity/Nonadherence to Homework Rules. The total score from the parent report form was used to measure changes in initiation and completion of homework.

The *Adolescent Academic Problems Checklist (AAPC)* is a 24-item rating scale measuring middle and high school students' common academic problems (Sibley, Altszuler, Morrow, & Merrill, 2014). The *AAPC* measures frequency of each item on a 4-point Likert scale (0 = "not at all", 1 = "just a little", 2 = "pretty much", 3 = "very much") with parent, teacher, and self-report measures (Sibley et al., 2014). In their development and validation study, Sibley et al. (2014) report strong internal reliability for the parent (.92) and teacher (.92) total scores. This study utilized the parent response form and the total score from the *AAPC* to help evaluate parent perceptions of students' common academic issues.

Procedures

BEST Project recruitment procedures. Students were recruited for the BEST Project from local high schools in PA and OH in the spring semester of the academic year before the treatment was implemented. Participating high schools were provided with a description of ADHD symptoms and common characteristics along with a description of the study. Educators then identified potentially eligible students and gained permission to pass along the student's and family's contact information for the BEST team to then initiate a phone screening and set up an initial evaluation meeting where inclusion and exclusion criteria were assessed.

In the initial diagnostic evaluation, informed consent and assent were collected from the parent and adolescent, respectively, and then the parent completed the ADHD Rating Scale-5 (ADHD-RS-5; DuPaul, Power, Anastopoulos, & Reid, 2016) The ADHD-RS-5 has norms for high school age students and has demonstrated good sensitivity and specificity in determining a diagnosis of ADHD (DuPaul et al., 2016; Ostrander et al., 1998). The parent identified as the primary caregiver also completed a semi-structured diagnostic interview, Children's Interview for Psychiatric Syndromes- Parent version (PChIPS) (Weller, Weller, Fristad, & Rooney, 1999).

Also in the initial evaluation, the student completed several rating scales and a clinical interview, Children's Interview for Psychiatric Symptoms (ChIPS) (Weller et al., 1999). The student was given the Wechsler Abbreviated Scale of Intelligence – Second Edition (WASI-II; Wechsler, 1999) and the Woodcock-Johnson-IV (WJ-IV; Pearson, 2009) which helped collect further data for academic functioning and an estimate of IQ for the exclusionary criteria.

After the initial evaluation, the student's core content teachers were also asked to complete ADHD rating scales (ARS-5 and CPS). Parents were asked for written consent to release information from the school at their initial evaluation.

Following each initial eligibility evaluation, results from the parent and student assessment were reviewed at weekly meetings with the research assistants and supervising principal investigator and at each respective site. Final diagnoses and eligibility decisions were determined by unanimous agreement among the PI and research assistants at each site.

BEST Project Inclusion Criteria.

Participants met criteria for ADHD in order to be include in the BEST Project. ADHD symptoms were considered present if endorsed by parents (PChIPS) or 2 teachers (ADHD-RS-5). Impairment in two or more settings was considered present if the parent and teacher endorse impairment in at least one domain at both home and school on the PChIPS (parent) or the ADHD-RS-5 or CPS (scores 1 SD above the mean).

BEST Project Exclusion Criteria. Participants in this study were excluded based on IQ score, school attendance level, and certain diagnoses. Students were excluded from the study if they had an estimated Full Scale IQ (FSIQ) (measured by the Matrix Reasoning and Vocabulary subscales on the WASI) below 75. Students who attend school less than 80% of the school days were also excluded from the study. The final exclusionary criterion was meeting diagnostic criteria for Bipolar Disorder, Obsessive Compulsive Disorder, substance dependent or a psychiatric disorder. Students with those disorders typically require different or more intensive intervention strategies than what were provided in the BEST Project intervention.

Randomization. Randomization of participants occurred within each school. Participants were randomized into the treatment group (who received the interventions) or the community care control group (who were not exposed to the BEST intervention, but were be free to continue to receive school and community supports and services). The families were informed about the randomization process at the initial evaluation meeting and through the consent process.

Participant medication status (use of an ADHD medication) was considered in the randomization process, and was blocked on medication status and gender. This study analyzed the influence of anxiety and depressive symptom severity on academic outcomes in high school students with ADHD. Each participant in the treatment group received the multicomponent intervention for one academic year (September to early June), and all participants were evaluated pre-treatment in September and post-treatment (in late May early June).

Academic and Organizational Skills. Various academic and organizational interventions targeted at students' organization of their materials, assignments, and time were implemented by graduate research assistants (academic coaches) in one-on-one coaching sessions lasting approximately 10-20 minutes, twice a week. The coaches used checklists to monitor students' use of an assignment planner, organization of assignments, and organization of classroom materials in their binders. Coaches monitored each student's completion of assignments and helped students prioritize schoolwork for completion based on importance, due dates, and available time. Additionally, the coaches taught academic skills including teaching students to use flashcards, outlines, and notes to facilitate completion of assignments and test-taking strategies (Evans et al., 2007; Evans et al., 2015; Langberg et al., 2012; Miranda et al., 2006; Raggi & Chronis, 2006).

Check & Connect. Once a month, academic coaches checked in with each student to monitor their grades, missing assignments, attendance, tardiness, and in-school and out-of-school disciplinary infractions (Anderson, Christenson, Sinclair, & Lehr, 2004). If a student met the designated risk indicator, the coach followed a problem solving procedure with the student and connected with the student to help them work toward their selected solution (Anderson et al., 2004). The student indicated the risk factor and identified the problem, set a goal, and

brainstormed possible solutions with the academic coach. The coach and student then selected a solution or combination of solutions and decided when to implement the solution and how to evaluate the solution's effectiveness.

Interpersonal Skills Group (ISG). At each participating high school, the treatment participants attended 10 ISG sessions, 5 sessions in the fall semester and 5 sessions in the spring semester. The goals of the group were to help the adolescents identify personal goals for themselves and help them understand the relationship between their behavior and the reactions of others (Evans et al., 2007; Evans et al., 2015). In each session, the students engaged in social activities, and periodically met with coaches at set intervals to discuss how well they were working toward their ideal self-goals in each session. The coach and student rated how well the student was meeting their self-goal on a scale of -3 to 3. The coach asked about the reactions of peers to the student's behavior and helped the student focus on important aspects of these reactions, discussed how those reactions related to the ideal self-goals of the student, and developed a plan for the following interval based on those factors. Although the feedback was intended to be brief, the theory of change in this intervention was based on learning through many repetitions of this process so the student begins to think in this manner during social interactions.

Parenting Group. While the students were in the ISG group, parents were invited to attend 10 sessions of a Parenting Group. The topics of these sessions included psychoeducational information regarding ADHD, parent-teen communication and negotiation strategies, implementation of a homework management plan (HMP) and contracting in other areas outside homework (Evans et al., 2007; Evans et al., 2015; Hoagwood et al., 2007; Miranda et al., 2006 & Raggi & Chronis, 2006). The parent sessions were led by graduate research assistants using

power point slides across all sites. The parents developed a HMP, and then extended contracting to other areas of concern. After the 10 sessions, the parents and students were invited to a follow-up meeting lead by the parent group leader to troubleshoot and problem solve issues with the HMP or other risk indicators.

Self-Management. Self-management was integrated into several of the intervention components to help students increase their independence of implementing the newly learned skills and strategies. Students were trained in a skill and then asked to practice the skill to establish routines and habits that will allow them to independently implement a skill (DuPaul & Stoner, 2014; Miranda et al., 2006; Raggi & Chronis, 2006). Students identified important skills or behaviors related to the other intervention components and attended to those behaviors when implementing the skills in class, at home, or in social situations. Students monitored their target behaviors in their coaching sessions through student and teacher ratings.

Treatment Fidelity and Supervision. Treatment fidelity checks were conducted by comparing the audio recordings taped during each individual coaching sessions, ISG, and parent group against a fidelity checklist of procedures and content intended to be covered in each session or group. Additionally, each academic coach has weekly individual supervision with a doctoral level psychologist (Dr. Steve Evans in Ohio, and Dr. George DuPaul in Pennsylvania). Supervision consisted of the academic coach reviewing participants' current academic and organizational needs and any present risk indicators. The coach and supervisor then discussed next steps based on treatment protocol and any other needed intervention components that need to be utilized. Approximately 30% of all sessions (chosen at random with a random number generator) were coded for integrity, including coding of intervention treatment components and quality of the student coach relationship, and 30% of those cases (chosen at random with a

random number generator) double coded for reliability.

Coders assessed the fidelity with which each aspect of the BEST protocol was implemented using a coding manual that outlined categorical and operationally defined aspects of each intervention, including organizational interventions (e.g. daily planner use, and maternal organization), problem solving, Check & Connect, study skills (e.g. test taking strategies and using flashcards), interpersonal skills training, and parent groups. Coaches' interactions with the student participants were also coded for use of a neutral voice, enthusiasm, completing the steps efficiently, and promoting the student's autonomy and decision-making. Results indicate high adherence and competence to recommended procedures. For example, the average adherence was above 85% for all intervention components.

Data Analysis Plan

Because multivariate regression requires complete data, cases with missing data were removed. If more than 10% of cases have missing data, an attrition analysis was completed to determine if there was differential drop-out between the treatment and community care control group. Preliminary analyses to check the statistical assumptions of normality and multicollinearity were also conducted. The intercorrelations among measures also were examined. Specifically, skewness and kurtosis were used to check the assumptions of normality and tolerance and variance inflation factor (VIF) was used to check the assumptions of multicollinearity in SPSS. A correlation matrix was also requested in SPSS as a preliminary analysis. Descriptive and demographic data for both the treatment and community care control groups was obtained to test possible between-group differences in parent education level, age, and gender. Finally, a post hoc assessment of psychometric properties of three of the academic performance measures (COSS, HPC, and AAPC) with this population was conducted. Internal

consistency was evaluated using Cronbach's alpha.

For the first research question, a multivariate multiple linear regression analysis was conducted in SPSS to determine if the severity of pre-treatment depression and/or anxiety symptoms in adolescents with ADHD predicted their academic functioning prior to intervention above and beyond prediction based on gender and parent education (i.e., established demographic predictors of academic performance). The BYI-A and RADS2-SF scores used to measure anxiety and depression symptom severity were mean-centered. This helped determine the relative contribution of anxiety and depression in the academic functioning among adolescents with ADHD before the BEST intervention was implemented.

The univariate *F*-test results for each dependent variable (GPA, COSS, HPC, AAPC) were examined to determine if there was a significant relationship between pre-treatment anxiety and depression symptoms severity and each measure of academic performance. Finally, for any measure of academic performance that had a significant univariate *F*-test result, the statistical significance of individual predictor standardized regression weights for that dependent variable measure were examined.

To answer the second research question, a second multivariate multiple linear regression analysis was conducted in SPSS to determine if the severity of pre-treatment depression and/or anxiety symptoms in adolescents with ADHD moderated the impact of treatment on their academic functioning post-intervention. The BYI-A and RADS2-SF scores used to measure anxiety and depression symptom severity were mean-centered, and a 0,1-coding system was used for the dichotomous group assignment variable (control and treatment). This coding system was used for both the actual analyses and for use in creation of the multiplicative interaction term.

The univariate *F*-tests results for each measure of academic performance were examined to determine if there was a significant relationship between pre-treatment anxiety and depression symptoms severity and the measures of post-treatment academic performance. Finally, for any measure of post-treatment academic performance that had a statistically significant univariate *F*-test result, the statistical significance of individual predictor standardized regression weights for that dependent variable was examined.

The main effect of the severity of depression symptoms and anxiety symptoms was analyzed, along with the interaction effects of group assignment (treatment group or control group) by RADS2-SF and group assignment (treatment group or community care control group) by BAI-Y. Gender and parent education level were also included to control for the impact of those predictors. The criterion for these analyses was gain scores representing change from pre- to post-treatment on academic variables. This helped to determine if there was a significant interaction between varying levels of anxiety and depression symptoms severity and treatment group in predicting changes in academic functioning from pre- to post-treatment.

Chapter 4

Results

Due to multivariate regression requiring complete data, cases with missing data were removed from the data set. Before any analyses were conducted, the type of missing data was explored. For the first question, which utilizes the full dataset, 40 cases (24%) were removed, leaving 126 complete cases. For the second question, 61 cases were removed (37%), leaving 105 complete cases. There were a limited number of participants (3 participants) who formally withdrew from the study. However, many participants missed one or more data points (i.e., eligibility, baseline, or end of year) resulting in the aforementioned incomplete data.

Comparison of those participants with complete and incomplete data revealed no significant differences between the mean age of participants with complete data ($M = 15.32$; $SD = .85$) and participants who were removed for missing data ($M = 15.43$; $SD = .86$), ($t [167] = .43$, $p = .98$). No significant differences were found between participants with complete data and participants with missing data in terms of gender ($\chi^2[1] = .39$, $p = .53$). No significant differences were found between the percentage of participants from the treatment group with complete data relative to the percentage of participants with complete data from the control group ($\chi^2[1] = .78$, $p = .38$). There was a significant difference in medication use between participants with complete data and participants with missing data, ($\chi^2[1] = 7.48$, $p = .01$), such that there were more students receiving medication with complete data relative to those with missing data. There was a significant difference in missing data between the two site locations (i.e. Ohio or PA), ($\chi^2[1] = 7.13$, $p = .008$), such that more participants with complete data were from PA than Ohio. There was also a significant difference in race/ethnicity between participants with complete data and participants with missing data ($\chi^2[1] = 10.33$, $p < .00$), indicating there were more non-White

participants with missing data than with complete data. Participants who had complete data had slightly higher symptom severity (M hyperactivity-impulsivity = 9 and M inattention = 10) than those with missing data (M hyperactivity-impulsivity = 8 and M inattention = 9), although this difference was not statistically significant, for inattention symptom severity (t [169] = 1.47, p = .11) or for hyperactivity symptom severity (t [169] = .46, p = .55). Finally, chi-square tests for independence indicated no significant difference in parental education level between participants with complete data and participants with missing data (χ^2 [6] = 4.66, p = .46).

To ensure there were no statistically significant differences between participants who were included in both research questions (N = 105), and those who were only included in the first research question (N = 126), independent sample t -tests and chi square analyses were conducted. With respect to age (t [229] = -.23, p = .97), inattentive symptom severity (t [229] = .06, p = .94), and hyperactive-impulsive symptom severity (t [229] = -.03, p = .76), there were no significant differences between the sample of participants used in research question 1 and the sample of participants used in research question 2. Similar nonsignificant findings were obtained for gender (χ^2 [1] = .003, p = .95), race/ethnicity (χ^2 [1] = .66, p = .42), and medication use (χ^2 [1] = .54, p = .46). Finally, chi-square tests for independence indicated no significant differences between groups of participants for each research question regarding parental education level (χ^2 [6] = 2.41, p = .88).

Descriptive and demographic data for both the treatment and community care control groups were also examined to test possible between-group differences in participant age, gender, severity of ADHD symptoms, race/ethnicity, medication use, and parent education level (see Table 3). There were no statistically significant differences between the treatment and control groups in terms of age (t [124] = .62, p = .20), inattentive symptom severity (t [124] = -.38, p

=.89), or hyperactive-impulsive symptom severity $t [124] = -.66, p = .57$). Chi-square tests for independence indicated no significant differences between the treatment and control group regarding medication use ($\chi^2[1] = .46, p = .55$), parental education level ($\chi^2[6] = 6.60, p = .36$), gender ($\chi^2[1] = .002, p = .96$), or race/ethnicity ($\chi^2[1] = 2.76, p = .10$).

Preliminary analyses were conducted to examine the statistical assumptions of normality, and a correlation matrix was also calculated to explore intercorrelations among the variables (see Table 4). Estimates of skewness and kurtosis were used to determine if the assumption of normality was met, and the variance inflation factor (VIF) was used to examine the assumption of multicollinearity in SPSS using the full dataset. Variables in this model were checked for univariate normality and had skewness (range = $-.148$ to 1.081) and kurtosis (range $-.757$ to 1.328) values between -2 and $+2$, all within ranges recommended by Lomax (2001). The collinearity diagnostics were acceptable based on Studenmund's (2001) recommendation that only $VIF > 5$ would indicate a problem (Condition = 1.015 , BYI-A = 2.646 , RADS = 2.663).

A post hoc assessment of internal consistency of three of the academic performance measures (COSS, HPC, and AAPC) with this population was conducted. Internal consistency estimates were evaluated using Cronbach's alpha, yielding the following internal consistencies COSS ($\alpha = .79$); HPC ($\alpha = .93$); and AAPC ($\alpha = .95$), all in the acceptable range.

Hypothesis for Question 1: Depression and anxiety symptom severity will predict pre-treatment academic performance above and beyond predictive contributions of gender and parent education (i.e., established demographic predictors of academic performance).

Additionally, because depressive symptoms have been linked to more serious cognitive deficits, it was hypothesized that pre-treatment depression symptom severity would be a stronger predictor of academic performance deficits than pre-treatment anxiety symptom severity.

To test this hypothesis, a multiple multivariate regression analysis was conducted in SPSS, with all factors included in the model simultaneously. The combination of anxiety symptom severity (measured by the BYI-A), depression symptom severity (measured by the RADS2), gender, and parent education was significantly related to measures of academic performance (GPA, COSS, HPC, and AAPC) (Wilks' $\Lambda = .76, p = .01$). Subsequently, separate models for each outcome variable were examined. The full model explained a significant amount of variance in adolescent academic skills problems (measured by the AAPC) as rated by their parents ($R^2 = 10\%, p = .02$) (See Table 5). Gender was the only predictor variable with a significant regression weight for adolescent academic problems ($\beta = -.18, p = .04$), indicating male students had higher AAPC scores and were, rated to have more academic problems by their parents than female students (See Table 6). For the remaining outcomes, none of the regression models were statistically significant.

***Hypothesis for Question 2:** It was hypothesized that increased symptom severity of both depression and anxiety would predict smaller treatment-related gains through the BEST Project (i.e., there will be a negative regression weight associated with each of these predictors). Further, the interaction between depression symptom severity and group assignment (treatment vs. community care control group) as well as the interaction between anxiety symptom severity and group assignment would significantly predict academic performance outcomes at post-treatment.*

It was hypothesized that as the severity of depression symptoms increase, the beneficial impact of the BEST treatment protocol on academic performance would decrease. It was also hypothesized that participants with low levels of anxiety symptoms would benefit from their mild anxiety and experience more academic benefits from the BEST treatment protocol, that moderate

levels of anxiety symptoms would not impact the effects of the BEST treatment protocol, and high levels of anxiety symptoms would negatively impact the effects of the BEST treatment protocol on academic performance outcomes.

Finally, it was hypothesized that variables including depression symptoms (i.e., baseline depression symptom severity and interaction between depression symptom severity and group assignment) would be stronger predictors of academic performance outcomes than similar variables tapping anxiety symptoms.

To examine whether general level of pre-treatment anxiety symptom severity and depression symptom severity predict post-treatment academic performance, and moderate the relationship between the effects of the BEST treatment protocol and academic performance, a multiple multivariate regression analysis was conducted in SPSS with all factors included in the model simultaneously. Findings for the full regression model indicate that this set of predictors was significantly related to academic functioning (Wilks' $\Lambda = .68, p = .03$). Separate analyses for each academic outcome measure were conducted with the regression model for the amount of change in parent perceived homework problems (measured by changes in HPC) being the only model to achieve statistical significance. Anxiety and depression symptom severity explained a significant amount of variance in changes in homework problems from pre- to post-intervention as rated by parents ($R^2 = 15\%, p = .01$) (See Table 7). Holding constant all other predictors, group ($\beta = .22, p = .02$), the interaction between anxiety trait symptom severity (BYI-A score) and group ($\beta = .61, p < .00$), and the interaction between depression symptom severity (RADS2-SF score) and group ($\beta = -.37, p = .04$) were significantly related to changes in homework problems (See Table 8), suggesting that treatment-induced improvements in homework problems

for participants in the BEST intervention were moderated by pre-treatment internalizing symptom severity.

These interactions were then graphed to examine the specific nature of these interactions (see Figure 1). The predicted value for the change in HPC scores is displayed for three different levels of anxiety trait symptom severity ($-1SD$, M , $+1SD$), with separate lines for the treatment and control groups, each spanning the range of the data. Specifically, this graph shows that higher levels of trait anxiety were associated with more positive changes in HPC scores for treatment group participants but declines in HPC scores over time for the control group participants. Figure 2 depicts the predicted value for the change in HPC scores at three different levels of depression symptom severity ($-1SD$, M , $+1SD$), with separate lines for the treatment and control groups. Specifically, higher levels of depression symptoms were associated with worse HPC change scores over time for participants in the treatment group but not for participants in the control condition.

Additionally, Johnson-Neyman plots were derived in PROCESS to illustrate the confidence intervals around the conditional effect of group assignment (i.e., the difference between treatment or control, specifically) on changes in homework problems across different levels of pre-treatment internalizing symptom severity. The Johnson-Neyman plot in Figure 3 indicates that the conditional effect of group assignment (treatment or control) on improvements in homework problems is increasingly positive as pre-treatment anxiety trait symptom severity increases and is significantly greater than 0 when anxiety symptom severity is less than $BYI-A$ T-score = 34.05 (3 participants) and greater than $BYI-A$ T-score = 47.95, meaning parents of participants in the BEST treatment group with higher levels of anxiety symptoms reported significantly greater improvement in homework problems than parents of participants with

higher levels of anxiety in the control group. Only three participants' T-scores were lower than the lower boundary of the region of statistical significance accounting for less than 3% of the sample, therefore it was not interpreted further (Hayes, 2017).

The Johnson-Neyman plot in Figure 4 indicates that the conditional effect of group assignment (treatment or control) on improvements in homework problems is increasingly negative as depression symptom severity scores increase and is significantly different from 0 when depression symptom severity is RADS2-SF T-score = 50.03 or less, meaning for youth with lower levels of depression symptoms, parents of those participants in the BEST treatment group reported significantly greater improvement in homework problems than parents of those participants in the control group, and this effect is less positive as depression symptom severity increases.

Further, the upper and lower bounds of the regions of significance were manually added to the graphs as vertical dashed lines based on the respective Johnson-Neyman results (See Figures 1 and 2). These lines mark the internalizing symptoms severity T-scores where the moderation of anxiety or depression by condition on improvement in changes in homework problems becomes statistically significant. These lines display the approximate boundaries of the Johnson-Neyman region of non-significance, such that for depression, RADS2-SF T-scores below the lower bounds indicate a significant difference between treatment and control participants' improvement in homework problems. For anxiety, BYI-A T-scores above the upper bounds indicate a significant difference between treatment and control participants' improvement in homework problems.

Chapter 5: Discussion

Does Pre-Treatment Internalizing Symptom Severity Predict Academic Performance?

It was hypothesized that pre-treatment depression and anxiety symptom severity would predict pre-treatment academic performance in high school students with ADHD. The overall regression model was statistically significant and accounted for about 10% of the variance in academic performance, suggesting a small effect size (Tabachnick & Fidell, 2007). Neither anxiety nor depression symptom severity predicted pre-treatment academic performance on any of the included measures (COSS, HPC, AAPC, or GPA). Gender did significantly predict academic problems measured by the AAPC, with males rated by their parents to have more academic problems compared to parental ratings of females' academic problems. This finding is consistent with previous literature that suggests males and females with ADHD often display different symptom profiles, with males presenting with more externalizing and disruptive behaviors than females (Birchwood & Daley, 2012; Kuriyan et al., 2013; Merikangas, He, Brody, Fisher, Bourdon, & Koretz, 2010; Ohan & Visser, 2009; Quinn & Madhoo, 2014; Soffer, Mautone, & Power, 2007). This finding, that parents rated males with ADHD as having more academic problems, is supported by the literature that reports increased rates of ADHD and externalizing problems among males (Eme, 2017). There is also a well-documented literature suggesting a higher prevalence rate of ADHD among males (Eme, 2017; Gershon, 2002; Merikangas et al., 2010; Rucklidge, 2008).

Parental attitudes and perceptions about ADHD vary based on children's gender (Merikangas et al., 2010; Quinn & Madhoo, 2014). Parents and teachers often overlook females' symptoms of ADHD, while males are more likely to be referred for intervention (Coles, Slavec, Bernstein, & Baroni, 2012; Quinn & Madhoo, 2014; Soffer, Mautone, & Power, 2007). These

gender differences may be due to the fact that females with ADHD may develop better coping strategies than their male counterparts, that can hide the impact of their ADHD symptoms (Soffer, Mautone, & Power, 2007). For example, Ohan and Visser (2009) found that when teachers and parents read vignettes about students with ADHD, they were more likely to suggest that students should be referred support services when the student was a male.

The finding that parents rate male children as having more academic problems, as rated on the AAPC, makes sense given the literature. The AAPC provides parent perceptions of behaviors related to academic problems, and this finding suggests that parents are observing males' disruptive, noncompliant, or externalizing behaviors associated with academic difficulties.

Meta-analyses of youth with ADHD also suggest gender differences in academic outcomes. Gershon (2002) found that teachers often rate males as more significantly impaired than females, which may be due to males displaying frequent disruptive behaviors that teachers may pay more attention to more than females' inattentive behaviors. Rucklidge (2008) also found that males exhibit more hyperactive and impulsive behaviors both socially, and in the classroom. Rucklidge's findings suggest that males more often blurt out answers to questions and are more hyperactive and physical in the classroom and display more aggressive behaviors with their peers.

In similar fashion, Kent et al. (2011) found that male high school students experienced significant academic impairment compared to their non-ADHD peers. High school males with ADHD often obtain lower grades, demonstrate higher rates of course failure, exhibit lower rates of work completion, and that teachers viewed them to work below their potential. Further, while comparable on measures of aptitude, males with ADHD had lower grade point averages (Kent et

al., 2011) This sample of male students with ADHD, from Kent et al., was also found to have higher rates of absenteeism and to drop out from high school. It is interesting to note, the same authors also analyzed the impact of ADHD for high school females, and found that when controlling for IQ, there were not significant differences on academic performance between females with and without ADHD (Babinski et al., 2011).

Next, because depressive symptoms have been linked to more serious cognitive deficits, it was hypothesized that pre-treatment depression symptom severity would be a stronger predictor of academic performance deficits than pre-treatment anxiety symptom severity. Internalizing symptom severity was not a statistically significant predictor of academic problems. Perhaps pre-treatment anxiety and depression did not predict pre-treatment academic functioning because a large portion of the participants in the sample had average to mildly elevated levels of internalizing symptom severity, and these lower levels of anxiety (as a trait) or depression symptoms may not significantly impact student's academic functioning pre-intervention. There is literature to suggest that subclinical levels of the internalizing disorders do not cause the same level of impairment as clinically significant symptoms (Beesdo, Knappe, & Pine, 2009; Keyes, Eisenberg, Perry, Dube, Kroenke, & Dhingra, 2012; Snyder, 2013; Tandon, Cardeli, & 2009).

Does Pre-Treatment Internalizing Symptom Severity Moderate the Academic Benefits of the BEST Intervention?

The overall model for changes in homework problems, as measured by the HPC, was statistically significant and accounted for 15.2% of the variance, indicating a small effect (Tabachnick & Fidell, 2007). It was predicted that greater internalizing symptom severity would lead to smaller treatment gains; however, the opposite was found to be true for anxiety trait symptom severity. Higher levels of pre-treatment anxiety led to greater treatment gains, perhaps

suggesting that anxiety symptoms can serve as a protective factor for students exposed to a highly structured academic and social intervention.

This finding is supported by previous literature suggesting general anxiety trait symptoms can serve as a protective factor, increasing effort and motivation to avoid negative performance or evaluation and decreasing impulsive and reactive behaviors commonly associated with ADHD (Becker et al., 2012; Bloemsma et al., 2013; Hammerness et al., 2010; Humphreys et al., 2013; Jensens et al., 2001; Linnenbrink & Pintrich, 2009; Shatz & Rostain, 2006). More specifically, Owens et al. (2012a, 2012b) propose that anxiety is only a protective factor for youth with ADHD when they also have strong working memory skills. It is possible that the BEST intervention helped support any weaknesses in working memory, through improving the organizational and problem-solving skills of students, and allowed the motivational aspects of their anxiety to serve as a contributing factor that helped increase their academic performance.

Additionally, the BEST intervention could have supported this unique population of students by helping them overcome anxious avoidance of academic tasks through direct exposure to academic tasks and social interventions in coaching sessions and social skills groups. Prior studies of Skills for Academic and Social Success intervention implemented in educational contexts, found that direct instruction in CBT and problem-solving skills with in vivo exposures decreased social anxiety symptoms (Masia Warner, Fisher, ShROUT, Rathor, & Klein, 2007; Neil, & Christensen, 2009). Perhaps, the components of the BEST intervention provided the necessary structure, accountability, exposures, and working memory supports to address cognitive deficits associated with ADHD and anxiety while also decreasing anxious avoidance for students such that anxiety-induced motivation served as a protective factor.

For depression symptom severity, the original hypothesis was supported as higher symptom severity led to smaller treatment gains. This finding is consistent with previous literature demonstrating that depression is associated with poor academic performance (Blackman et al., 2005; Bruffaerts, Mortier, Kiekens, Auerbach, Cuijpers, Demyttenaere, Green, Nock, & Kessler, 2018; Carrier, 2013; Deighton, Humphrey, Belsky, Boehnke, Vostanis, & Patalay, 2017; Fröjd, Nissinen, Pelkonen, Marttunen, Koivisto, & Kaltiala-Heino, 2008). Many of the core symptoms of depression (e.g., difficulty concentrating, apathy, psychomotor retardation, low self-esteem, and feelings of worthlessness) can negatively impact academic performance (Biederman et al., 2008; Fröjd et al., 2008). Further, emotional distress can hinder academic performance by changing the cognitive functions related to learning (Deighton et al., 2017; Moilanen et al., 2010).

Even in the context of an academic and social intervention, the finding that students with higher levels of depression continue to display academic problems is not surprising. There is some empirical support to suggest that continued academic failures and negative feedback may exacerbate the cognitive deficits associated with depression (Beck, 1967; Daviss, 2008; Fröjd et al., 2008; March et al., 2000), and some research has suggested repeated academic difficulties may lead to negative self-concept, feelings of learned helplessness, and avoidance (Eadeh et al., 2017). It is possible that depressive symptoms impact cognitive functioning, negatively affecting academic performance, and the inability to fulfill academic standards and continued negative feedback may exacerbate depressive cognitions (Bandura, Pastorelli, Barbaranelli, & Caprara, 1999; Deighton et al., 2017; Fröjd et al., 2008). Perhaps, for students with more severe symptoms of depression who were not meeting academic goals, the frequent feedback from academic coaches and parents (as a part of the BEST intervention) exacerbated their depressive symptoms,

and in turn negatively impacted their homework performance. It could be that negative interactions with parents around homework management plans is more pronounced for youth with higher levels of depressive symptoms.

The interactions between group (treatment or community care control) and anxiety symptom severity ($\beta = .60$) and depression symptom severity ($\beta = -.37$) both significantly predicted homework performance and were associated with medium effect sizes (Tabachnick & Fidell, 2007). It also is interesting to note that the interaction with anxiety symptom severity was almost twice as impactful as the interaction with depression symptoms. Specifically, these interactions predicted improvements in homework performance but no other aspects of academic function. Perhaps this is because homework is often completed at home, where parents can directly observe changes in homework performance, whereas the COSS and AAPC measure more general behaviors related to academic functioning and organization that parents may not observe directly. Further, previous research on similar academic interventions did not find benefits for GPA until the following school year (Evans, Schultz, DeMars, & Davis, 2011; Langberg, Epstein, Urbanowicz, Simon, & Graham, 2008; Langberg, Epstein, Girio-Herrera, Becker, Vaughn, & Altaye, 2011; Langberg et al., 2012). Potentially, improvements in homework-related behaviors may positively impact GPA in the next school year, once students are consistently initiating and completing homework throughout the duration of the entire school year. Additionally, the limited power of this study may not have detected statistically significant changes in GPA or parent's reports of academic and organizational problems.

As predicted, when depression symptom severity increased, the impact of the intervention on academic performance decreased, and participants demonstrated less improvement on homework as rated by their parents. Additionally, the Johnson-Neyman region

of significance shows that this relationship is significant for participants whose RADS2 T-scores are below a T-score of 50, meaning the difference between treatment and control groups is significant for youth with T-scores below the mean (50).

It was predicted that mild anxiety symptoms would lead to greater impact from the intervention, moderate anxiety would not impact the outcomes, and high levels of anxiety would lead to low impact from the intervention. For the treatment participants, higher levels of anxiety symptoms lead to more treatment gains and a greater improvement in homework problems. Looking at the Johnson-Neyman regions of significance, this relationship is significant for participants with BYI-A T-scores of 34.48 or below and 47.90 and higher. For the participants in the community care control group, the hypothesized relationship was found, with more anxiety leading to poorer academic performance and more homework problems. Finally, depression was hypothesized to be a stronger predictor of academic outcomes than anxiety. Once again, this hypothesis was not supported, and anxiety was found to be a stronger predictor (BYI-A $\beta = -.38$; BYI-A x group $\beta = .61$) than depression (RADS $\beta = .32$; RADS x group $\beta = -.37$) of reductions in homework problems, especially for participants in the treatment group (with medium effect sizes) (Tabachnick & Fidell, 2007).

Consistent with previously established research, depressive symptoms can negatively impact academic outcomes and weaken the academic benefits of this intervention. Consistent with the findings of Jensen et al. (2001), anxiety comorbid with ADHD may have minimal effects on baseline functioning, but could more substantially impact students' response to treatment. Alternatively, it is also possible that anxiety, within the context of a structured multicomponent intervention that provides targeted academic, organizational, problem solving

and social skills interventions, providing working memory support and direct exposures to academic and social tasks, could serve as a protective factor for high schoolers.

Consistent with previous studies analyzing academic, organizational, or multicomponent interventions, students in the BEST intervention benefitted from direct skills instruction and increased structure in the home during homework time, and as depressive symptom severity increased, benefits from the intervention decreased. Surprisingly, for students in the BEST intervention, increasing anxiety symptom severity positively impacted their homework performance leading to larger improvements in homework problems as rated by their parents. This latter response to the intervention was different than expected, especially given the findings from Jensen et al. (2001) that students with ADHD and comorbid anxiety did not make significant treatment gains on academic measures. It is possible that the improvement in homework problems, as rated by parents, is reflecting more immediate behavioral improvements, easily observable by parents, than other more distal academic measures (i.e. GPA).

The finding that the interaction of the BEST intervention with internalizing symptom severity predicted improvements in homework problems but no other academic measures is consistent with several previous studies on multicomponent interventions for youth with ADHD. Helping parents to structure the home environment and routine around homework time has been shown to decrease homework problems and increase homework accuracy and completion rates (Axelrod et al., 2009; Langberg et al., 2012; Raggi & Chronis, 2006). More specifically, creation of a systematic homework routine has been shown to impact HPC ratings completed by teachers (Power et al., 2012) and the inclusion of self-management strategies increased on-task behaviors and homework completion (Axelrod et al., 2009).

Consistent with findings from the CHP intervention (Evans et al., 2007; Evans et al., 2014), moderate effect sizes were found for parent ratings; however, an important difference is that the CHP program was shown to impact parent ratings of academic functioning, not specifically homework problems. Similar to the present findings, the CHP was not found to significantly improve organizational skills, academic skills, or directly impact GPA. The CHP has shown promise as an intervention to potentially impact GPA; however, few significant distal academic benefits have been found (Evans et al., 2004; Evans et al., 2007; Evans et al., 2014). The trend toward improvement in GPA that has previously been observed in several studies analyzing the impact of the CHP program was not replicated here; however, an important distinction is that the trend toward improvement in GPA was found into the following school year.

This study found a significant impact of intervention on parent reported measures of homework problems which is consistent with findings from Langberg et al. (2012) who found direct homework and organizational skills training improved students homework completion. Alternatively, this study did not find that treatment effects on organizational skills or grades were moderated by internalizing symptom severity as has been found for the HOPS program.

Implications for Practice

Although homework problems were the only outcome significantly moderated in this study, it is possible that more distal measures of academic achievement, such as GPA, could be moderated by internalizing symptom severity if the sample size were larger. Research conducted with over 13,000 students indicated that homework completion impacts students' GPA (Keith, Diamond-Hallam, & Fine, 2004). Research has also demonstrated that the amount of homework

completed and frequency of homework completion positively impact academic achievement, including GPA (Maltese, Tai, & Fan, 2012; Trautwein, 2007).

Further, the HPC measured behaviors related to homework problems, which if decreased could positively impact parent child interactions. Given this literature, the protective nature of anxiety symptoms should be assessed and taken into consideration when planning intervention for youth with ADHD. Thus, the BEST intervention should be considered when designing treatments and interventions for youth with ADHD with moderate to severe anxiety symptoms.

If anxiety may serve as a protective factor when high school students with ADHD are provided structured support for academic, organizational, and social skills at home and school, it will be important to screen students with ADHD to identify students who have comorbid anxiety and/ or depression to provide targeted interventions. This research demonstrates that elevated levels of anxiety could enhance response to a structured training intervention. These findings may be particularly relevant for special education students with comorbid ADHD and above-average levels of anxiety. Providing interventions targeting the cognitive deficits commonly associated with anxiety and ADHD as well as providing supports to decrease avoidant behaviors, may help students with comorbid ADHD and anxiety improve their academic functioning.

Additionally, anxiety and depression symptom severity could potentially be used as a possible decision point for inclusion in multicomponent academic and social interventions. When implementing programs like the BEST intervention, it could be important to screen for student anxiety and depression levels to help decide who would optimally benefit from the intervention, in terms of homework performance, and who would benefit from an additional referral to a psychologist or psychologist. This study suggests that students with self-reported anxiety may experience more improvement on homework performance than those students below the

population median, and students with self-reported depressive symptoms below the population median have more improvement on homework performance. This finding provides more evidence that students with ADHD and comorbid depression may need additional supports and interventions to address their depressive symptoms before they can optimally benefit from academically targeted interventions. Given the well documented need for school-based interventions (DuPaul et al., 2012; Evans et al., 2007; Langberg, et al., 2012; Loe & Feldman, 2007; Miranda et al., 2006) and often limited budgets and staff (Backer, Sciarra, & Farrier, 2014; Baker, & Carcoran, 2012; Ladson-Billings, 2006; Spatig-Amerikaner, 2012), this is an important finding that can help educators determine which students would benefit from a potentially costly intervention.

Implication for Future Research

Future research should initially focus on replicating these findings. Replication studies should aim to use a larger more representative sample. It would also be beneficial to further investigate the findings from this study using teacher measures of academic outcomes. Although parent reports were able to reflect changes in homework problems, teacher report measures may more accurately capture proximal academic functioning in the classroom and student organizational skills that were not detected by parent reports. With a larger sample size and use of teacher measures, potential moderation of AAPC, COSS, and GPA may be detected and future research should strive to additionally investigate the long-term benefits of this intervention. Further research is also needed to explore the types of changes in homework problems that are predicted by the interaction of treatment and internalizing symptom severity, such as completion of homework, time it takes to complete homework, oppositional behaviors at homework time, or changes in parent child interactions.

It will also be important to investigate the impact of the BEST intervention on anxiety and depression symptom severity. It is possible that anxiety serves as a protective factor when the cognitive deficits and avoidance associated with anxiety are decreased. This hypothesis should be evaluated and the relationship between academic progress and internalizing symptoms should be investigated. Anxiety symptom severity could be monitored through the course of intervention, and specific behaviors related to avoidance of academic tasks could be recorded. Further research should also seek to understand the degree to which ADHD comorbid with both anxiety disorder and depression symptoms have on outcomes of the BEST intervention. Previous research on comorbidity suggest that youth with primary anxiety and comorbid depression function differently than youth with primary depression comorbid with anxiety (Cummings et al., 2014; Garber & Weersing, 2010). Cummings et al. found that youth with the addition of depression to primary anxiety disorder had worse outcomes than youth with anxiety disorder alone; however, no impact was found for the addition of comorbid anxiety disorder for youth with depression, again suggesting that depression may be more detrimental to youth's functioning than anxiety. Therefore, the impact of internalizing symptom severity may depend on the student's unique symptom profile.

It would be important to investigate the relationship between anxiety symptom severity, avoidance and academic performance before, during, and after intervention, to determine if the intervention impacts avoidant behaviors and if a reduction in avoidant behaviors impacts academic performance. Additionally, it is believed that level of motivation may serve an important role in how anxiety can serve as a protective factor. Measures of motivation, for both adolescents and their parents, should be included in future research that explores how motivation impacts treatment outcomes. Previous research suggests that dual interventions, targeting both

academic performance and internalizing symptoms, could have reciprocal benefits and more research is needed to understand the impact of such interventions on key areas of functioning for adolescents, and to investigate the relationship of internalizing symptoms severity and motivation (Masia Warner, Fisher, Shrout, Rathor, & Klein, 2007; Neil, & Christensen 2009; Pekrun et al., 2017; Wegmann, Powers, Swick, & Watkins, 2017).

Furthermore, it is important to investigate the efficacy of the different components of the BEST intervention. Future studies should seek to answer whether parts of the intervention are more effective for students with ADHD and comorbid internalizing symptoms. It could be possible that different parts of the intervention may be more impactful for students with anxiety or depression, or at different levels of symptom severity. Perhaps academic coaching and homework management plans are beneficial for youth with ADHD and anxiety, while interpersonal skills training could be helpful for youth with depressive symptoms. Future research should also explore the preventative benefits of this intervention. Future research is needed to determine if the intervention package, or components of the intervention, could function as preventative measures for students with ADHD and/or internalizing symptoms, preventing students with ADHD from developing more severe internalizing disorders.

Lastly, future researchers should utilize Johnson-Neyman plots when investigating moderation of treatment effects. This technique is practically beneficial and can provide specific guidance on implementation. The Johnson-Neyman plots provide the regions of statistical significance and non-significance and can indicate under what conditions moderation effect is statistically significant. For example, in this study, these results can guide educators and practitioners to understand the anxiety symptom severity that is associated with a statistically significant positive effect on changes in homework problems, and at what level of depression

symptom severity the effect is less positive as well as the level where this trend becomes non-significant.

Limitations

These findings should be interpreted and utilized with several limitations in mind. Most importantly, the sample size used in both research questions was small and did not meet suggested sample size from the *a priori* power analysis. This limitation could impact the power of the analyses to detect statistically significant relationships. Additionally, medication status between pre-treatment and post-treatment was not controlled for, and changes in medications or dosage could have impacted these findings. Changes in ADHD medication status or dosage, or the addition or change in medication for anxiety disorder and depression could potentially alter symptom severity or expression and thus impact the moderation findings of this study.

Next, the COSS was not normed for high school students and may not accurately capture the organizational skills and needs of high school students. Alternatively, this measure has been used by Evans and Langberg with adolescent samples (Evans, Langberg, Schultz, Vaughn, Altaye, Marshall, & Zoromski, 2016; Langberg et al., 2012; Langberg, Dvorsky, & Evans, 2013). It is also important to note the limitations of using change scores (i.e., changes in academic measures from pre-intervention to post-intervention), which do not allow researchers to examine students' performance level at post-treatment. Thus, conclusions cannot be drawn about whether students' improvements in homework problems occurred at different levels of initiation or completion.

The demographic characteristics of the participants could limit the generalizability of this study. There is limited racial and ethnic diversity among the participants, and the sample included more male than female participants; however, this gender ratio is typical and expected

for studies of youth with ADHD (Arnett, Pennington, Willcutt, DeFries, & Olson, 2015; Ramtekkar, Reiersen, Todorov, & Todd, 2010). Although the students who participated are relatively representative of the school populations they were sampled from, the students were mostly recruited from suburban schools in Pennsylvania and Ohio, which limits the generalizability of these findings to other students in other settings and geographic locations.

Finally, it is important to note there were differences in medication use, race/ethnicity, and site location between those participants with missing data and those with complete data. There were more non-White participants with missing data than with complete data. Participants with missing data also reported less medication use than the participants who had complete data, possibly indicating that participants with severe symptoms of ADHD that warranted medication were more likely to continue participating throughout the duration of the study. Further, there were significantly more participants with missing data from Ohio than from PA. Participants who were adherent with medication use and completed all data collection points may also have been more likely to follow through with recommendations made within the BEST intervention. These differences could have possibly impacted the findings from this specific study, with the included participants being more likely to adhere to recommendations and follow through on different components of the intervention.

Conclusions

The findings from this study suggest that internalizing symptom severity does not predict pre-treatment academic performance but does moderate the academic benefits associated with the BEST intervention. Gender predicted pre-treatment academic problems, with males with ADHD rated by their parents as having more academic problems than their female peers. Overall, initial findings suggest that youth with ADHD and average to above average levels of

anxiety who are exposed to the BEST intervention may experience greater improvement in homework problems, suggesting anxiety may potentially serve as a protective factor in the context of a structured academic and social intervention. Alternatively, youth with depressive symptoms may not benefit as greatly from such interventions, as youth with more depressive symptoms exposed to the BEST treatment demonstrated less improved homework problems than those with lesser depressive symptoms. Replication of these findings with a larger more diverse sample is needed. Finally, more research is needed to explore the relationship between internalizing symptoms and academic benefits from the BEST intervention components, and if there is a reciprocal benefit between internalizing symptom reduction and academic gains.

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Table 1
Participating School Demographic Information

	Region	Racial and Ethnic Demographics	Percent of students who qualify for free/reduced lunch
Ohio High Schools			
1	Rural Appalachian	97% White, 1% Hispanic, 1% African American, and 1% Asian	64% of students
2 ^a	Urban	68% White, 13% Hispanic, 12% African American, 4% multi-racial, 2% Asian	59% of students
Pennsylvania High Schools			
3	Suburban	85% White, 5% Hispanic, 5% African American, and 5% Asian.	9% of students
4	Small town, Suburban	91% White, 2.7% African American, 3.5% Hispanic, and 1.7% Asian	15.3% of students
5	Suburban	61% White, 23% Hispanic, 8% African American, and 5% Asian	40.5% of students
6	Large town	91% White, 3% Hispanic, 3% African American, and 2% Asian	13% of students
7	Small city, Urban	57% White, 18% Hispanic, 19% African American, and 5% Asian	42% of students
8	Suburban	76% White, % Hispanic, 5% African American, and 5% Asian	18% of students

Note. Data retrieved from U.S. Department of Education, National Center for Education Statistics, 2015.

^a Four high schools make up district 2.

Table 2

Independent and Dependent Measures

Independent Measures	Dependent Measures
1. BYI-A self-report total T- score: measure of anxiety symptom severity. Higher scores indicate higher anxiety symptom severity	1. GPA: student grades for English, Math, History and Science on a 4-point scale ranging from 0.00 to 4.00, where F=0.0 and A=4.0.
2. RADS2-SF self-report total T- score: measure of depression symptom severity. Higher scores indicate higher depression symptoms severity	2. COSS total T-score: parent reported measure of student organizational skills. Higher scores indicate more organizational, planning, and time management problems.
	3. HPC total raw score: parent reported measure of homework problems, where higher scores indicate more problems with homework completion and materials management.
	4. AAPC total raw score: parent reported measure of academic problems, higher scores indicate more academic problems.

Note. BYI-A = Beck Youth Inventory - Anxiety. RADS2-SF = Reynolds Adolescent Depression Scale, Second Edition – Short Form. GPA = Grade Point Average. COSS = Children’s Organizational Skills Scale. HPC = Homework Problems Checklist. AAPC = Adolescent Academic Problems Checklist.

Table 3
Descriptive and Demographic Data for the Full Data Set

Variable	Treatment	Control
<i>N</i>	68 (54%)	58 (46%)
Mean age	15.2 years old (<i>SD</i> = .79)	15.3 years old (<i>SD</i> = .94)
Gender	males <i>n</i> = 53 (78%) females <i>n</i> = 15 (22%)	males <i>n</i> = 45 (78%) females <i>n</i> = 13 (22%)
Medication use	Yes <i>n</i> = 27 (40%), No <i>n</i> = 37 (60%)	Yes <i>n</i> = 28 (48%) No <i>n</i> = 30 (52%)
Race	White <i>n</i> = 52 (76%) Nonwhite <i>n</i> = 16 (24%)	White <i>n</i> = 51 (88%) Nonwhite <i>n</i> = 7 (12%)
Inattention symptom severity	<i>M</i> = 9.76 (<i>SD</i> = 3.13)	<i>M</i> = 9.98 (<i>SD</i> = 3.39)
Hyperactivity symptom severity	<i>M</i> = 8.32 (<i>SD</i> = 4.21)	<i>M</i> = 8.81 (<i>SD</i> = 3.94)
Anxiety symptom severity	<i>M</i> = 48.9 (<i>SD</i> = 8.93)	<i>M</i> = 49.00 (<i>SD</i> = 11.05)
Depression symptom severity	<i>M</i> = 48 (<i>SD</i> = 8.06)	<i>M</i> = 49.57 (<i>SD</i> = 11.67)
Parent education	Less than 9 th = 0 (0%) Partial High School = 3 (4%) High School = 13 (19%) Some College = 17 (25%) Associates Degree = 14 (21%) Bachelors = 13 (19%) Master's/Doctoral = 8 (12%)	Less than 9 th = 2 (3%) Partial High School = 1 (2%) High School = 5 (9%) Some College = 15 (26%) Associates Degree = 11 (19%) Bachelors = 16 (27%) Master's/Doctoral = 8 (14%)

Table 4
Correlation Matrix

Variable	1	2	3	4	5	6	7	8	9
1. condition	---								
2. Gender	-.001	---							
3. Parent Education	-.09	-.05	---						
4. BYIA	-.01	.05	.22*	---					
5. RADS2-SF	-.08	.08	.16	.78**	---				
6. GPA	.01	.04	.11	-.07	-.09	---			
7. COSS	.06	.14	-.11	.116	.07	-.02	---		
8. AAPC	-.01	-.18*	.02	.18*	.18*	-.25**	.49**	---	
9. HPC	.06	-.10	-.04	.20*	.23*	-.14	.47**	.66**	---
Skewness	---	---	-.237	1.084	.805	-.148	.213	.145	.148
Kurtosis	---	---	.216	1.328	-.463	-.628	-.147	-.075	-.757

Note. BYI-A = Beck Youth Inventory - Anxiety. RADS2-SF = Reynolds Adolescent Depression Scale, Second Edition – Short Form. GPA = Grade Point Average. COSS = Children’s Organizational Skills Scale. AAPC = Adolescent Academic Problems Checklist. HPC = Homework Problems Checklist. Skewness and kurtosis values were not calculated for the dichotomous gender or condition variables.

** $p < .01$

* $p < .05$

Table 5
Within Cells Regression (Univariate F Tests) for Question 1

Variable	R^2	Adj. R^2	F	Sig.
GPA	.02	.00	.76	.56
COSS	.04	.01	1.21	.31
AAPC	.10	.07	3.20*	.02
HPC	.10	.04	2.19	.07

Note. GPA = Grade Point Average. COSS = Children's Organizational Skills Scale. AAPC = Adolescent Academic Problems Checklist. HPC = Homework Problems Checklist.

** $p < .01$

* $p < .05$

Table 6

Regression Analyses for Within Cells Error Term (Individual Univariate) for the AAPC

Covariate	B	β	SE	t-value	Significance
BYI-A	.10	.10	.15	.69	.49
RADS2	.12	.11	.15	.80	.43
Gender	-4.64	-.18	2.19	-2.11*	.04
Parent education level	1.10	.15	.64	1.73	.09

Note. AAPC = Adolescent Academic Problems Checklist. GPA = Grade Point Average. COSS = Children's Organizational Skills Scale. HPC = Homework Problems Checklist.

** $p < .01$

* $p < .05$

Table 7
Within Cells Regression (Univariate F Tests), Question 2

Variable	R^2	Adj. R^2	F	Sig.
GPA	.09	.03	1.58	.16
COSS	.03	.00	.46	.84
HPC	.15	.10	2.94*	.01
AAPC	.07	.01	1.18	.33

Note. GPA = Grade Point Average. COSS = Children's Organizational Skills Scale. HPC = Homework Problems Checklist. AAPC = Adolescent Academic Problems Checklist.

** $p < .01$

* $p < .05$

Table 8

Regression Analyses for Within Cells Error Term (individual univariate) for the HPC

Covariate	B	β	SE	t-value	Significance
BYI-A	-.48	-.38	.27	-1.75	.08
RADS2-SF	.40	.32	.26	1.56	.12
BYI-A x Condition	1.19	.61	.38	3.16**	.00
RADS2-SF x Condition	-.80	-.37	.39	-2.05*	.04
Condition	5.55	.22	2.32	2.39*	.02
Gender	-1.90	-.06	2.83	-.67	.50
Parent education level	-.03	-.00	.86	-.03	.96

Note. BYI-A = Beck Youth Inventory - Anxiety. RADS2-SF = Reynolds Adolescent Depression Scale, Second Edition – Short Form. GPA = Grade Point Average. COSS = Children’s Organizational Skills Scale. AAPC = Adolescent Academic Problems Checklist. HPC = Homework Problems Checklist.

** $p < .01$

* $p < .05$

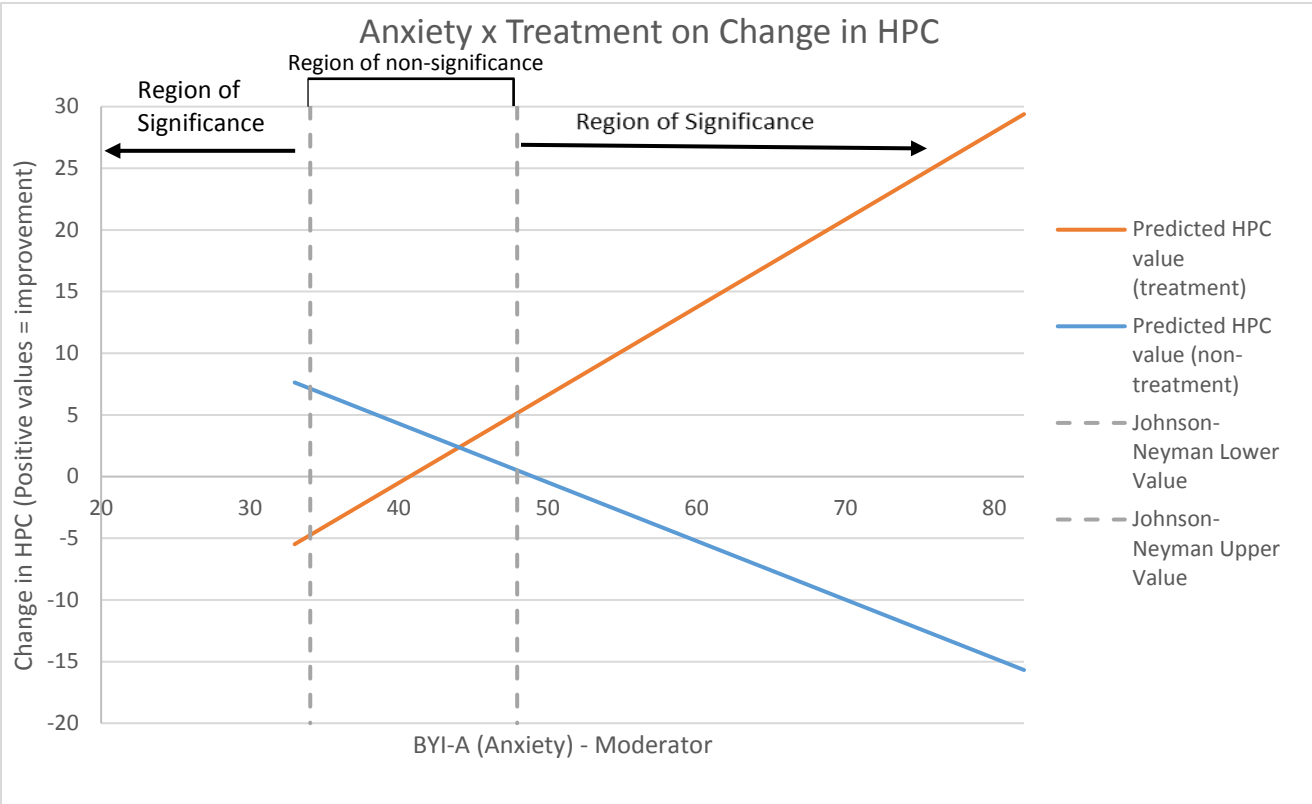


Figure 1. Interaction between Anxiety Symptom Severity and Condition on Change in HPC

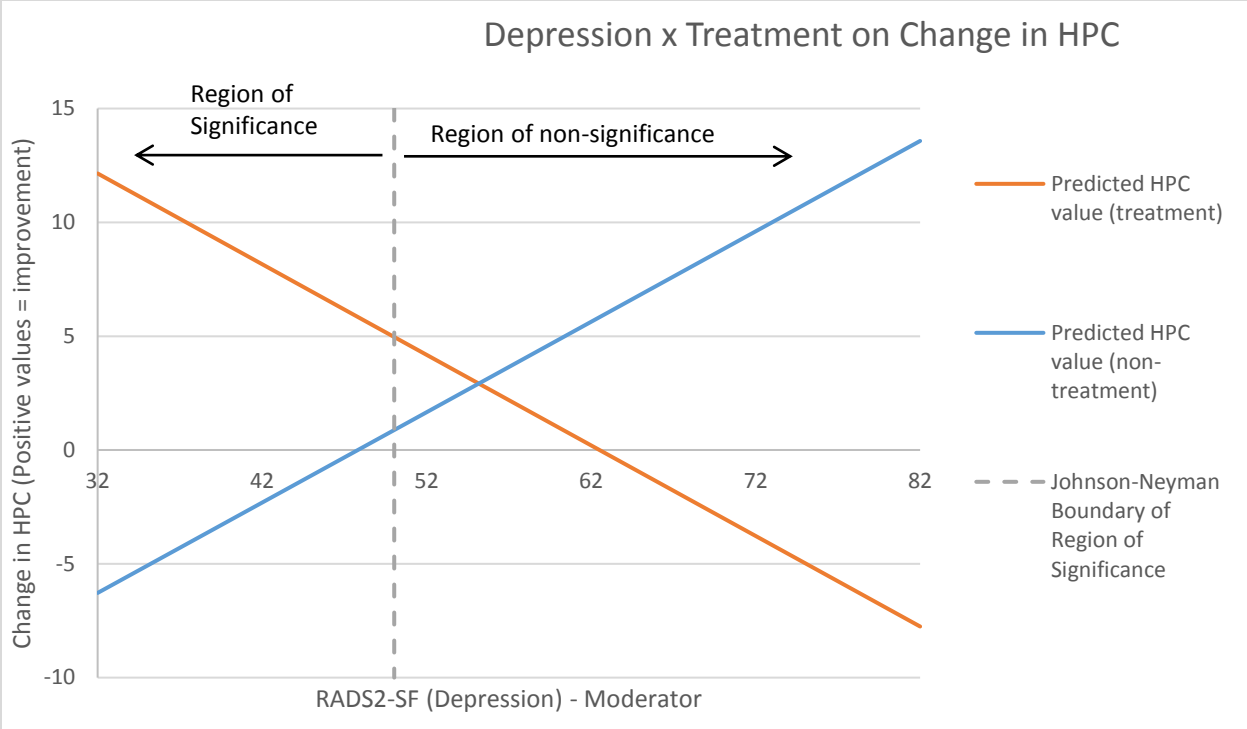


Figure 2. Interaction between Depression Symptom Severity and Condition on Change in HPC

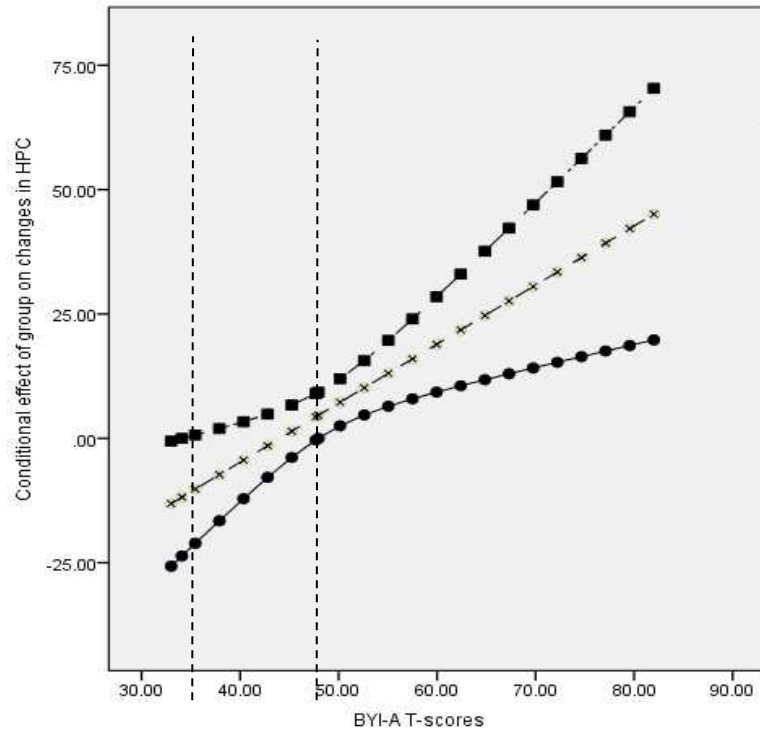


Figure 3. Johnson-Neyman Plot for Anxiety Symptom Severity

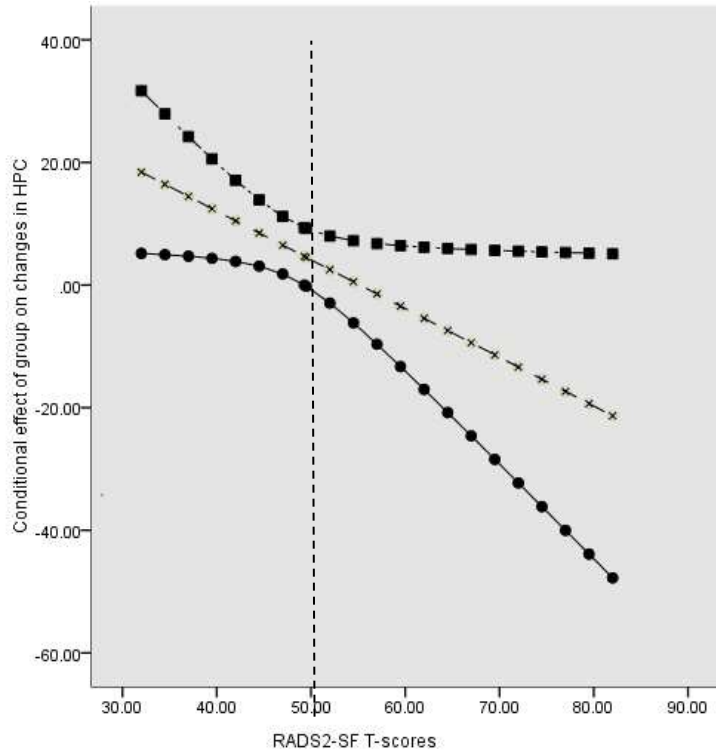


Figure 4. Johnson-Neyman Plot for Depression Symptom Severity

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EDUCATION

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RELATED EMPLOYMENT

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- Conduct inpatient consultations with pediatric oncologists, neurologists, intensive care specialists, endocrinologists, pulmonologists, gastroenterologists, nephrologists and other medical providers in the Janet Weis Children's Hospital.
- Provide emergency psychiatric assessment and triage services for suicidal or aggressive patients in the Emergency Department. Additionally, provide support for family crises, understanding contributions of medical conditions and substances on acute symptoms, and coordination of follow up care including psychiatric admission.
- Function as a member of specialty multidisciplinary teams within the hospital, including Pediatric Hematology/Oncology, Neurology, and Cystic Fibrosis Clinic.
- Assess and treat behavioral and emotional problems, such as depression, anxiety, suicidal ideation, school refusal, selective mutism, ADHD, ODD, Tic Disorders, sleep problems, adherence concerns, PTSD, adjustment to medical illness, somatization, chronic pain and headaches in children and adolescents (ages 1-18 years old) in the Pediatric Psychology Outpatient Clinic. Participate in individual, family, and group psychotherapy, carrying a full caseload of outpatient clients, utilizing evidence-based treatments (e.g. CBT, MI, ACT, behavior modification).

- Function in a newly integrated pediatric primary care office, conducting warm handoffs, assessments, interventions, and consultations with primary care staff.
- Participate in Anxiety Disorders clinic, evaluating new patients and using comprehensive evidence-based intervention strategies (e.g. Coping Cat), exposure, and response prevention.
- Deliver evidence-based group treatments. Engage in behavioral parent training and children's problem-solving skills training for school-age children with ADHD and/or disruptive behavior disorders. Provide Parent-Child Interaction (PCIT)/behavior parent training and children's social competence and emotional/behavioral regulation from preschool-age children using the Incredible Years programs.
- Provide psychological and neuropsychological testing for children and adolescents with a variety of neurological, psychiatric, and neurodevelopmental conditions. Supervised by a pediatric neuropsychologist.
- Daily use of EPIC electronic medical records.

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- Worked on a multi-site study of school-based treatment approaches for adolescents with ADHD, Bridges to Educational Success for Teens (BEST).
- Was an academic coach for high school students, implementing evidence-based intervention methods to improve academic performance (teaching academic and organizational skills, problem solving and interpersonal skills, conducting monthly check-ins)
- Led groups for the parents of student participants. Provided parents with effective, research based parenting skills and behavioral management techniques, taught parents how to promote effective and positive communication and negotiations with their teens, and how to construct and utilize behavioral contracting for homework completion and other desired behaviors.
- Helped plan a multi-component intervention for high school students with ADHD, BEST. Interventions consist of academic and organizational skills, interpersonal skills, self-management, Check & Connect, and parent education components.
- Helped create the manual for portions of the intervention and aided in the creation of the screening and recruiting procedures.
- Assisted in the assessment and evaluation process for recruitment and eligibility with adolescents and their parents. Conducted cognitive (WAIS-IV) and academic assessments (WJ-III) and psychosocial and behavioral interviews (PChIPS & ChIPS).

Data Collector

Teach Me to Learn at Home

September 2014 - May 2015

- Collected data for an independently funded evaluation of a preschool literacy curriculum aimed at helping parents promote their children's language and early literacy skills.
- Conducted individualized assessments with pre-school children using Get Ready to Read!, myIGDIs, and the CELF-P-2.

Therapeutic Support Staff, Chester County Intermediate Unit

Home and Community Services

May 2012 - August 2013

- Worked in the home and community with a seven-year-old male with Autism and moderate Intellectual Disability.
- Worked with a speech and language pathologist to teach my nonverbal client to use a communication device. Additionally, provided parents with procedures and skills to facilitate communication device use at home and in the community.
- Taught skills to clients' parents, grandparents, and home health aide.

Graduate Assistant, Center for Public Scholarship and Social Change

Civic and Community Engagement and Research Project

August 2011- 2013

- Assisted in Research and Polling Center and faculty research projects.
- Conducted a literature search on resources and services available to children with an incarcerated parent.
- Created a directory of available services for families with an incarcerated parent.
- Created information resource cards for incarcerated parents that provided quick links and phone numbers for related services and advocates.
- Organized and advertised for Reflect & Connect and Engaged Scholars Program events to encourage students and faculty to become civically active leaders connected with the community. Created flyers, managed social networking sites, the center's website, scheduled and organized event space. Scheduled and organized seminars and lectures.

Assistant to Child Life Specialist, Child Life Department

Children's Hospital of Pittsburgh

August 2007 - May 2011

- Assisted in the care of acutely and chronically ill infants, children, and adolescents.
- Supported psychosocial and developmental needs of patients through play, supervised medical play, and other creative outlets.
- Planned and coordinated developmentally appropriate activities in the Child Life Activity Centers and provided opportunities for normal play to patients.
- Attended to patients in their assigned hospital rooms offering distraction and relaxation techniques during stressful or painful procedures.
- Assisted with the organization and planning of large hospital wide events.
- Processed donations.

CLINICAL TRAINING EXPERIENCE

Peer Group Supervision, Lehigh University

Supervisor: Christine Novak, Ph.D.

August 2016- June 2017

- Provide weekly supervision to a group of 2 third year Education Specialist students in the school psychology program completing their pre-certification internship.

Psychology Extern, Kids Care Primary Care Center

St. Luke's University Health Network, Bethlehem, PA

August 2016- June 2017

Supervisor: Joanne Regina, Ph.D.

- Created local medical and behavioral health resource directory for staff and families.
- Conducted a needs assessment & basic program evaluation. Identified the social, emotional, and behavioral needs of the Kids Care patients, and developed intervention plans and program goals.
- Worked closely with the providers to integrate behavioral health care to the patient visits. Provide behavioral interventions to help increase adherence with medical treatments or interventions for patients with Asthma, Diabetes, and behavioral sleep concerns. Provide parents with resources on parenting skills, communication skills, and discuss behavioral and contingency management to address aggression, ADHD, and other behavioral concerns. Provide psychoeducational resources and strategies to increase coping skills and assess stress related to chronic illness and recurring pain.
- Managed a small case load of patients for weekly individual counseling sessions for patients struggling to cope with their medical condition or chronic illness, providing coping, stress reduction, problem solving, and self-advocacy skills.
- Presented three "Lunch & Learn" presentations to the physicians and medical staff on the cognitive behavioral principals related to treatment adherence (e.g. cognitive restructuring, positive reinforcement, contingency management), pediatric behavioral sleep concerns, and the benefits of stimulant medication use for core symptoms of ADHD and the role of educational professionals in monitoring the behavioral effects of medications in the school setting.
- Served as a liaison between the medical and educational settings when needed, facilitating conversations regarding special educational service, medical needs, and behavioral concerns both in the home and school environments.

Psychology Extern, The Sleep Center

Children's Hospital of Philadelphia, Philadelphia, PA

July 2016 - June 2017

Supervisor: Melissa Xanthopolous, Ph.D.

- Currently working with children and adolescents with Obstructive Sleep Apnea and their families and medical providers to promote CPAP adherence.
- Interviewing patients and their families, often utilizing motivational interviewing strategies to introduce behavioral desensitization to CPAP.
- Developing treatment plans to promote CPAP adherence often utilizing motivational interviewing, cognitive restructuring, systematic desensitization, and positive reinforcement strategies.
- Providing in-person and telephone follow-up care to patients and their families. Engaging in motivational interviewing and problem solving to increase CPAP use and adherence.
- Documenting patient interactions in the electronic medical record database (EPIC).
- Assisted in the review of manuscripts submitted for publication to *Behavioral and Developmental Pediatrics* and *Health Psychology*, mentored by Melissa Xanthopolous, Ph.D., the Children's Hospital of Philadelphia.

Psychology Extern, Center for Management of ADHD

Children's Hospital of Philadelphia, Philadelphia, PA

July 2015 - July 2016

Supervisors: R. Eiraldi, Ph.D., J. Nissley-Tsiopinis, Ph.D., and J. Betkowski, Ph.D.

- Assisted in multimethod evaluations and implementation of an organizational skills intervention for middle school students with ADHD.
- Conducted multimethod evaluations of ADHD and psychological and learning disorders, including behavioral observations and interviews with student and family members.
- Scored assessments, and aided in report writing after consulting with Drs. Eiraldi and Betkowski regarding clinical decisions and appropriate recommendations.
- Participated in feedback sessions with parents regarding evaluation findings and recommendations for home and school.
- Worked with Dr. Nissley-Tsiopinis to implement an organizational skills intervention for middle school students with ADHD in a small group setting. Worked with patients each week on different time management, planning, memory, and organizational skills in session, and checked in individually with them and their parents each week to tailor the program to fit their specific needs. Discussed intervention goals and patient needs with one of the patient's teachers three times during the course of the intervention.
- Engaged in session post-group planning with three patients and their parents. Put together a post intervention plan that would support the patient in generalizing the skills they have learned from the group, and facilitated problem solving and post-group care coordination.
- Engaged in ongoing weekly outpatient sessions with one patient from the organizational skills group to address patient's planning and organizational skills. Individual sessions targeted inattention, trouble concentrating or staying with or completing a task, time management skills, and problem-solving strategies. Parent-child communication and conflict was also a focus of the follow up care with the goal to reduce parent-child conflict through behavior parent training and parent cognitive behavior therapy.
- Participated in care coordination with patient's multidisciplinary team at CHOP (psychiatrist, and psychologists from the Eating Disorder Program and Center for Management of ADHD) and school teachers and guidance counselor.
- Documented patient interactions in the electronic medical record database (EPIC).

Psychology Extern, Pediatric Specialty Care Center

Lehigh Valley Health Network, Allentown, PA

September 2014 - June 2015

- Helped explain the IEP and 504 Plan processes to patients and families.
- Facilitated communication between the Pediatric Specialty Care Center clinics (Pulmonology, Sleep, Gastroenterology, and Neurology) and school personnel.
- Helped with behavioral concerns in the home and school through assessment of the concern, intervention planning, and providing resources for community support services.
- Helped patients and their families adhere to medication regimen and diet maintenance.
- Addressed issues that impact children such as self-esteem, motivation, bullying, and internalizing behaviors, with the medical team and aided in treatment planning.
- Provided support to patients who felt they were perceived as different due to their illness (e.g. Cystic Fibrosis, Irritable Bowel Syndrome, Asthma), medications, and/ or treatments.

- Utilized assessments including the Multidimensional Anxiety Scale for Children, Children's Depression Inventory, Second Edition, Behavior Assessment System for Children, Second Edition, Reynolds Adolescent Depression Scale, Second Edition, and Beck Youth Inventories, Second Edition, Combination Booklet.

School Psychology Intern, the School District of Philadelphia
Philadelphia, PA

September 2013 - June 2014

- Intern at Albert M. Greenfield School (K-8), General Phillip Kearny School (K-8) and Constitution High School (9-12).
- Conducted assessments, observations, interviews, and record reviews for the RTII process, special education evaluations and reevaluations.
- Presented evaluation or reevaluation findings to parents and teachers.
- Attended parent, teacher, and staff meetings to problem solve and help provide recommendations or interventions for students who are struggling academically or behaviorally in school.
- Assisted in the collection of student academic and behavioral data for the RTII process of service delivery.
- Created a screening procedure for gifted referrals at Albert M. Greenfield School.
- Assisted in facilitating a social skills group for second, third, and fourth graders with ADHD, Autism, or Speech and Language Disabilities.
- Managed and organized evaluation and reevaluation calendars.
- Provided one on one counseling to students in crisis.
- Provided guidance counseling to students applying to 8th grade, and college/career counseling to high school students applying to college and/or trade schools.
- Provided information on recommended community mental health services, or other related community services to students in need.

Practicum Student, Derry Township School District
Hershey, PA

January - May 2013

- Conducted observations using the Behavior Observations of Students in Schools.
- Attended IEP and data review meetings.
- Assisted in social skills group with second and third graders with ADHD utilizing whole body listening to build theory of mind to address off-task behaviors in the classroom and emotional regulation in social situations.
- Worked one-on-one with a kindergarten student adjusting after an international adoption. Engaged in play therapy for 30 minutes, once a week for two months.
- Worked individually with a 12th grade student to decrease her fear of public speaking. Utilized cognitive behavioral therapy strategies, (e.g. identifying and challenging maladaptive thoughts, relaxation techniques, guided imagery, and gradual exposure) in weekly session to help this student become comfortable enough to complete her final English project that required a speech and presentation of her final paper.
- Conducted a special education eligibility evaluation using the RTII process and presented findings to parents, teachers, and educational staff.
- Observed RTII process for identification of specific learning disabilities and RTII model of service delivery.

Undergraduate Intern at Friendship Academy
Pittsburgh, PA

October 2010 - August 2011

- Conducted Functional Behavior Assessments and standardized KeyMath Assessments.
- Conducted classroom observations.
- Shadowed Dr. Jessica Bleil Walters while administering cognitive and neurocognitive assessments with students.
- Wrote background histories for students' Individualized Education Plans (IEP).
- Participated in IEP meetings, presenting on observations and FBA findings.
- Scored various assessments for Dr. Walters (BREIF, TSCC, GADS, CDI, Tower of London, RCMAS-2, Berry VMI, Conners' 3rd Ed., Child Behavior Checklist).
- Created new, and edited existing, Friendship Academy Staff Resource Binders for Teachers, Therapists, School Psychologists, and Crisis Staff.

RESEARCH EXPERIENCE

Graduate Research Assistant to Karena Rush, Ph.D.

Millersville University, Millersville and York, PA

May 2012 - May 2014

- Conducted literature review on stress management and emotional regulation using biofeedback programs with children with emotional support needs.
- Conducted literature review on the importance of play in child development to aid in the development of a "Playability Scale".
- Conducted Behavior Observations of Students in Schools (BOSS), State-Trait surveys, and the Pair Cancellation and Numbers Reversed subtests from the WJ-III with elementary and middle school students in Emotional Support classrooms.
- Assisted in the implementation of HeartMath, a biofeedback computer game to teach stress reduction and promote emotional regulation and social skills.
- Conducted my thesis on "The Use of Biofeedback to Improve On-Task Behaviors in Children with Special Needs".

Graduate Research Assistant to Adam Lawrence, Ph.D.

Millersville University, Millersville, PA

August 2011 - May 2012

- Conducted polling in the Research and Polling Center for the 2012 Quality of Life Survey for the Lancaster County area.

Research Assistant to Heather Bachman, Ph.D.

University of Pittsburgh, Pittsburgh, PA

March 2010 - May 2011

- Collected early literacy skills data from children in childcare centers in Pittsburgh, using early literacy assessments.
- Assisted with Institutional Review Board documents.
- Assisted with creating standard operating procedures for a new study.
- Assisted in the creation of a study codebook.
- Monitored data and de-identified documents to ensure data safety.
- Created regression tables in APA format.
- Assisted in data entry using SPSS and ACCESS.
- Scheduled, participated in, and transcribed parent interviews.

PUBLICATIONS & PRESENTATIONS

Golden, M. E. & DuPaul, G. J. (2018). Coordinating services with non-school providers. In F.C. Worrell & T. L. Hughes (Eds.), *Cambridge Handbook of Applied School Psychology*. New York, NY: Cambridge University Press.

Sevecke, J. R., Meadows, T., Massura, C. E., O'Dell, S., German, R., **Golden, M. E.**, & Petgrave, D. (2018, April). *BHPC Access and Utilization: Can Established Relationships with Off-Site PCPs Bridge the Gaps?* Poster presentation at the annual convention of the Society of Pediatric Psychology, Orlando, FL.

Puzino, K., DuPaul, G. J., **Golden, M. E.**, & Kipperman, K., (2017, February). *Predictors of School Functioning Among Adolescents with ADHD*. Paper presentation at the annual convention of the National Association of School Psychologists, San Antonio, TX.

Rush, K. S., **Golden, M. E.**, Mortenson, B. P., Albohn, Dr., & Horger, M. (2017). The effects of a mindfulness and biofeedback program on the on-and-off-task behaviors of students with emotional behavioral disorders. *Contemporary School Psychology*, 21(4), 347-357.

Golden, M. E., DuPaul, G. J., & Hetrick, A. (2017, February). *Academic Functioning in Secondary Students with ADHD and Internalizing Problems*. Poster presentation at the annual convention of the National Association of School Psychologists, San Antonio, TX.

Brumley, L. D., Nissley-Tsiopinis, J., Abikoff, H., Gallagher, R., Betkowski, J., **Hoff, M. E.**, Theobald, A., Lubinski, L. E., & Gentile, K. (2016, October). *Helping preteens/teenagers with ADHD succeed: Clinic-based Organizational Skills Training and Practice group*. Poster presentation at the Association for Behavioral and Cognitive Therapy (ABCT) 50th Annual Convention. New York, NY.

Rush, K., **Hoff, M.E.**, Mortenson, B., & Helwig, J. (2015, February). *Using Biofeedback and Mindfulness Techniques in Special Education Classrooms*. Poster presentation presented at the annual convention of the National Association of School Psychologists, Orlando, FL.

Rush, K., **Hoff, M. E.**, VanBuren, V., Mortenson, B., & Horger, M. (2015, March). *The Effects of Biofeedback and Mindfulness Computer Games on Academic Engagement*. Presentation at the annual convention of Eastern Psychological Association, Philadelphia, PA.

PROFESSIONAL CERTIFICATIONS

Nationally Certified School Psychologist (44703), National Association of School Psychologists
In-State Educational Specialist I (826719), Commonwealth of Pennsylvania

HONORS AND QUALIFICATIONS

Leiser Scholar at the Lehigh Special Education Law Conference, May 2015

Trained Mandated Reporter, April 2015; May 2017

School Psychology Club, Social Media and Awareness 2014-2015

PROFESSIONAL MEMBERSHIPS

American Psychological Association (APA)

- Division 16: School Psychology
- Division 53: Clinical Child and Adolescent Psychology
- Division 54: Pediatric Psychology

National Association of School Psychologists (NASP)

Pennsylvania Psychological Association (PPA)

Association of School Psychologists of Pennsylvania (ASPP)

- Graduate student representative (2015-2017), Lehigh University