

The Relationship between Attention Problems, Internalizing Symptoms and  
Quality of Life in Youth Receiving Outpatient Services

Hannah Reed Harwood

A dissertation submitted to the faculty of the University of North Carolina at  
Chapel Hill in partial fulfillment of the requirements for the degree of Doctor of  
Philosophy in School Psychology

Chapel Hill  
2011

Approved by

Advisor: Eric A. Youngstrom

Advisor: Barbara Wasik

Reader: Brenda Devellis

Reader: Sandra Evarrs

Reader: Steven Knotek

## **Abstract**

HANNAH REED HARWOOD: The Relationship between Attention Problems, Internalizing Symptoms and Quality of Life in Youth Receiving Outpatient Services

(Under the direction of Dr. Eric A. Youngstrom and Barbara H. Wasik)

Attention problems, internalizing problems and quality of life (QOL) were investigated to understand the possible mediating and moderating role of internalizing problems on the relationship between attention problems and QOL. Extant literature provides theoretical explanations for the influence emotional distress has on reducing QOL in individuals with attention problems; however, empirical examination of the explanations is lacking. Parents of 590 children and adolescents ages 8 to 18 years who were treated at one of two outpatient clinics completed a norm referenced broadband behavior rating scale and a QOL scale. Using Baron and Kenny (1986) model, the possible mediating effect of internalizing problems was examined. Results indicated that study variables were moderately correlated (range =  $-.26$  to  $-.51$ ;  $p < .05$ ). Regression analysis indicated a significant indirect effect ( $b = -.26$ ;  $p < .01$ ), combined with a nonsignificant direct effect, thereby suggesting full mediation of internalizing problems on the relationship between attention problems and QOL. Moderation analysis indicated a significant interaction effect between attention problems and internalizing problems; however, the main effect of internalizing problems was the strongest predictor of QOL across levels of attention problems. Implications for future research and for practice are discussed. Future research directions include examining the stability of results across self-report measures and

demographic variables. The results have clinical implications for treatment: Methods aimed at interrupting the development of internalizing problems in individuals with attention problems are identified and discussed.

## **ACKNOWLEDGEMENTS**

Thank you to my advisors and committee members. Your guidance and support were invaluable for completing this project.

To Dr. Eric Youngstrom, thank you for the opportunity to work with you. I am grateful for all of the time you have dedicated to help me complete this project. Your feedback and revisions were invaluable throughout the process of writing this dissertation. I have gained so much from your insight and research expertise.

To Dr. Wasik, thank you for your guidance through this project and during my years at UNC. I appreciate all of your encouragement and feedback throughout the dissertation process.

To Dr. Devellis, thank you for your thoughtful comments on my dissertation drafts. Specifically, the issues you raised related to the constructs under investigation were helpful for improving the overall clarity of the study.

To Dr. Evarrs, thank you for your willingness to participate in my defense at the last minute. I appreciate that you made time for my project on such short notice.

To Dr. Knotek, thank you for being on my committee and for your contributions to this study. I'm grateful for your insight and feedback on refining the statistical analysis.

To Dr. Simeonsson, I feel fortunate to have taken your research design class. The skills I gained in your class were helpful for developing and completing this dissertation. Thank you for your thoughtful contributions to this study.

## TABLE OF CONTENTS

LIST OF TABLES.....	vii
LIST OF FIGURES.....	viii
BACKGROUND AND OVERVIEW.....	1
LITERATURE REVIEW.....	3
PURPOSE AND RATIONALE.....	36
METHODOLOGY AND ANALYSES.....	40
RESULTS.....	50
DISCUSSION.....	57
REFERENCES.....	68

## LIST OF TABLES

### Table

1. Description of Constructs.....	2
2. Symptom Overlap.....	11
3. Participant Demographic Data.....	42
4. Diagnoses.....	51
5. Mean and Standard Deviations.....	51
6. Correlations.....	53

## LIST OF FIGURES

Figure

1. Moderation.....	34
2. Mediation.....	35
3. Mediation Analysis.....	54
4. Interaction Effect.....	55



## CHAPTER ONE

### Background and Overview

Attention deficit hyperactivity disorder (ADHD) is among the most prevalent developmental disorders experienced by children and adolescents (Rowland, Lesesne, & Abramowitz, 2002). Children and adolescents with ADHD display atypical levels of inattention, hyperactivity and impulsivity (American Psychiatric Association, 2001). Extant research has demonstrated that these core deficits have negative implications for academic achievement, socialization and internalizing psychopathology (Mash & Wolfe, 2007). In comparison to typically developing peers, children and adolescents with ADHD face an array of challenges during development.

Because these challenges are not limited to one domain of functioning, ADHD appears to lower overall quality of life. A recent meta-analysis indicated that children and adolescents with ADHD have a poorer quality of life than do their peers without ADHD (Danckaerts et al., 2010). The effect was especially large when parents reported on their children's quality of life.

One of the limitations of the studies included in the meta-analysis is the minimal attention given to possible third variables that may help explain this relationship. An important variable that has strong associations to quality of life is internalizing symptomatology (Freeman et al. 2009). Individuals with internalizing problems consistently report poorer quality of life than do those without internalizing problems (Ay-Woan, Sarah, LyInn, Tsyr-Jang, & Ping-Chuan, 2006; da Silva Lima &

de Almeida Fleck, 2006; Jho, 2001; Mechanic, McAlpine, Rosenfield, & Davids 1994; Vitiello et al., 2006). Because of this strong association and the high rate of internalizing problems experienced by individuals with ADHD, internalizing symptomatology is a possible mediating variable in the relationship between symptoms of ADHD and quality of life.

The purpose of this study is to investigate the relationship between attention and quality of life, and the possible mediating and moderating effect of internalizing symptomatology. See Table 1 for description of constructs. Using the Baron and Kenny (1986) model for testing mediation and moderation, the strength of the relationships between variables will be examined before testing for possible mediating and moderating effects. Results from the analyses will suggest either no mediating effect, partial or whole mediation, as well as whether there is an additional moderating effect of internalizing problems.

**Table 1.** Description of Constructs

	<i>Description</i>
Attention Problems*	Can't concentrate Can't sit still Daydreams Impulsive Stares blankly Impulsive
Internalizing Problems	Depression Anxiety
Quality of Life**	Physical well-being Emotional well-being Self-esteem Family Friends School

\*Consistent with CBCL Attention Problems and Internalizing Problems scales (Achenbach & Rescorla, 2001). \*\*Consistent with KINDL (Ravens-Stieberger & Bullinger, 1998)

## CHAPTER TWO

### **Attention, Internalizing Psychopathology and Quality of Life**

Attention deficit-hyperactivity disorder (ADHD) affects approximately 3-7% of school-aged students (American Psychiatric Association, 2001). The hallmark features include inattention, hyperactivity, and impulsivity, although other co-occurring psychological problems and impairments have been well documented in this population. Children and adolescents with ADHD are at risk for academic failure (Frazier, Youngstrom, Glutting, & Watkins, 2007), poor peer and family relationships (Heiman, 2005), and internalizing symptoms (Angold, Costello, & Erkanli, 1999).

Whereas in this study attention is examined, the literature reviewed is based on samples of individuals with ADHD who likely have a constellation of the disorder's three hallmark features. Attention is conceptualized as including concentration, restlessness, impulsivity, day dreaming, and school performance, which is consistent with the Attention Problems scale on the Child Behavior Checklist (Achenbach & Rescorla, 2001). The decision to focus on ADHD specifically, while examining attention generally, was based on several factors. First, in the DSM-IV-TR, inattention is the only common core diagnostic feature of ADHD-Inattentive type and ADHD-Combined type, the two most prevalent subtypes of ADHD (Barkley, 1998). Individuals with ADHD-Hyperactive type do not necessarily have clinical levels of inattention; however, this group of individuals is smaller than the other groups and not as well represented in research (Barkley, 1998).

Second, inattention is a general construct that is frequently associated with several disorders (e.g., anxiety, bipolar disorder), thus by focusing on attention, results can be interpreted in light of other disorders that share the common associated feature. Finally, attention appears to be on a continuum of severity (Lubke, Hudziak, Derks, van Bijsterveldt, & Boomsa, 2009), thus results can be generalized to a wider population than those with psychiatric conditions. The following section will review the broad implications of ADHD in order to present a clinical picture of children and adolescents with attention problems.

**Developmental Trajectory of ADHD Symptoms.** Significant effort has been made to understand the developmental trajectory of ADHD. Symptoms can emerge early in a child's life; approximately 2% of children aged 3 to 5 years are diagnosed with the disorder (Lavigne et al., 1996). Preschool-aged children with ADHD are characterized as engaging in greater sensorimotor activities, frequently moving from one play area to another, and exhibiting more noncompliant behavior than their non-ADHD peers (Alessandri, 1992; DuPaul, McGoe, Eckert, & VanBrakle, 2001). The stability of ADHD symptoms at this young age, though, has been questionable because children who exhibit these characteristics at a young age (i.e., age 3) may not exhibit the same symptoms at older ages (Rietveld, Hudziak, Bartels, van Beijsterveldt & Boomsma, 2004). Among the defining features of the disorder, inattention is believed to be more persistent over time than hyperactivity (Barkley, 1990; Cantwell, 1996). In fact, a portion of children who initially meet the criteria for ADHD-combined type, may in adolescence meet only the criteria for the inattentive subtype (Hurtig et al., 2007).

**Academic Achievement and ADHD.** The importance of attention during child development is incontrovertible. Attention plays an essential and pivotal role in learning and achievement (Shaywitz & Shaywitz, 2008; Steinmayr, Ziegler, & Trauble, 2010), thus it is unsurprising that attention problems are usually present before school related problems (Sanson, Prior, & Smart, 1996; Smart, Sanson, & Prior, 1996). The academic problems associated with ADHD begin as early as pre-school. Pre-school children with ADHD exhibit poorer developmental skills, including pre-academic skills and conceptual development, than do typically developing students (DuPaul, McGoe, Eckert, & VanBrakle, 2001). Students with ADHD have performed less well than have their peers without ADHD on tasks that measure cognitive processing abilities and academic achievement. In a meta-analysis examining neuropsychological variables, Frazier, Demaree and Youngstrom (2004) found medium to large effect sizes indicating that students with ADHD scored significantly lower than did students without ADHD on measures of cognitive ability, working memory, and processing speed. In a subsequent meta-analysis examining academic achievement, Frazier, Youngstrom, Glutting, and Watkins (2007) reported an overall effect size between ADHD groups and non-ADHD groups of .71, indicating a large and significant difference between groups. Additionally, students with ADHD have worse GPAs, higher rates of school drop-out, more school suspensions, higher rates of grade retention, and lower rates of college entrance than do their peers without ADHD (Loe & Feldman, 2007). Inattention specifically has also been associated with school performance (Herman, Lambert, Ialongo, & Ostrander, 2007; Lee & Hinshaw, 2006).

In summary, the preponderance of evidence indicates that ADHD interferes with academic achievement, as measured by a wide variety of outcome measures. From direct measures of norm-referenced tests of academic achievement to rates of school drop-out, groups of ADHD are outperformed by their peers without ADHD.

**Social Implications of Attention Problems.** Further contributing to school maladjustment, students with ADHD have less well developed social and communication skills than do typically developing children (Klimkeit et al., 2006). Such skills have implications for developing peer relationships, thus the finding that both parents and teachers have reported that children with ADHD have poorer peer relationships than nondisabled students is unsurprising (Heiman, 2005). Heiman (2005) discovered that parents and teachers indicated that students with ADHD experienced more loneliness than did typically developing students. Additionally, parents and teachers estimated that children with ADHD had fewer friends than did the typically developing group. When assessed by their peers, students with ADHD have shown to be more disliked than randomly selected students (Hoza et al., 2005).

Within the family domain, children with ADHD experience more family difficulties than do children without the disorder. Numerous studies have been conducted to better understand family functioning in families with a child with ADHD. Profiles of parents of children with ADHD indicate more authoritarian parenting style (Alizadeh & Andries, 2002) and less engagement in child-directed activities (Danforth, Barkley, & Stokes, 1991) than parents of children without ADHD. Parents of children with ADHD have reported more stress, less social support

and lower overall quality of life (Lange et al., 2005). Moreover, Lange et al. (2005) found that parents of children with ADHD rated parent satisfaction in their family of origin as more satisfying than that in their current family. When children with ADHD reported about their family relationship and overall family functioning, their reports were generally consistent with parent reports. Children with ADHD reported lower positive affect toward both parents, poorer communication and lower involvement than the nondisabled children (Ghanizadeh & Shams, 2007). Given the importance of family functioning and relationships during child development, the family adversities experienced by children with ADHD may play an important role in this group's broader difficulties (e.g., behavior problems, internalizing distress).

**Internalizing Disorders and ADHD.** Along with academic and social problems, children with ADHD are at a higher risk than the general population for comorbid psychiatric conditions. In fact, the co-occurrence of other disorders and conditions has been deemed the rule rather than the exception for individuals with mental health problems (Baldwin & Dadds, 2008). Significant attention has been given to externalizing problems associated with ADHD; however, researchers have revealed important findings about the significant comorbidity of ADHD with internalizing problems (e.g., depression and anxiety). Though the prevalence rates of comorbid depression and anxiety with ADHD vary based on the source, the rates range between 0% and 50% for depression (Angold et al., 1999) and 15-35% for anxiety (Pliszka, Carlson, & Swanson, 1999). Children with ADHD also experience depressive symptoms at a younger age than do children without the disorder and are at a five times greater risk of lifetime depression (Biederman et al., 2008).

In addition to a higher rate of diagnosis of anxiety and depression in children and adolescents with ADHD than in the general population, individuals with ADHD have more anxiety and depression symptoms when assessed from a non-categorical approach, though it appears to depend on the source reporting the symptoms. In one sample of school children with ADHD, the children obtained elevated scores on measures of anxiety and depression according to parent, teacher and self reports (Baxter & Rattan, 2004); however, this finding is not consistent across samples. Other researchers have reported that when children self-report internalizing symptomatology, their ratings are commensurate with control groups (Wilson & Marcotte, 1996), and that parent reports of anxiety and depression are higher than are child self-reports (Karustis, Power, Rescorla, Eiraldi, & Gallagher, 2000). Although there is variability between reporters with regard to internalizing symptomatology, there appears to be consensus that anxiety and depression occur at higher rates in children and adolescents with ADHD than occur in their nondisabled peers.

**Substantive vs. Methodological Explanation for Comorbid ADHD and Anxiety and Depression.** When understanding co-occurring disorders or conditions, there are several possible explanations for the co-existence. An examination of the possible explanations helps determine if there is a true comorbidity or if the association is a spurious result of methodological issues. Researchers have grouped the explanations for comorbidity into two broad categories: substantive and methodological explanations (Lilienfeld, 2003). Substantive explanations include those that suggest there is a true co-occurrence between distinct conditions. For



example, one disorder being a risk factor for the second disorder would be a substantive explanation for the comorbid conditions. In contrast, methodological explanations suggest that the co-occurrence between disorders is spurious in that the methodology for assessing and diagnosing the disorders accounts for the co-occurrence. For example, overlap in diagnostic criteria can erroneously increase the rates of comorbidity.

**Methodological Explanations for Comorbidity between Attention and Internalizing Problems.** Lilienfeld (2003) presented an important review of methodological explanations for the overlap of externalizing and internalizing problems. The three explanations are method covariance, overlap in diagnostic criteria and selection bias. Researchers have investigated these explanations as they apply to ADHD and anxiety or depression.

As Baldwin and Dadds (2008) explained, method covariance occurs when the relationship between conditions is a result of “shared modes of assessment” (p. 68). One often cited example of method covariance is the halo effect. Generally, the halo effect has been described as falsely evaluating a trait based on the presence or absence of a second trait. In the case that parents provide assessment data about their child’s attention problems, they may erroneously report elevated symptoms of anxiety or depression due to perceptions about the comorbidity (Baldwin & Dadds, 2008). Campbell and Fiske (1959) have identified this problem as heterotrait-monomethod, or measuring different constructs using a single method. One technique for examining possible method variance is by observing the factor structure of measures used to assess constructs. On the Child Behavior Checklist (Achenbach & Rescorla, 2001),

items assessing attention and internalizing problems load onto separate, albeit strongly correlated, factors indicating distinct factors or constructs despite a having a single rater.

Symptom overlap or overlap in diagnostic criteria is a second methodological explanation for the relationship between conditions, and it is especially compelling with regard to ADHD and internalizing problems. In the DSM-IV-TR, symptoms of anxiety include restlessness, irritability, sleep disturbance and difficulty concentrating, which are all diagnostic criteria or associated features of ADHD (Tannock, 2000; see Table 2 for symptom overlap using DSM-IV-TR criteria). In a study to better understand if symptom overlap explains the relationship between ADHD and comorbid conditions, Milberger, Biederman, Faraone, Murphy, and Tsung (1995) partialled out the shared diagnostic features of ADHD and depression and ADHD and anxiety. Results indicated that 79% and 75% of participants with ADHD continued to meet criteria for depression and anxiety, respectively. This finding discounts the symptom overlap hypothesis; however, there is still some speculation that overlapping symptoms has some explanatory utility (Jarrett & Ollendick, 2008).

**Table 2** Symptom Overlap

<b>Symptom</b>	<b>ADHD</b>	<b>Anxiety (GAD)</b>	<b>Depression</b>	<b>Mania</b>
Inattention	Core	Associated	Associated	Associated
Restlessness	Core	Core		
Irritability	Associated	Core	Core	Associated
Sleep disturbance	Associated	Core	Core	Core
Difficulty concentration	Core	Core	Core	Core
Academic deficits	Associated	Associated	Associated	
Dysphoria	Associated	Core	Core	
Mood lability	Associated	Associated	Associated	Associated
Self-esteem issues	Associated			Core
Low frustration tolerance	Associated			
Oppositional behavior	Associated			Associated
Task avoidance	Core			
Forgetfulness	Core			
Disorganization	Core			
Excessive worry		Core	Associated	
Hyperactivity	Core			Associated
Excessive talking	Core			Core

*Core* refers to core diagnostic symptoms. *Associated* refers to associated features of the disorder.  
Consistent with DSM-IV-TR (APA, 2000).

The third methodological explanation for comorbid conditions is referral bias. There are two distinct ways to discuss referral bias, both of which could hypothetically apply to ADHD and internalizing symptoms. The first is selection bias, which Lilienfeld (2003) explains as “the straw that breaks the camel’s back phenomenon” (p. 286). More specifically, because of the greater problems usually associated with comorbid conditions, these individuals are more likely to seek treatment. Berksonian bias is different from selection bias, in that it is strictly an artifact of mathematical probability (Caron & Rutter, 1991). It suggests that clinic samples will have higher rates of comorbidity, because the likelihood of seeking treatment is the combined likelihood of seeking treatment for condition A or condition B. One way to better understand if referral bias is skewing true comorbidity rates is to obtain base rates of comorbidity in community samples. With regard to ADHD and anxiety and depression, in a meta-analysis of epidemiological studies,

Angold et al. (1999) found that individuals with ADHD had approximately 3 and 6 times higher rate of anxiety and depression, respectively, in the general population. This finding disconfirms referral bias as an explanation for the increased level of internalizing problems in ADHD.

The methodological explanations presented are intuitively compelling when discussing ADHD and internalizing problems; however, there does not appear to be robust evidence to support such explanations. Instead, the presence of ADHD and internalizing psychopathology appears to be a true comorbidity, and not a result of methodological issues that preclude an accurate understanding.

**Substantive Explanations for Comorbidity between Attention and Internalizing Problems.** One substantive explanation for the co-occurrence of ADHD and internalizing problems is possible biological link between the disorders. Researchers who have investigated biological factors and focused on family risk have revealed findings about the biological transmission of the disorders. One of the salient questions regarding genetic transmission is if the disorders cosegregate, or are transmitted together. Examining the rates of anxiety and ADHD in relatives of individuals with both disorders is one method for investigating genetic transmission. Results have indicated that in comparison to individuals with pure ADHD, individuals with anxiety and ADHD were two times more likely to have a relative with anxiety (Braaten et al., 2003). If the results had indicated that relatives of individuals with comorbid ADHD and anxiety were two time more likely to have both disorders, this would have supported the cosegregation hypothesis. In fact, because relatives of individuals with ADHD and anxiety are more likely to have

anxiety but not necessarily comorbid ADHD, Jarrett and Ollendick (2008) concluded that anxiety and ADHD appear not to cosegregate.

Depression and ADHD appear to have a similar genetic transmission pattern as anxiety and ADHD. In a comprehensive review of family risk for ADHD and depression, Faraone and Biederman (1997) reported that relatives of children with ADHD were approximately three times more likely than children without ADHD to meet criteria for depression. Furthermore, rates of ADHD increased in groups of parents with depression in comparison to parents without depression. Whereas there appears to be a familial link between ADHD and depression, when Biederman et al. (1992) investigated the possibility of cosegregation, the rate of depression in relatives of children with ADHD and depression and rates of depression in relatives of children with pure ADHD was commensurate; thus cosegregation was rejected. Instead, the authors suggested that depression in children with ADHD may be a result of environmental factors. In summary, there appears to be a genetic link between ADHD and internalizing problems; however, research does not appear to support that these disorders are transmitted together.

Because depression and anxiety do not appear to cosegregate with ADHD, another possible substantive explanation is that internalizing symptomatology is secondary to problems associated with ADHD. There appear to be two ways to consider this hypothesis: first, attention problems may precede internalizing problems from a developmental perspective, and second, internalizing problems may be the result of attention problems. The first explanation is supported by the average age of onset for each disorder. As has been suggested, ADHD characteristics can be evident

as early as 3 and continue to emerge in preschool (Barkley, DuPaul, & McMurray, 1990). Depression typically has a later onset, and it has been found that comorbid conditions with depression commonly precede major depressive disorder (Birmaher et al., 1996). With regard to ADHD specifically, ADHD has been found to precede depression (Biederman, Faraone, Mick, & Lelon, 1995; Kovacs, Akiskal, Gatsonis, & Parrone, 1994). In a community sample of over 500 individuals, the average age of onset for generalized anxiety disorder was approximately 15.5-years-old (Angst, Gamma, Baldwin, Ajdacic-Gross, & Rossler, 2009). The findings of age of onset for ADHD, depression and anxiety indicate that it is likely ADHD precedes anxiety and depression when the conditions are comorbid. Because depression and anxiety have a later onset than ADHD, it may be the case that ADHD contributes to disruptions in emotional health.

The hypothetical explanation that ADHD contributes to anxiety is especially convincing in light of theoretical explanations and empirical research. With regard to ADHD and anxiety, Schatz and Rostain (2006) presented seven theories of ADHD (cognitive processing model, dysregulated arousal model, executive inhibition model, executive dysregulation model, motivational model, cognitive energetic model and hybrid theories) and then described the way in which anxiety may be secondary to deficits related to ADHD, from the perspective of each model. With each model, the authors describe the way in which a core deficit of ADHD may lead to or increase anxious symptomatology. Empirical literature also lends support to the hypothesis that anxiety may be secondary to ADHD. In a study of adults with ADHD (Roth et al., 2004), the group with ADHD and comorbid anxiety were more negatively affected by

the task irrelevant thoughts pertaining to poor performance than the working memory deficits that are associated with ADHD. In this scenario, anxiety was secondary to fear of poor performance. In children, the authors of a large scale study of children with ADHD (MTA Study; March et al., 1999), found that anxiety in children with ADHD may be qualitatively different than expression of anxiety in non-ADHD children. Children with ADHD and anxiety had more negative affectivity than phobic behavior. Schatz and Rostain (2005) suggest that such a finding may indicate the fears are more associated with competency. Finally, in an unexpected finding of the MTA Study Group Data (1999), when ADHD symptom were treated with either a behavioral approach or a pharmacological approach (neither of which targeted symptom of anxiety), symptoms of anxiety improved. Such evidence lends support to the hypothesis that when ADHD symptoms are improved, anxious symptoms are also mitigated.

With regard to ADHD contributing to depression, the empirical research and theoretical explanations are inconclusive. ADHD has been shown to predict the onset of depression (Biederman et al., 2008); however, such evidence is not consistent across studies (Baldwin & Dadds, 2008). In a review of the etiology of comorbid ADHD and depression, Daviss (2008) suggests that the academic and social impairments commonly experienced by children and adolescents with ADHD may contribute to their depressive symptomatology. This demoralization hypothesis, however, has not always been supported in empirical literature (e.g., Biederman, Mick, & Faraone, 1998). Another possible way that Daviss (2008) suggests that ADHD may contribute to depression includes the use of stimulant pharmacotherapy.

Stimulant medication is the most frequently prescribed medication to mitigate ADHD symptoms (Barkely, 2006). It has also been found that such medication may increase risk for irritability and sadness in subset of children taking stimulants medication (Wilens & Spencer, 2000); however, this has not been supported consistently across studies investigating mood and stimulant medication.

In summary, the substantive explanations for the association between internalizing problems and ADHD provide support for a true comorbidity between attention problems and internalizing symptomatology. The developmental trajectory of each condition, the biological factors and the epidemiological studies of comorbidity are robust indicators of the link between attention and internalizing problems. Moreover, substantial evidence indicates that ADHD precedes internalizing psychopathology. Although the underlying reasons why ADHD precedes anxiety and depression are largely inconclusive, the developmental trajectory of the disorders remains consistent across studies. Several hypotheses have been offered to elucidate the underlying mechanisms of ADHD that may give rise to anxious and depressive symptomatology; however, empirical support for these hypotheses is not conclusive.

#### **Outcomes of Children with Comorbid Internalizing Problems and ADHD.**

Because of the high comorbidity between internalizing problems and ADHD, substantial attention has been devoted to better understanding the combined effects of ADHD and internalizing problems. Several methods have been employed to examine the possible combined effects. In a longitudinal study, comorbid depression was shown to increase the risk for oppositional defiant disorder, bipolar disorder, and agoraphobia in children with ADHD (Biederman et al., 1996). Children with comorbid



depression and ADHD have also been found to have decreased social competence (Blackman, Ostrander, & Herman, 2005) and increased family stress (Jensen, Martin, & Cantwell, 1997) in comparison to children with ADHD without depression. Given these findings, the additive effect of depression and ADHD appears to be most closely related to greater impairment in psychosocial functioning. The effect of comorbid ADHD on depression appears to be earlier onset of depression, greater duration of depression, more severe depressive symptomatology, increased risk for drug abuse or dependence and increased risk for suicidality (Biederman et al., 2008). In sum, the combined effect of ADHD and depression appears to have a graver impact on functioning than either of the disorders without the comorbid condition.

Similar studies have been conducted with regard to the combined effects of anxiety and ADHD. One of the more salient questions about the combined effect of anxiety and ADHD is if anxiety mitigates impulsivity in individuals with ADHD. In a review by Schatz and Rostain (2006), the author's conclusion was the effect of anxiety on impulsivity was small. The effect of anxiety on ADHD has been shown to negatively impact working memory (Tannock, Ickowicz, & Schachar, 1995), as well as parent stress, maternal depression and pharmacological treatment response (Jensen, Martin, & Cantwell, 2001). Consistent with the negative impact that ADHD has on academic achievement, children with ADHD and anxiety are served in special education at a higher rate than children with anxiety without ADHD (Hammerness et al., 2010). With regard to emotional functioning, parent reported anxiety in children with ADHD has been shown to predict self reported withdrawal and social problems in adolescence (Newcorn, et al., 2004).

An alternative means of understanding the combined effects of internalizing symptomatology and attention problems is examining treatment outcomes. Researchers have focused on the interaction of internalizing problems and ADHD on response to pharmacological and behavioral treatments. One study revealed the significant moderating effect of a diagnosis of anxiety on treatment outcomes. Children with ADHD and comorbid anxiety responded as well to behavioral treatment as they did to pharmacological treatment and combined pharmacological and behavior treatment, whereas children with pure ADHD did not show a similar response to behavioral treatment as they did to the two other types of treatment. In a similarly designed study investigating the moderating effect of an ADHD diagnosis on depression and treatment response, individuals with ADHD and depression had a more positive response to all treatment methods (psychostimulant pharmacotherapy, cognitive behavioral therapy and combined therapy). Unlike effects of internalizing problems and ADHD symptoms on psychological and academic achievement outcomes, children with comorbid ADHD and internalizing problems may yield a more positive response to treatment. In summary, the presence of internalizing problems appears to negatively impact the clinical presentation of ADHD, with the possible exception of response to the treatment.

The clinical picture that emerges when examining the experience of children and adolescents with ADHD is punctuated with negative implications and poorer outcomes than typically developing students. From poorer academic achievement than their nondisabled peers to greater levels of depression and anxiety, these children are at risk for adversity across several domains of functioning.

Furthermore, the high incidence of internalizing problems does not appear to be an artifact of issues related to diagnostic methods. Rather, children and adolescents are at a higher risk for anxiety and depression than their nondisabled peers. Furthermore, the investigations into the experience of children and adolescents with ADHD and internalizing symptomatology have yielded robust findings about the negative implications of the combined effects of the disorders. Children with ADHD and either depression or anxiety appear to be at a graver risk for psychological problems than students without comorbid internalizing problems. Due to the findings about the impact of ADHD, a broad outcome measure may better capture the overall life experience of these children and adolescents.

### **Quality of Life**

Because of the negative outcomes encountered by children with ADHD, investigation of their quality of life (QOL) is compelling. QOL has gained attention over the past two to three decades. Despite broad variability in its conceptualization, several features help define QOL. First, QOL is generally believed to be a multidimensional construct. The typical domains represented are physical, psychological and social (Coghill, Danckaerts, Sonuga, Sergeant, & ADHD European Guidelines Group, 2009), although other dimensions may also be included. Second, QOL is a subjective variable. QOL largely depends on the person's own subjective assessment of their "present lifestyle, past experience, hopes for the future, dreams, and ambitions" (Eiser & Morse, 2001, p. 249). More precise definitions of QOL suggest that it is commensurate with subjective well-being (Diener, 1984), and that

QOL can be defined as the proximity between attained and desired goals (Eiser & Morse, 2001).

In an effort to further investigate QOL, several underlying variables have been identified. In a large adult sample, stress, control over one's life, performance in personal life, depression and social support were associated with QOL (Abbey & Andrews, 1985). Level of aspiration, comparison level and perceived control have also been shown to predict QOL (Gutek, Allen, Tyler, Lau, & Majchrzak, 1983). In a compilation of three models, Barry (1997) depicted a mediation model of QOL, which indicates that the appraisal process is influenced by personal characteristics (e.g., self-esteem, self-efficacy, perceived control, and mediating variables generally) and objective life conditions. These studies were conducted on adults, and although they further the understanding of QOL for both clinicians and researchers, the generalizability to children is unknown.

Several researchers have purported to obtain a general understanding of QOL in children and adolescence. In a review of QOL in child psychiatric disorders, Schmeck and Poustka (1997) suggested that there are five broad factors that underlie QOL in this age group: immediate psychosocial situations, social and ecological environment, individual characteristics, illness and developmental deficits, and access to treatment. The World Health Organization suggested that instruments purporting to measure children's QOL should include: family/social relations, physical functioning, psychological, physical appearance, psychosocial relations to social and material environment and the child's environment (e.g., school, food, and material comfort) (WHO, Division of Mental Health, 1994). In empirical research, child

psychopathology has consistently been associated with lower reported QOL (Bastiaansen, Koot, & Ferdinand, 2005). This finding was consistent across raters (i.e., parent-, clinician- and self-report). Bastiaansen, Koot, Ferdinand, and Verhulst (2004) found that in a clinical sample of children, Self-Esteem and the Total Problems Scale of the Child Behavior Checklist were correlated with QOL. According to the children's self-report, social support from classmates and stressful life events were also salient predictors of QOL.

Several demographic variables that further contribute to the understanding of QOL in children and adolescents. In Bastiaansen et al.'s (2005) study of a clinical sample of children and adolescents, several important demographic variables were associated with QOL. Specifically, socioeconomic status, age and sex were predictive of QOL. Subsequent investigation has further supported age and sex effects in QOL (Freeman et al., 2009). Lower SES is associated with poorer QOL, which is consistent with the assumption that children and adolescents from lower SES have fewer resources that likely increase QOL. With regard to age, QOL of life decreased with age from childhood to adolescence. Finally, females tended to report a lower QOL than do males.

**Theoretical Models of QOL.** Several models have been put forth to help explain QOL. Emerging from the notion that QOL is a subjective evaluation of one's life, the Satisfaction Model proposes that "personal characteristics, objective life conditions in various life domains and the satisfaction with life conditions in these various domains" underlie QOL (Lehman, 1988, p. 52). As Angermeyer and Kilian (1997) explain, one interpretation of this model is that compatibility between actual

life events and an individual's needs and desires determines one's QOL. Furthermore, the authors suggested that, based on this model, good QOL can be achieved in several ways. First, it can be achieved when one's needs, wishes and desires are met. Second, it can be achieved if an individual does not deem a particular life domain as especially salient, thus satisfaction is not largely dictated by it, or lastly, it can be achieved if the individual has revised their desires to better match their reality. Angermeyer and Kilian (1997) concluded that only the first interpretation conveys authentic high QOL.

**Gap-Discrepancy Theories.** Three separate theories make up what are referred to as Gap-Discrepancy Theories, and are presented as theories relevant for discussing QOL in individuals with long-term mental illness (Fabian, 1990). They are included in this general section on theoretical models of QOL because these theories are also relevant for understanding how individuals resolve differences between desired and actual functioning or conditions. Fabian (1990) presented three Gap-Discrepancy theories: adaptation level theory, person-environment fit models, and social comparison theories.

As Fabian (1990) explained, the adaptation level theory suggests that individuals revise their "internal standard of evaluation... in response to change in conditions or environment" (p. 164). As the name suggests, this revision of one's standard of evaluation is adaptive. An individual who can successfully recalibrate their self-evaluation to better match the current condition or environment would theoretically have an improved subjective well-being or quality of life. The second gap-discrepancy theory includes examining satisfaction from the perspective of the

individual in his or her broader environment. Unlike revising internal standards of evaluation, the person-environment fit model proposes that satisfaction can be conceptualized as the match between the individual's qualities and those of the environment. This is also referred to as "goodness of fit" (French, Rodgers, & Cobb, 1974). Finally, the third gap discrepancy model is social comparison theory, which suggests that discrepancies between desired and actual states are a result of one's social comparisons. Social comparison theory has implications for understanding QOL in that when an individual compares himself to others, his QOL will be improved if the individual perceives his own situation as superior to that of his comparison.

**Adaptive Functioning Models.** The adaptive functioning models are yet another theoretical basis for understanding QOL. An adaptive functioning model has similarities to the other theories, which suggest that discrepancies between actual and perceived functioning yield a reduced subjective well-being. Adaptive functioning theory posits that a person's qualities may not need to match those of the environments, as the goodness of fit models suggested, but proposes that an individual's QOL is inherently related to the person's "coping or mastery behaviors" within an environment (Fabian, 1990, p. 164). Within this type of theory, the individual's ability to proactively function within the environment is integral to QOL.

**Dynamic Process Model.** Angermeyer and Kilian's (1997) dynamic process model of QOL has some semblance of the adaptive functioning model, in that one's ability to adapt to the situation is largely based on one's ability to "continuously reconcile his own desires and goals with the conditions of his environment and his

ability to meet the social demands associated with the fulfillment of these desires and goals” (p. 23). As Angermeyer and Kilian (1997) discussed in their explanation of their dynamic process model of QOL, one’s subjective rating of their environment and subjective well-being are largely influenced by socio-cultural factors, individual development and personality. The authors explained that because people develop in a broad range of circumstances, the ability to adapt to new situations will vary. For example, they suggested that it is unreasonable to assume that an individual who has been deprived and has low needs and desires has a high QOL. To address this issue, Angermeyer and Kilian (1997) recommended a means to measure the person’s adaptations across specified domains (e.g. relationships, social acceptance, and goal attainment).

**QOL as an Outcome Measure.** Since QOL has gained attention in psychological literature, it has been touted as an increasingly important outcome measure. As Eiser and Morse (2001) described, “QOL, and its measurement can seem nebulous or unscientific compared to traditional endpoints. However, the more elusive and subjective outcomes may, in the end, be more important” (p. 249). There are at least four reasons why researchers have suggested QOL is a relevant outcome variable. First, because it is multidimensional and inclusive, QOL conveys a broader understanding of health status (Matza, Swensen, Flood, Secnik, & Leidy, 2004). Second, it is believed that QOL can assist with educational programming across domains (Watson & Keith, 2002). Third, QOL has been heralded as “the gold standard” for developing clinical practice at the individual level and broader community health (Coghill et al., 2009). At an extreme, it has been suggested that



patients may be better served if they were diagnosed according to their QOL rather than by existing diagnosis (Stein & Jessop, 1989). Finally, by measuring QOL, it acknowledges that some symptoms of a condition may not be distressing, and thus QOL is a good subjective indicator of the impact of a condition.

**QOL Measurement in Children.** The importance of QOL as an outcome measure transcends age groups, and thus has garnered attention for use with the children and adolescents. There are unique issues when studying the construct in these age groups. Because of the subjective nature of QOL, the child perspective is widely believed to be integral in obtaining an accurate understanding of the child's QOL (Matza et al., 2004 (a); Ravens-Sieberer, et al., 2006). The accuracy of children's reports, though, can be called into questions due to young children's inability to convey reliable information about their health status (Matza et al. et al., 2004(a)). It has been suggested that at approximately age 9 or 10 years, children can provide reliable self-reports regarding their QOL (Landgraf & Abetz, 1996). Until this age, parent reports may be a more accurate estimate of QOL.

When parents report on their child's functioning, though, several limitations are possible. First, it has been suggested that parent reports are unduly influenced by parents' own functioning. For example, mothers' psychopathology and stress has been associated with their report of their child's QOL (Bastiaansen, Koot, & Ferdinand, 2005). The effect of parent psychology on their report of their child should be interpreted cautiously, due to more comprehensive reports that such an effect is said to be minimal (e.g., Richters, 1991). Second, school-aged children spend a significant amount of time at school, which plays an important role in a child's life,

thus a parent proxy report may not accurately capture school functioning (Coghill et al., 2009). Finally, discrepancies between reporters are evident when parents and children report on both psychosocial and physical domains of QOL (Klassen, Miller, & Fine, 2006; Upton, Lawford, & Eiser, 2008).

### **Relationship between Attention Problems and QOL**

Significant efforts have been made to study the QOL of individuals with ADHD. Substantial evidence shows that ADHD negatively affects QOL (Danckaerts et al., 2010). In a meta-analysis conducted by Danckaerts et al. (2010), the authors suggested a large and significant effect size between children with and without ADHD when parents reported QOL. More specifically, ADHD appears to reduce psychosocial QOL more so than physical QOL (Perwien et al., 2006). In comparison to groups of people with newly diagnosed cancer, and cerebral palsy, those with ADHD reported commensurate or lower QOL (Varni & Burwinkle, 2006). The relationship between poor QOL and ADHD is strongly supported (Matza et al., 2004(b)); however, there are additional factors that may shed further light on the relationship between ADHD and QOL.

**Symptom Severity and QOL.** The significant inverse relationship between ADHD symptoms and QOL further supports the association between ADHD and QOL (Matza et al., 2004(b)). This association was especially strong (e.g.,  $r = -.56$ ) for the psychosocial domain of QOL. Attention symptoms specifically, are moderately and significantly negatively correlated with the psychosocial domain ( $r = -.54$ ). Furthermore, individuals using treatment to mitigate symptoms of ADHD reported lower QOL (Martenyi et al., 2009). Given the association between medication use

and symptom severity (Thiruchelvam, Charach, & Schachar, 2001), Martenyi et al.'s (2009) study may further support the association between symptom severity and reduced QOL. Consistent with the literature on symptom severity and poorer QOL, when ADHD symptoms improved with treatment, individuals reported increased QOL (Matza et al., 2004(b)). Several empirical studies have assessed the efficacy of medication on increasing QOL. Amoxetine has been shown to improve QOL across samples (e.g., risk avoidance domain,  $ES = .56$ , Escobar et al., 2009; general QOL, no effect size provided, Wehmeier et al., 2007); however, the effect size for change in academic performance and psychosocial functioning were small (Brown, Perwien, Faries, Kratochvil, & Vaughan, 2006).

**Issues with the Relationship between Attention and QOL.** Despite the evidence in favor of the relationship between ADHD and QOL, there is limited research that exists to further understand this relationship. Studies included in the meta-analysis by Danckaerts et al. (2010) generally examined the direct correlations between QOL and ADHD or group comparisons. In one study (Topolski et al., 2004), self-reported depressive symptomatology was covaried in the analysis because of the established relationship between depression and QOL. The covariate is likely to be an important variable in this investigation, because the difference between the ADHD group and control group did not differ significantly on the general QOL domain when depression was included as a covariate. In another study (Matza, Secnik, Mannix, & Sallee, 2005) included in Danckaerts et al.'s (2010) meta-analysis, between 53 and 62% of the ADHD sample had "some problems" with anxiety/depression; however, there was no statistical adjustment for internalizing levels. Other studies included in

the meta-analysis failed to consider internalizing psychopathology or symptomatology as possible influential variables in the relationship.

A second potential issue that was revealed by a study in the meta-analysis is the effect of medication for ADHD on the reported QOL. Interestingly, children who are taking medication to mitigate their ADHD symptoms may not report a substantially better psychosocial QOL than those children who are not taking medication for ADHD (Escobar et al., 2009). Another study found that pharmaceutical treatment improved QOL; however, after 10 weeks of treatment, QOL was still a standard deviation below the mean of children without ADHD (Prasad et al., 2007). Such findings may suggest that an improvement in ADHD symptoms may not lead to or only partially lead to an improved QOL, especially in the psychosocial domain. Perhaps other underlying difficulties associated with ADHD (e.g., depression or anxiety) are more influential in determining QOL.

In summary, there appears to be robust evidence that children and adolescents with ADHD experience lower quality of life. A recent meta-analysis suggested that the effect size of quality of life between children with ADHD and children without ADHD is large, and indicated that multiple studies reported differences of 1.5 to 2 SD between children with and without ADHD, when parents report (Danckaert et al., 2010). An overall effect size was not reported for the seven self-report studies included in the meta-analysis; however, the authors suggested that the children did not report reduced QOL with the same magnitude as parents report. Positive illusory bias and lack of insight were offered as possible explanations for the self-report findings. Limited research has investigated this relationship beyond direct comparison between

groups and correlation between constructs. In the one study that did account for internalizing problems, results revealed that such a variable may be influential in the relationship between ADHD and QOL. Further examination of the relationship between attention problems and QOL appears warranted.

### **Association between Internalizing Problems and QOL**

There are several ways to examine the potential role internalizing problems play in the association between attention and QOL. This section will examine internalizing problems and QOL from a theoretical and empirical perspective.

**Internalizing Problems and Theoretical Models of QOL.** Emerging from the notion that QOL is a subjective evaluation of one's life, the Satisfaction Model proposes that "personal characteristics, objective life conditions in various life domains and the satisfaction with life conditions in these various domains" underlie QOL (Lehman, 1988). Based on the Satisfaction theory of QOL, internalizing problems could influence QOL in at least two ways. As Gladis, Gosch, Dishuk, and Crits-Christoph (1999) suggested, "depression distorts judgment and thus depressed people see their condition as more negative than other raters" (p. 322). Negative bias has long been associated with depression. For example, Beck's (1967, 1976) theory of depression included the "cognitive triad:" negative conception of the self, negative interpretation of life experiences, and a nihilistic view of the future. Researchers have subsequently provided substantial evidence in support of the theory of depression and negative bias (e.g., Lewinsohn, Steinmetz, Larson, & Franklin, 1981; Raes, Hermans, & Williams, 2006).

In addition to the negative bias exhibited by individuals with depression, depression is also highly associated with life satisfaction (Koivumaa-Honkanen, Kaprio, Honkanen, Viinamaki, & Koskenvuo, 2004; Kortte, Gilbert, Gorman, & Wegener, 2010; Wong, 2010), thus if QOL is determined by level of life-satisfaction, depression would seemingly play a pivotal role.

According to the gap-discrepancy theories, depression may influence QOL in several ways. The first gap-discrepancy model pertains to revising one's internal standard of evaluation. Perhaps the best way to understand how depression may influence an individual's revised standard of evaluation is by considering the depressive attributional style. The depressive attributional style consists of making internal-stable-global attributions about negative life events. In a study by Gladstone, Kaslow, Seeley, and Lewinsohn (1997), results indicated that depressed adolescents' attributions regarding negative life events were more internal, stable, and global than were nondepressed adolescents. The internal-stable-global attribution style would seemingly interfere with an individual's revision of his internal standard of evaluation, because the attribution style suggests stability across time and situations.

Anxiety and depression could influence one's goodness of fit with their environment in several ways, especially for children. One of the most important environments that children navigate is the school environment. At school, children are challenged to socialize with peers, follow rules and procedures, and achieve academically. Children with anxiety and depression typically do not meet these challenges as easily as students without internalizing problems (Masi et al., 2000; Mychailyszyn, Mendez, & Kendall, 2010). Mychailyszyn et al. (2010) found that,

according to teachers, children without anxiety worked significantly harder, learned significantly better and performed significantly better academically than did children with anxiety. Masi et al. (2010) reported that children with self-reported depression and anxiety tended to underestimate their academic competence. This finding suggests that teachers and children with internalizing problems perceived the school functioning of those with internalizing problems as poorer than students without depression and anxiety. Based on this literature, it is arguable that the goodness of fit between children with internalizing problems and the school setting is weaker than the fit for children without these symptoms.

With regard to the third gap-discrepancy theory, a substantial body of evidence exists pertaining to social comparison and depression. Researchers have identified that individuals with depression tend to engage in social comparisons more often than people with more mild depression symptoms (Weary, Marsh, & McCormick, 1994), which would seemingly be adaptive according to social comparison theory. Upon further investigation about the social comparisons of people with depression, they tend to make more social comparisons to people who they perceive to be better off than they are (Butzer & Kuiper 2006). One proposed idea is they compare themselves to people who they perceive are faring better themselves, because of their negative outlook (Wood, Michela, & Giordano, 2000). Similarly, individuals with anxiety tend to make more social comparisons to individuals who they perceive are better off than they are (Butzer & Kuiper, 2006), although it appears less is known about the function these social comparisons serve. In light of these

findings, it is plausible that internalizing problems could impact QOL, as conceptualized by social comparison theory.

The impact of internalizing problems on problem-solving may have negative implications for QOL, as conceptualized by adaptation models. An important environment in which all individuals exist is the social environment, and to successfully master this environment, social problem solving is an important process. Social problem solving, as described by Siu and Shek (2010), includes “effective application of rational problem-solving skills... [and] a positive orientation towards problem solving” (p. 394). In their study of adolescents, Siu and Shek (2010) reported that both anxiety and depression were negatively associated with social problem solving. In a study that investigated perceived problem-solving effectiveness, self-perceived effective problem solvers reported lower levels of depressive symptomatology than did those individuals who perceived themselves to be ineffective problem solvers (Dixon, 2000). With regard to the adaptive functioning model, depression may thwart a person’s problem solving abilities and thus impede active mastery and coping in one’s environment and lower QOL.

### **Empirical Evidence of the Relationship between Internalizing and QOL.**

Empirical research conducted on internalizing problems and QOL has revealed several findings about the relationship between the two constructs. First, the negative association between QOL and depression and/or anxiety has been consistently reported across studies (Ay-Woan, Sarah, LyInn, Tsyr-Jang, & Ping-Chuan, 2006; da Silva Lima & de Almeida Fleck, 2006; Hoffman, Dukes, & Wittcehn, 2008; Jho, 2001; Mechanic, McAlpine, Rosenfield, & Davids 1994; Vitiello et al., 2006;



Watanabe, et al., 2010). When symptoms of internalizing distress were treated, QOL was found to improve (Moses, Leuchter, Cook, & Abrams, 2006). Treatment failure also has been associated with QOL (Ravindran, Matheson, Griffiths, Merali, & Anisman, 2002).

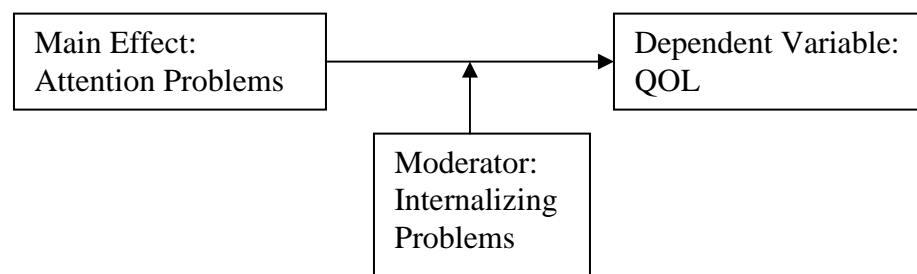
Because QOL is typically comprised of physical, psychological and social aspects of well-being, researchers have focused on the possible relationship internalizing problems and each of these components of QOL. In a study investigating QOL in cancer patients, both anxiety and depression were negatively correlated with all three aspects of QOL when pain level and illness severity were controlled (Smith, Gomm, & Dickens, 2003). Chung, Pan and Hsiung (2009) reported that depression predicted physical and psychological QOL. These findings would suggest that depression and anxiety impact QOL beyond just the psychological component measured.

### **Mediating and Moderating Variables and Effects**

Moderation and mediation procedures have been used to advance the study of relationships between constructs via third variables. Often confused and used interchangeably, *moderation* and *mediation* serve two distinct purposes and have unique sets of premises. Baron and Kenny (1986) presented a description of each and the underlying assumptions and rules for each procedure. Moderation is used to understand at what level of a moderating variable an independent variable affects a dependent variable. More simply, a moderating variable changes the relationship between the independent and dependent variables. Using the variables attention, internalizing and QOL, if internalizing moderated the relationship between attention

and QOL, attention and internalizing would significantly interact, and thus QOL would not be stable across levels of attention when internalizing problems are factored into the model (e.g., people with poor attention and high internalizing problems have poor QOL, but people with poor attention and low internalizing problems might have high QOL).

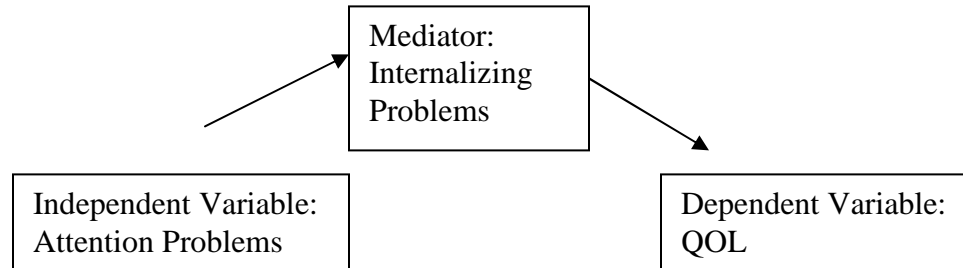
**Figure 1.** Moderation



In mediation, the mediating variable suggests a different effect the third variable has on the relationship between constructs. As Baron and Kenny (1986) explain, “a given variable may be said to function as a mediator to the extent that it accounts for the relation between the predictor and the criterion...mediators speak to how or why such effects occur” (p. 1176). In the case of attention problems, internalizing and QOL, attention problems would influence QOL as a result of corresponding changes in internalizing symptomatology. Mediation is thus a causal model by nature (Baron & Kenny, 1986). Mediation is said to have occurred if the correlation between the independent variable and the dependent variable is significantly reduced when the mediating variable is introduced in the model (See Figure 2). In the example of attention problems, internalizing and QOL, internalizing is said to mediate the relationship between attention and QOL if the partial correlation

between them is zero, or negligible, after adjusting for the covariance between internalizing and QOL.

**Figure 2.** Mediation



## CHAPTER FOUR

### **Methodology and Analyses**

Data for this study are part of a larger data set. The Assessing Bipolar Disorder: A Community-Academic Blend (ABACAB) data were collected at two sites in the mid-western region between 2002 and 2009. One site was a university hospital, and the other was an outpatient community mental health treatment facility. The intended purpose of the ABACAB project was to improve the assessment of juvenile bipolar spectrum disorders. Using a clinical epidemiological design, potential participants were either a consecutive cases series or randomly drawn from intakes at treatment facilities, depending on the volume of referrals at any given time.

**Data Collection Procedure.** Participants were recruited from two types of clinical settings. One setting was a community mental health center with four urban sites. At the two largest sites, a random sample of families seeking outpatient treatment was invited to participate in the ABACAB study. The second recruitment setting was an outpatient academic medical center. The medical center was enrolling participants for more than a dozen different research projects. Target samples for research studies included: bipolar disorder, unipolar depression, ADHD, conduct disorder, post traumatic stress disorder and aggressive behavior. Information about various treatment protocols were presented to families through advertisements and referrals, and interested families participated in diagnostic assessment for screening and baseline estimates.

All participants completed parental consent forms and subsequent assessments at an outpatient clinic in a Midwestern city. Assessment procedures were consistent for all participants. Parents completed the Kiddie-Schedule for Affective Disorders and Schizophrenia (K-SADS), KINDL-R (Ravens-Stieberger & Bullinger, 1998), Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2001), and a diagnostic interview. All diagnoses were based on review of K-SADS, treatment history and consensus of trained mental health care providers. An expert consensus team, consisting of at least one licensed psychologist, used the Longitudinal Expert Evaluation of All Data (LEAD; Spitzer, 1983) framework during the diagnostic review process. Diagnostic decisions were based on the following information 1) results from the K-SADS; 2) developmental history; 3) family history of mental illness; and 4) psychiatric history, including current diagnoses. Diagnoses were blind to rating scale scores gathered from families by a second research assistant during the same day.

**Participants.** There were several inclusion and exclusion criteria when initially recruiting individuals to participate in the ABACAB study. First, participants were required to be between the ages of 5 years 0 months and 18 years 11 months old and seeking outpatient treatment. Families were excluded if they did not speak conversational English in order to complete the interview, or if their child had a pervasive developmental disorder as assessed by review of psychiatric history, psychiatric interview or by an Autism Screening Questionnaire score of 15 or above (Berument, Rutter, Lord, Pickles, & Bailey, 1999). Participants were also excluded if there was suspected moderate, severe or profound mental retardation, as evidenced by

educational history or a score of below 70 on a standardized cognitive ability test or the Peabody Picture Vocabulary Test—Third Edition (Dunn & Dunn, 1997). There were no exclusion criteria for gender or race.

In the current study, data from 590 children and adolescents ages 8 to 18 years were included. One quarter of the participants in the study were recruited at the university hospital and the remaining three quarters were recruited from the outpatient community mental health center. Results from chi square analysis indicated that there were no differences on gender, rate of ADHD, oppositional defiant disorder, conduct disorder or the overall rate of comorbid conditions between participants from the two settings. Significant differences were revealed for race, the occurrence of bipolar disorder, occurrence of post traumatic stress disorder, parent income and parent education. Bipolar was a more common occurrence at the university hospital setting, PTSD was more prevalent at the community mental health center and parent income and level of education was higher at the university hospital setting.

**Table 3.** Participant Demographic Data

<b>Sample Characteristics</b>	<b><i>N</i></b>	<b>Percent</b>
Male	333	56.4
Female	257	43.6
Race		
African American	418	71
Asian or Pacific Islander	2	.3
Hispanic	9	1.5
White	141	23.9
Other	19	3.2
Age	M= 12.09	SD= 2.627

## Measures

**KINDL-R.** The revised KINDL, KINDL-R (Ravens-Stieberger & Bullinger, 1998), is designed to measure QOL in the general population and individuals with illness. The KINDL-R was originally developed in German before it was translated into English. Separate measures exist for parents and children. The parent version of the KINDL-R for ages 8-16 includes 24 items, all of which are scored on a 5 point Likert scale (0= *never*, 5= *all the time*). Subscales include: physical well-being, emotional well-being, self-esteem, family, friends, and school. Higher scores indicate better QOL.

The psychometric properties of the KINDL-R have been examined and deemed to be within acceptable limits. In a large scale representative sample of over 2,000 German children and adolescents, Ravens-Sieberger, Erhart, Wille, Bullinger and the BELLA study group (2008) reported evidence of the psychometric properties of the KINDL-R parent version. Cronbach's  $\alpha$  were between 0.64 and 0.74 for the six subscales and 0.84 for the total measure. This study also revealed that the KINDL-R parent version differentiated children with and without mental health problems.

**Child Behavior Checklist (CBCL).** The Child Behavior Checklist (Achenbach & Rescorla, 2001) is one measure of the larger Achenbach System of Empirically Based Assessment (ASEBA; Achenbach & Rescorla, 2001). The CBCL is a parent report instrument and is a broad-band measure of behavior and emotional problems. There are different versions based on the child's age. The preschool form is used for children aged 1.5 to 5 years, and the school-age form is used for children 6 to 18 years. In this study, age appropriate forms were administered. The school-age

form of the CBCL includes 118 behavior problem items and asks caregivers to use a 3 point Likert type rating scale (e.g., 0= Not True; 1= Somewhat or Sometimes True; 2= Very True or Often True) to rate the child's behavior.

The CBCL (Achenbach and Rescorla, 2001) has been shown to have acceptable psychometric properties. Because only the Attention Problems and Internalizing scales are used in the current study, the discussion of psychometric properties will be limited to these specific scales. Several indices of reliability are published in the technical manual. Test-retest and internal consistency for the Attention Problems scales are  $r = .92$  and  $\alpha = .86$ , respectively. For the Internalizing scale,  $r = .91$  and  $\alpha = .90$ . The mean test-retest interval was 8 days. The stability of Attention Problems and Internalizing after 12 months is .70 and .80, respectively.

The validity of the Attention Problems and Internalizing scales has been supported by examining criterion-related validity and construct validity. To examine criterion-related validity, the authors determined the extent to which the scale scores could accurately discriminate referred and nonreferred children. A significant referral status effect was evident in the Attention Problems. Lastly, with regard to construct validity, the authors provide evidence that the scales correlate with intended constructs. The Internalizing scale and Attention Problems is correlated with the DSM-IV Checklist for depression and ADHD, respectively.

## **Analysis**

**Descriptive Statistics and Missing Data.** Descriptive statistics will be examined for the sample. Mean scores, standard deviation and ranges will be calculated for each variable. Skewness and kurtosis will also be investigated for each



variable in order to determine the extent that distributions deviate from normal. Minimum and maximum values will be inspected for outliers and impossible values that may be a result of inaccurate data entry. In addition to examining descriptive statistics about variables under investigation, demographic information including gender, race and age will be analyzed, as well as diagnostic information.

The rate of missing data will be determined prior to all analyses by obtaining the product of the number of variables and the number of participants followed by dividing the product by the number of complete data points. As suggested by Allison (2002), if the number of missing data is small, those cases missing will be deleted listwise.

### **Inferential Statistics**

Inferential statistics will be discussed specifically for each hypothesis.

#### **QUESTION ONE: What are the correlations between attention, internalizing symptomatology and QOL?**

To examine the correlations between each of the study variables, Pearson bivariate correlation will be used. Pearson's correlation is deemed appropriate if the following four assumptions are met: normally distributed data, homoskedasticity, interval or ratio level of measurement for both variable, and independence of sampled cases. As discussed, all variables will be tested for violations of normality. The Shapiro-Wilk test will be used to determine significant violations of normality. The third assumption is that data must be measured on at least an interval data. All variables are measured on an interval scale. Lastly, based on the epidemiological design, the cases are deemed to be independent, thus satisfying the final assumption.

If the analysis for normality suggests non-normal distributions, nonparametric correlations (e.g., Spearman's Correlation Coefficient) will be compared to the Pearson coefficient to show the extent to which violations might be influencing the results.

**QUESTION TWO: Do internalizing problems uniquely contribute to QOL beyond attention?**

In order to test the variance of QOL explained by internalizing problems and attention, regression analysis will be conducted. In the first regression, attention problems will act as the independent variable and QOL will be the dependent variable. In the second block, both attention and internalizing problems will be entered as the independent variables. The variance explained in each model will be compared. Tests of the regression coefficient for internalizing and attention problems in the second block will directly test the hypothesis that each makes a unique contribution to the prediction of QOL.

**QUESTION THREE: Does internalizing symptomatology mediate the relationship between attention and QOL?**

Mediation analysis in social science has evolved from Baron and Kenny's (1986) conceptualization. Since the Baron and Kenny model, it has been operationalized and refined (e.g., Holmbeck, 1997; MacKinnon, 2008) and challenged (Kraemer, Stice, Kazdin, Offord, & Kupfer, 2001). A brief description of the differences between the Baron and Kenny model and MacArthur model, as the Kraemer et al. version is often called, will be discussed for the sake of justifying the use of the Baron and Kenny model in the current study. The most remarkable

difference between the two models is the degree of emphasis placed on temporal ordering in determining causation. Mediation models are causal models, even if the data and design do not allow for causal conclusions. Mediation models are deemed causal, because an independent variable is said to cause a mediating variable, which is said to cause the dependent variable. Some substitute influence for cause. Based on this premise, in the MacArthur framework, Kraemer et al. (2001) make the claim that because of this path of influence, the independent variable must temporally precede the mediator, which must precede the dependent variable. As the authors suggest, a lack of temporal ordering leads to dubious results. As they explain, “a variable may be labeled in one study as a confounder and in another study of the same outcome in the same population as a moderator or mediator, depending on which factor is the focus of each investigation” (Kraemer et al., 2001, p. 849). The MacArthur conceptualization of mediation precludes conducting mediation analysis on cross-sectional data, because temporal precedence cannot be established (MacKinnon, 2008).

In Baron and Kenny’s tradition of mediation, temporal precedence is not requisite for evaluating the extent to which a third variable could explain the relationship between two correlated variables. Instead, the four assumptions discussed below are sufficient for determining that the data are consistent with mediation. Furthermore, the relationship between variables is usually based on theoretical rationale (MacKinnon, 2008). The lack of temporal precedence as a requisite for mediation analysis allows for mediation analysis to be conducted with cross-sectional data. This premise has been particularly important to social science research, because

longitudinal data is significantly more difficult to obtain for a variety of reasons (e.g., financial, participant attrition, etc.). The Baron and Kenny framework can utilize data from weaker designs in exchange for making more qualified statements about the results.

In the current study, the Baron and Kenny (1986) model of mediation will be used, because cross-sectional data are being analyzed and because extant literature provides a strong rationale as to why depression precedes reduced QOL and why attention problems would precede internalizing problems. There are four assumptions for determining mediation: 1) the independent variable and the mediator must be significantly associated, 2) the independent variable and the dependent variable must be significantly associated, 3) the mediator and the dependent variable must be significantly associated, and 4) the influence of the independent variable on the dependent variable is reduced when the mediator is entered into the model. The first three assumptions will be tested in previous analysis discussed above. To conduct the mediation analysis, Holmbeck (1997) has operationalized the analysis using a regression approach. In order to test the four assumptions, a series of regression analyses will be computed. In the first regression analysis, attention problems will be the independent variable and internalizing problems will act as the dependent variable. Second, attention problems will be entered as the independent variable and QOL will act as the dependent variable. Next attention problems and internalizing problems will be entered as predictor variables and QOL will act as the dependent variable. To test whether internalizing problems mediates the relationship between attention problems and QOL, the comparison between the association of attention

problems and QOL will be compared between the second regression analysis and the third. If internalizing problems mediate the relationship, the relationship between attention problems and quality of life will be reduced in the third regression analysis. Sobel's (1988) significance test to determine the indirect effect of attention problems on QOL via internalizing problems will be calculated to examine the significance of the mediating effect.

**QUESTION FOUR: Does internalizing symptomatology moderate the relationship between attention and QOL?**

To answer the final question, regression analysis will be used to investigate the possible moderating effect of internalizing symptomatology on attention and QOL. To test for a moderating effect, the goal is to determine if there is a significant interaction between the independent variable and moderating variable. When entered into the regression equation, the independent variable and moderating variable will be entered into the regression equation before the interaction of the independent variable and the moderator, as operationalized as the product of the two mean-centered predictors. Variables will be entered simultaneously. As Holmbeck (1997) explains, the independent variable and the moderator will likely be highly correlated with the interaction term, thus as Aiken and West (1991) suggest, the variables will be centered (i.e., scores are computed to a deviation score with a mean of zero). A significant interaction term will suggest a moderation effect. Regression lines will be plotted for high and low values of the moderator.

## CHAPTER FOUR

### **Results**

#### **Descriptive Statistics and Missing Data Analyses**

Preliminary data analyses examined means and standard deviations of the sample, as well as possible deviations from normality. Descriptive statistics were based on an *N* of 590 and were calculated for the variables under investigation as well as demographic and clinical characteristics of the sample. Results indicated that the number of comorbid diagnosis ranged from zero to 10; the mean number of diagnoses was 4. Table 4 illustrates the percent of individuals with the 6 most prevalent diagnoses. Most notably, 60% of the sample had an ADHD diagnosis. Median annual level of income for the primary caregiver was \$10,000 to \$14,999; however, approximately 22% of the sample did not provide information regarding incomes; thus the information is based on approximately 80% of the sample. Based on needs-testing, almost all cases presenting to the community mental health clinic were sufficiently impoverished to be eligible for Medic Aid. The median level of education completed by the primary caregiver was high school or GED. The level of education was provided by approximately 97% the sample.

**Table 4.** Diagnoses

	<b>Percent of Sample</b>
ADHD	60
Oppositional defiance disorder	37
Depression	31
Anxiety	27
Conduct disorder	13
Bipolar Disorder	13
Post traumatic stress disorder	9

See Table 3 for descriptive statistics for other demographic and clinical variables. Because of the high number of participants that were diagnosed with ADHD and internalizing disorders, the overall *T*-scores for attention problems and internalizing problems were expected to be elevated. Interestingly though, the mean attention problems score for individuals *without* a diagnosis of ADHD was approximately one standard deviation above the normative mean of the instrument ( $M = 64.10$ ), suggesting that attention problems were evident even among participants who did not have an ADHD diagnosis. Skewness and kurtosis were within acceptable limits for each variable. The range for skewness was  $-.50$  to  $.43$ , and the range for kurtosis was  $-.44$  to  $.16$ .

**Table 5.** Means and Standard Deviations

	<b><i>M</i></b>	<b><i>SD</i></b>	<b>Range</b>
KINDL	59.42	13.26	14.6-95.8
CBCL- Internalizing	63.75	10.22	34-92
CBCL- Attention	69.42	11.77	50-100

The Shapiro-Wilk test was used as a follow-up analysis of possible violations of normality. Results indicated that the internalizing variable ( $W = .978$ ;  $p < .05$ ) and the attention problems variable ( $W = .966$ ;  $p < .05$ ) violated assumptions of normality.

distributed data, consistent with there being small departures from normality combined with a large sample size. The absolute values of skewness and kurtosis were well within ranges where regression estimates generally remain accurate (Tabachnick & Fidell, 2007).

**Missing Data.** Sample size was reduced by an  $N$  of 20 due to missing data for the covariates. For all analyses testing study models, the primary caregiver's level of education attainment was entered in the first block in order to control for possible confounding effects of socioeconomic status. Sample size for regression analysis was  $N = 570$ . To determine the extent of missing data the number of complete data points was divided by the product of the number of variables and the number of participants. The result was small and thus cases with incomplete data were deleted listwise. As Allison (2002) suggested, deleting case listwise yields a more efficient estimate than deleting cases pairwise when correlations between variables is high.

**Correlations.** As an additional check for possible effects of the violation of normality, Spearman's correlation coefficient was calculated for all variables and compared to the Pearson's coefficient. Spearman's procedure does not assume normality; Pearson's does. All variables were moderately correlated (See Table 6), and the correlation estimates were always within .01 of each other, indicating that the estimates were not sensitive to the small departures from normal distributions in the variables. The significant correlations between study variables provide a preliminary basis for subsequent mediation analysis. Additionally, parent level of education correlated significantly with QOL ( $-.10; p < .01$ ); thus it entered in the first block in all regression analyses to control for its possible confounding effect.



**Table 6.** Correlations – Spearman’s rho below diagonal and Pearson’s R above the diagonal

	KINDL	CBCL-Internalizing	CBCL-Attention
KINDL	1	-.50***	-.26***
CBCL- Internalizing	-.51***	1	.47***
CBCL- Attention	-.25***	.46***	1

\*\*\* $p < .005$

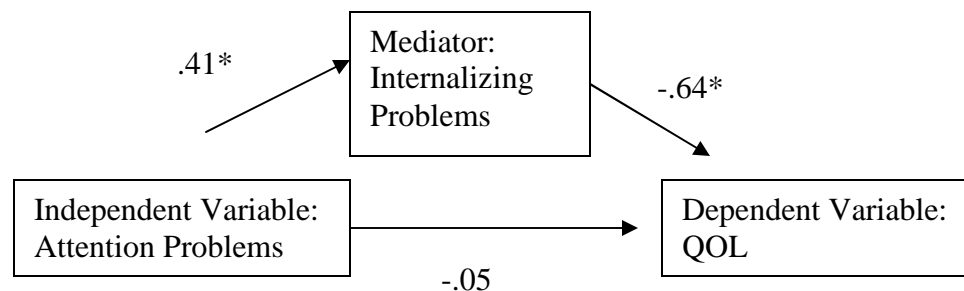
### Analyses for testing models under investigation

**Model 1: Unique Separate Effects.** To test the possible unique contribution of internalizing problems to QOL beyond attention problems, parent education entered in the first block, attention problems entered in the second block and internalizing problems entered in the third block. When internalizing symptoms and attention were entered together in the regression, a significant amount of the variance in QOL was explained ( $R^2 = .28, 3 df$ ). Of the two independent variables, internalizing symptoms was the only significant predictor (part  $r = -.44$ ), thereby suggesting that internalizing problems uniquely contribute to QOL beyond attention problems even after controlling for parent level of education. Conversely, the results indicated that attention problems made no incremental contribution to the prediction of QOL after controlling for internalizing problems. Thus the model positing that each would have unique effects on QOL was supported for internalizing but not attention problems.

**Model 2: Mediation Model.** Consistent with the Baron and Kenny (1986) model, a series of separate regression analyses tested a possible mediating effect. The first analysis estimated the direct effect of attention problems on QOL, while accounting for parent level of education. The data were consistent with the hypothesis that attention problems predicts QOL ( $b = -.31$ ). When attention problems and

internalizing problems entered together as independent variables in the second regression, the relationship between attention problems and QOL dropped to an insignificant and negligible level ( $b = -.05$ ;  $p = .311$ ). Because of this change in the relationship between the independent and dependent variable when the mediating variable is entered in the regression equation, a significant mediating effect is said to have occurred (see Figure 3). The Sobel test indicated a significant indirect effect ( $b = -.264$ ;  $p < .001$ ). The combination of a significant indirect effect and a non-significant residual direct effect is consistent with internalizing problems fully mediating the relationship between attention problems and QOL.

**Figure 3. Mediation Analysis**

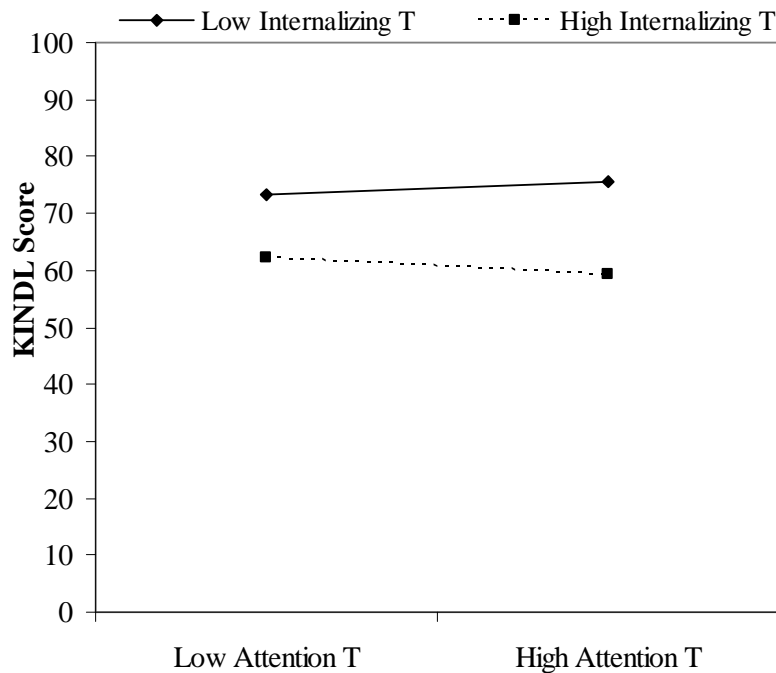


\* $p < .05$

**Model 3: Moderation Model.** Prior to conducting analyses to test the third model, variables were mean centered to reduce the potential extreme correlation between the independent variables and the interaction term. In the regression analysis to test for possible moderation, parent level of education entered in the first block, attention problems, internalizing problems and the interaction term entered in the second block, and QOL was the dependent variable. The model with the interaction predicted a similar amount of variance in QOL as the model without the interaction

( $R^2 = .28$ ), though the interaction term was significant ( $b = -.01$ ;  $p < .01$ ), thereby suggesting that internalizing problems moderate the relationship between attention problems and QOL. Further review of the data suggests that there is a relatively small ( $b = -.012$ ) change in the slope of the regression of QOL on attention problems as a result of one-unit of change in internalizing problems, thereby suggesting a small interaction effect. The visual representation of the data illustrates the results. The graph indicates that it is an ordinal interaction, or noncrossover interaction – the simple slopes do not cross within the range of clinically plausible scores (Aiken & West, 1991). It also represents the significant main effect for internalizing problems: Participants with elevated internalizing problems had lower QOL than participants with fewer internalizing symptoms. This was generally consistent across levels of attention problems.

**Figure 4.** Interaction Effect



**Exploratory Analysis.** One additional exploratory analysis was conducted to compare correlations between separate domains of QOL (e.g., social, emotional) and attention problems. Results indicated a low yet statistically significant correlation between parent reported attention problems and the emotional subscale of parent reported QOL ( $r = -.17$ ;  $p < .01$ ) and moderate and statistically significant correlations between attention problems and the friendship subscale of parent reported QOL ( $r = -.289$ ;  $p < .01$ ).

## CHAPTER 5

### **Discussion**

Consistent with other's findings, the results of the current study indicated a moderate correlation between study variables. The strongest correlation was between internalizing problems and QOL. The relationship was consistent with what others have reported between depression and QOL (e.g.,  $r = -.46$ ; Ay-Woan et al., 2006). The relationship between attention problems and QOL was also generally consistent with what has been reported. Matza et al.'s (2005) correlation of  $r = -.31$  for attention problems and QOL is slightly higher than the correlation in the current study,  $r = -.25$ . The correlation in the current study was weaker than the correlation between QOL and attention problems reported by Matza et al. ( $r = -.56$ ; 2004). The discrepancy between findings may have been a result of the QOL measure used. Matza et al. (2004) reported correlations between the psychosocial domain of QOL and attention problems, whereas in the current study, overall QOL was correlated with attention problems. In the follow up exploratory analysis, results indicated that attention problems were weakly correlated with the emotional subscale of QOL ( $r = -.17$ ). This is discrepant from the moderate correlation reported by Matza et al. (2004).

Because of the significant impairments experienced by individuals with attention problems, the negative impact on QOL is unsurprising. Children with attention problems have been shown to have poorer academic performance (Frazier, Youngstrom, Glutting, & Watkins, 2007), poorer social relationships (Heiman, 2005)

and more anxiety and depression (Angold et al. 1999). Due to the wide variety of problems experienced by children with attention problems, researchers have suggested the possibility that the social and emotional deficits associated with ADHD may be the catalyst for reduced QOL (Wehmeier, Schacht & Barkley, 2010). The authors provide hypothetical explanations as to why social emotional problems associated with ADHD contribute to poorer QOL; however they state that “the effect of these problems on quality of life has rarely been addressed (Wehmeier, Schacht & Barkley, 2010; p. 210). The aim of the current study was to address this gap in the research by empirically testing the relationship between attention problems, emotional distress and QOL.

In the current study, three separate models of the relationship between attention problems, internalizing problems and QOL were examined to determine which best explained the data. In the first model, the possibility that attention problems and internalizing problems uniquely contributed to QOL was examined. Results indicated that when entered together into the regression equation, 28% of the variance in QOL could be attributed to the model. Moreover, internalizing problems accounted for a significant amount of variance in QOL and attention problems was no longer a significant predictor. As a result, the hypothesis that internalizing problems accounted for QOL beyond what attention problems accounted for was supported. However, the results indicated that attention problems did not make a unique contribution to QOL after controlling for concurrent internalizing problems.

Due to the contribution of internalizing problems beyond attention problems in predicting QOL, the hypothesis that internalizing problems mediates

QOL was examined. Using the Baron and Kenny (1986) model of mediation, regression analyses suggested that internalizing problems fully mediates the relationship. This finding supports Wehmeier et al.'s (2010) position that emotional impairments in individuals with attention problems have a negative impact on QOL. Results also suggest that the development of internalizing problems, which is a common occurrence for individuals with attention problems, may represent the main mechanism leading to poorer QOL.

By design mediation analysis suggests causality and thus the results of the current study could be interpreted as consistent with a causal relationship between the variables. A rationale was developed above to suggest the temporal order of symptoms, and it appears consistent with multiple converging lines of evidence (as reviewed above). Briefly, there is evidence to support the belief that attention problems precede internalizing problems and internalizing problems precede poorer QOL. The rationale for the temporal order coupled with the current results indicates that attention problems lead to internalizing problems, which in turn cause reduce QOL. These results suggest that attention problems lower QOL indirectly, by way of increasing internalizing problems. This has implications for interpreting the Danckaerts et al. (2010) meta-analysis whereby children with ADHD were rated as having significantly lower QOL than their non-ADHD peers. Accounting for the possible mediating role of internalizing problems in the meta-analysis may have changed the authors' interpretation of results. When the findings of the meta-analysis are integrated with the results of current study, it is reasonable to suggest that the

children and adolescents with ADHD who developed internalizing problems were those who were rated as having a poorer QOL.

In the final model that was analyzed, the interaction of attention problems and internalizing problems was examined. When the interaction term was entered into the regression analysis, it proved to be a significant predictor of QOL, thereby suggesting that children and adolescents with attention problems and internalizing problems were at the highest risk for poorer QOL whereas those with relatively few attention problems yet elevated internalizing problems reported a slightly yet significantly higher QOL. Further review though revealed that the difference between the regression slopes across levels of internalizing was small and the main effect of internalizing problems was prominent. More simply, regardless of level of attention problems, children and adolescents with internalizing problems reportedly had a poorer QOL than those without internalizing problems. This finding is important when interpreting the mediation model, because as MacKinnon (2008) stated, if the interaction term is insignificant the mediation is said to be consistent across levels of the independent variable. A variable is said to be a mediator when the effect of the predictor is consistent across levels of the mediating variable. The result of the moderating analysis also contributes to a better understanding of the co-occurrence of attention problems and internalizing problems. When the two conditions co-occur, there is not an increase risk of poorer QOL beyond what would be predicted in individuals with few attention problems and elevated internalizing problems. This is particularly interesting due to the finding that the co-occurring internalizing problems



has been shown to further impact the functioning of individuals with ADHD (e.g., Biederman et al., 1996; Newcorn et al., 2004).

### **Limitations**

The current study should be interpreted in light of the following possible limitations. First, information regarding attention problems, internalizing symptoms and quality were gathered from only parent report measures. Previous research has demonstrated that parents provide important information about their child's functioning across a wide variety of areas (e.g., externalizing problems and internalizing problems); however, there is also evidence that parent and child reports of internalizing problems are discrepant (e.g., Achenbach, McConaughy, & Howell, 1987; Danckaerts et al; 2010; Nelson & Harwood, 2011). Relying solely on one informant may over or under represent the extent of the problem. There is no gold standard for evaluating the internalizing problems; however, using multiple informants may yield a accurate clinical picture of both overt and internal symptoms (Kazdin, 1990).

Second, there is more than one method for conducting a mediation analysis. In the current study, the Baron and Kenny (1986) method for mediation was used. The decision to use Baron and Kenny's model was based on the data collection procedure and the research design. Using the Baron and Kenny model, mediation analysis can be conducted on data that were collected simultaneously, as was the case in the current study. It is not imperative to empirically establish temporal ordering to determine causation under the Baron and Kenny model of mediation. One of the potential problems of conducting a mediation analysis on data that was collected

simultaneously is that the theoretical temporal ordering of variables is not verified. If in fact the theory that attention problems precede internalizing problems and these problems precede reduced QOL is inaccurate, the interpretation of the findings would be called into questions. In contrast to the Baron and Kenney mediation model, the MacArthur model of mediation requires that data are collected over time to confirm the theoretical assumption regarding the temporal ordering of the variables. The current study's findings are limited by the research design used to determine mediation. This limitation was addressed to some degree by reviewing the literature about age of onset and developmental sequencing of problems, confirming that it is plausible that attention problems often precede internalizing problems.

The current study is also possibly limited by the prevalence of mental health problems within the sample of participants. The mean scores on the Internalizing Problems and Attention Problems subscale revealed that these problems were more severe than what would be expected in the general population. Moreover, the average number of co-morbid diagnoses given to individuals was four, suggesting that children and adolescents participating in the study had significant mental health problems. Children and adolescents without mental health problems were underrepresented in the sample, thus making the generalizations to a typically developing, healthy population potentially problematic. Conversely, the high rates of attention problems and internalizing problems did ensure that there was sufficient variability in these constructs to provide adequate power to examine their relationship in a clinical sample.

Finally, the clinical epidemiological design of the study provided a representative sample of clients from the two settings from which data were collected. Results of the demographic variables however suggested that the sample was not representative of the general population with regard to family income, parent level of education and race. The results from the study may not be generalizable to a broader population of children and adolescents. This is an empirical question that could be tested by replication and extension to a new community-based non-clinical sample, ideally using consistent measurement strategies and statistical analyses.

### **Implications for Research**

Based on the study's findings and the limitations, there are several important future directions for researchers purporting to better understand the relationship between attention problems, internalizing problems and QOL. Results from this study indicated that internalizing symptomatology mediates the relationship between attention problems and QOL using parent report measures. Research has suggested that children are believed to be adequate reporters of internalizing symptoms, thus making them a valuable informant source. Others have suggested that children are the most important informant in reporting internalizing problems (Angold et al., 1987; Edelbrock, Costello, Dulcan, Conover, & Kale, 1986; Herjanic & Reich, 1997). Because extant literature provides evidence to suggest low agreement between parent and child report of internalizing problems, the findings from the current study should be compared to a similar study in which children self-reports of QOL and internalizing problems are used.

Second, an investigation into other variables that may impact the relationship between the three constructs may provide valuable information. For example, examining the stability of findings across gender may be beneficial. There is evidence that females experience more internalizing problems than males (Nolen-Hoeksema, 2001) and also that females report a lower QOL than males (Bastiaansen et al., 2005). Similarly, age may prove to be an important variable to consider. It has been suggested that as children and adolescents develop, internalizing symptoms increase and QOL decreases (Bastiaansen et al., 2005; Michael, Bisegger, Fuhr, Abel & The KIDSCREEN group, 2009).

Lastly, with regard to future research directions, internalizing symptomatology, as measured in this study, is comprised of anxiety and depression. Because anxiety and depression are distinct constructs with different symptoms and treatment, it may prove beneficial to parse internalizing problems into its distinct parts to better understand if one disorder is a stronger mediator of the relationship between attention problems and QOL.

### **Implications for Practice**

In addition to several implications for further research, the findings of the current study have practical implications. First, as was suggested in the current study, children and adolescents present at outpatient clinics with numerous symptoms and co-occurring psychiatric problems. Understanding the relationship between symptoms and conditions allows practitioners to better predict outcomes and intervene appropriately.

For assessment and intervention, the clarification between the relationships of the constructions has several implications. First, when assessing for attention problems, the importance of assessing for concurrent internalizing problems should not be overlooked. As this study and others have revealed, attention problems and symptoms of anxiety and depression are associated. Thus, when a child presents with attention problems or parents suspect possible ADHD, internalizing problems should be simultaneously assessed. Internalizing problems are particularly important to assess because, as this study found, it is by way of internalizing problems that children with attention problems have poorer QOL. When internalizing symptoms are present, the likelihood of poorer QOL increases. School psychologists are in a unique position at schools to conduct comprehensive assessments across mental health problems. Broad behavior ratings scales (e.g., CBCL) provide a wide range of information about behavior and social emotional problems across externalizing and internalizing problems.

Improving QOL in individuals is an important goal of therapeutic services. This study provides a preliminary framework for developing intervention strategies. Based on the findings, the mediation role that internalizing problems plays in the relationship between attention problems and QOL would suggest that efforts aimed to prevent or improve internalizing problems would have positive implications for QOL. There are potentially numerous ways to intervene in internalizing problems. Attention problems and characteristics of ADHD can emerge as early as preschool and are thought to precede internalizing problems. Given this finding, identifying those students as at-risk for developing internalizing problems is an important first step.

Subsequently managing the negative impact that the attention problems have on these children's social relationships and academic achievement may allow children with attention problems to develop a positive self-concept and decrease emotional distress. Similarly, attempts to provide children and adolescents with positive school environments has been shown to help students develop perceptions of control and mastery beliefs (Rudolph, Kurlakowsky, & Conley, 2001), which may decrease depressive symptoms. Diminishing the negative implications of attention problems may disrupt the path to depressive and anxious symptoms.

For students who have a constellation of attention problems and internalizing problems, the study would suggest that intervening on internalizing problems would likely have a greater impact on QOL than treating the attention problems in isolation. Effective means to reduce internal distress have been well documented in research. A variety of therapy techniques have been shown to help improve anxiety and depression; however, one of the more common evidence-based treatments for children is cognitive behavior therapy (CBT; Chambless & Ollendick, 2001). In a review of using CBT treatment with adults with ADHD, Knouse and Safren (2010) acknowledge that this is an "emerging" area of research. The authors provide a rationale for the potential benefits of using CBT to treat individuals with ADHD, especially with regards to cognitive restructuring and identifying cognitive errors; however, empirical research aimed at examining the efficacy of CBT at reducing emotional distress is limited. In their review, Knouse and Safren (2010) outline both randomized control studies and uncontrolled studies that have been

conducted and illustrate the initial support for CBT in the treatment of ADHD and co-occurring symptoms.

## **Conclusion**

The current study provided a framework for understanding the relationship between attention problems, internalizing problems and QOL. The relationship between attention problems and QOL has been demonstrated across studies, but the role of third variables has yet to be examined in detail. Because of the prevalence of co-occurring anxiety and depression in children and adolescents with attention problems, the investigation of internalizing problems as a possible third variable is compelling. Internalizing problems are also highly associated with QOL, furthering the potential influence on the relationship between attention problems and QOL. Results of the current study indicated that the mediation model best explained the relationship between the three variables, suggesting that the development of internalizing problems precipitates poorer QOL. These findings have implications for research investigating QOL and attention problems in that internalizing problems are likely a salient confounding variable. The results also have clinical implications for improving QOL in individuals with attention problems or ADHD. Efforts targeted at reducing anxious and depressive symptoms may prove to be most beneficial for increasing QOL.

## REFERENCES

- Abbey, A., & Andrews, F. M. (1985). Modeling the psychological determinants of life quality. *Social Indicators Research*, 16, 1-34.
- Achenbach, T. M., McConaughy, S. H., & Howell, C. T. (1987). Implications of child/adolescent behavioral and emotional problems: Cross-informant correlations for situational specificity. *Psychological Bulletin*, 101, 213-232.
- Achenbach, T. M. & Rescorla, L. A. (2001). Manual for the ASEBA School-Age Forms & Profiles. Burlington, VT: University of Vermont , Research Center for Children, Youth, & Families.
- Aiken, L. S., & West, S. G. (1991). *Multiple Regression: Testing and Interpreting Interactions*. Thousand Oaks: Sage.
- Alessandri, S. M. (1992). Attention, play, and social behavior in ADHD preschoolers. *Journal of Abnormal Child Psychology*, 20, 289-302.
- Alizadeh, A., & Andries, C. (2002). Interaction of parenting styles and attention deficit hyperactivity disorder in Iranian parents. *Child & Family Behavior Therapy*, 24, 37-52.
- Allison, P. D. (2002). *Missing data*. Thousand Oaks: Sage.
- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text rev.). Washington, DC: Author.
- Angermeyer, M. C., & Kilian, R. (1997). Theoretical models of quality of life for mental disorders. In H. Katschnig, H. Freeman & N. Sartorius (Eds.), *Quality of life in mental disorders* (pp. 19-30). New York: John Wiley & Sons.
- Angold, A., Costello, E. J., & Erkanli, A. (1999). Comorbidity. *Journal of Child Psychology and Psychiatry*, 40, 57-87.
- Angold, A., Weissman, M. M., John, K., Merikangas, K. R., Prusoff, B. A., Wickramaratne, P., Gammon, C. D., et al. (1987). Parent and child reports of depressive symptoms in children at low and high risk of depression. *Journal of Child Psychology and Psychiatry*, 28, 901-915.



- Angst, J., Gamma, A., Baldwin, D. S., Ajdacic-Gross, V., & Rossler, W. The generalized anxiety spectrum: prevalence, onset, course and outcome. *European Archives of Psychiatry and Clinical Neuroscience*, 259, 37-45.
- Ay-Woan, P., Sarah, C. P., LyInn, C., Tsyr-Jang, C., & Ping-Chuan, H. (2006). Quality of life in depression: Predictive models. *Quality of Life Research*, 15, 39-48. doi: 10.1007/s11136-005-0381-x
- Baldwin, J. S., & Dadds, M. R. (2008). Examining alternative explanations of the covariation of ADHD and anxiety symptoms in children: A community study. *Journal of Abnormal Child Psychology*, 36, 67-79. doi: 10.1007/s10802-007-9160-1
- Barkley, R. (2006). *Attention-deficit hyperactivity disorder: A handbook for diagnosis and treatment* (3rd ed.). New York: Guilford.
- Barkley, R. A. (1998). *Attention deficit hyperactivity disorder: A handbook for diagnosis and treatment* (2<sup>nd</sup> ed.). New York: Guilford.
- Barkley, R. A. (1990). Attention deficit disorders: History, definition, and diagnosis. In M. Lewis & S. M. Miller (Eds.), *Handbook of Developmental Psychopathology* (pp. 65-75). New York: Kluwer Academic.
- Barkley, R. A., DuPaul, G. J., & McMurray, M. B. (1990). A comprehensive evaluation of attention deficit disorder with and without hyperactivity. *Journal of Consulting and Clinical Psychology*, 58, 775-789.
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51, 1173-1182.
- Barry, M. M. (1997). Well-being and life satisfaction as components of quality of life in mental disorders. In H. Katschnig, H. Freeman & N. Sartorius (Eds.), *Quality of life in mental disorders* (pp. 31-42). New York: John Wiley & Sons.
- Bastiaansen, D., Koot, H. M., & Ferdinand, R. F. (2005). Determinants of quality of life in children with psychiatric disorders. *Quality of Life Research*, 14, 1599-1612. doi: 10.1007/s11136-004-7711-2
- Bastiaansen, D., Koot, H. M., Ferdinand, R. F., & Verhulst, F. C. (2004). Quality of life in children with psychiatric disorders: Self-, parent, and clinician report. *Journal of the American Academy of Child and Adolescent Psychiatry*, 43. doi: 10.1097/00004583-200402000-00019

- Baxter, J. & Rattan, G. (2004). Attention deficit disorder and the internalizing dimension in males, ages 9-0 through 11-11. *International Journal of Neuroscience*, 114, 817-832. doi: 10.1080/00207450490450064
- Beck, A. T. (1967). *Depression: Causes and treatments*. Philadelphia: University of Pennsylvania Press.
- Beck, A. T. (1976). *Cognitive therapy and the emotional disorders*. New York: International Universities Press.
- Berument, S. K., Rutter, M., Lord, C., Pickles, A., & Bailey, A. (1999). Autism screening questionnaire: diagnostic validity. *British Journal of Psychiatry*, 175, 444-451.
- Biederman, J., Faraone, S. V., Keenan, K., Benjamin, J., Krifcher, B., Moore, C., Sprich, S., Udaglia, K., Jellinek, M. S., Steingard, R., Spencer, T., Norman, D., Kolodny, R., Kraus, I., Perrin, J., Keller, M. B., Tsuang, M. T. (1992). Further evidence for family-genetic risk factors in attention deficit hyperactivity disorder (ADHD): Patterns of comorbidity in proband and relatives in psychiatrically and pediatrically referred samples. *Archives of General Psychiatry*, 49, 728-738.
- Biederman, J., Faraone, S. V., Milberger S., Guite, J., Mick, E., Chen, L, et al. (1996). A prospective 4-year follow-up study of attention-deficit hyperactivity and related disorders. *Archives of General Psychiatry*, 53, 437-446.
- Biederman, J., Mick, E., & Faraone, S. V. (1998). Depression in attention deficit hyperactivity disorder (ADHD) children: "True" depression or demoralization? *Journal of Affective Disorders*, 47, 113-122. doi: S0165-0327(97)00127-4
- Biederman, J., Ball, S. W., Monuteaux, M. C., Mick, E., Spencer, T. J. McCreary, M., Cote, M., & Faraone, S. V. (2008). New insights into the comorbidity between ADHD and major depression in adolescent and young adult females. *Journal of the American Academy of Child and Adolescent Psychiatry*, 47, 426-434. doi: 10.1097/CHI.0b013e31816429d3
- Biederman, J., Faraone, S., Mick, E., & Lelon, E. (1995). Psychiatric comorbidity among referred juveniles with major depression: Fact or artifact? *Journal of the American Academy of Child and Adolescent Psychiatry*, 34, 579-590.
- Birmaher, B., Ryan, N. D., Williamson, D. E., Brent, D. A., Kaufman, J., Dahl, R. E., Perel, J., & Nelson, B. (1996). Childhood and adolescent depression: A review of the past 10 years: Part I. *Journal of the American Academy of Child and Adolescent Psychiatry*, 35, 1427-1439.
- Blackman, G. L., Ostrander, R., & Herman, K. C. (2005). Children with ADHD and depression: A multisource, multimethod assessment of clinical, social, and

- academic functioning. *Journal of Attention Disorders*, 8, 195-207. doi: 10.1177/1087054705278777
- Braaten, E. B., Biederman, J., Monuteaux, M. C., Mick, E., Calhoun, E., Carran, G., et al. (2003). Revisiting the association between attention-deficit/hyperactivity disorder and anxiety disorders: A familial risk analysis. *Biological Psychiatry*, 53, 93-99.
- Brown, R. T., Perwien, A., Faries, D. E., Kratochvil, C. J., & Vaughan, B. S. (2006). Atomoxetine in the management of children with ADHD: Effects on quality of life and school functioning. *Clinical Pediatrics*, 45, 819-827. doi: 10.1177/0009922806294219
- Butzer, B., & Kuiper, N. A. (2006). Relationships between the frequency of social comparisons and self-concept clarity, intolerance of uncertainty, anxiety, and depression. *Personality and Individual Differences*, 41, 167-176. doi: 10.1016/j.paid.2005.12.017
- Campbell, D. T., & Fiske, D. W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin*, 56, 81-105.
- Cantwell, D. P. (1996). Attention deficit disorder: A review of the past 10 years. *Journal of the American Academy of Child & Adolescent Psychiatry*, 35, 978-987.
- Caron, C. & Rutter, M. (1991). Comorbidity in child psychopathology: Concepts, issues and research strategies, 32, 1063-1080.
- Chambless, D. L., & Ollendick, T. H. (2001). Empirically supported psychological interventions: Controversies and evidence. *Annual Review of Psychology*, 52, 685-716.
- Chung, L., Pan, A., & Hsiung, P. (2009). Quality of life for patients with major depression in Taiwan: A model-based study of predictive factors. *Psychiatry Research*, 168, 153-162. doi: 10.1016/j.psychres. 2008.04.003
- Coghill, D., Danckaerts, M., Sonuga-Barke, E., Sergeant, J., and the ADHD European Guidelines Group. (2009). Practitioner Review: Quality of life in child mental health—conceptual challenges and practical choices. *The Journal of Child Psychology and Psychiatry*, 50, 544-561. doi: 10.1111/j.1469-7610.2009.02009.x
- Danckaerts, M., Songua-Barke, E. J. S., Banaschewski, T., Buitelaar, J., Dopfner, M., Hollis, C., Santosh, P., Rothenberger, A., Sergeant, J., Steinhausen, H. Taylor, E., Zuddas, A., & Coghill, D. (2010). The quality of life of children with attention deficit/hyperactivity disorder: A systematic review. *European Child & Adolescent Psychiatry*, 19, 83-105. doi: 10.1007/s00787-009-0046-3

- Danforth, J. S., Barkley, R. A., & Stokes, T. F. (1991). Observations of parent-child interactions with hyperactive children: Research and clinical implications. *Clinical Psychology Review, 11*, 707-727.
- da Silva Lima, A. F. B., & de Almeida Fleck, M. P. (2007). Subsyndromal depression: An impact on quality of life? *Journal of Affective Disorders, 100*, 163-169. doi: 10.1016/j.jad.2006.10.010
- Daviss, W. B. (2008). A review of co-morbid depression in pediatric ADHD: Etiologies, phenomenology, and treatment. *Journal of Child and Adolescent Psychopharmacology, 18*, 565-571. doi: 10.1089/cap.2008.032
- Diener, E. (1984). Subjective well-being. *Psychological Bulletin, 95*, 542-575.
- Dixon, W. A. (2000). Problem-solving appraisal and depression: Evidence for a recovery model. *Journal of Counseling & Development, 78*, 87-91.
- Dunn, L. M., & Dunn, L. M. (1997). *Examiner's Manual for the Peabody Picture Vocabulary Test—Third Edition*. Circle Pines, MN: American Guidance Service.
- DuPaul, G. J., McGoey, K. E., Eckert, T. L., & VanBrakle, J. (2001). Preschool children with attention-deficit/hyperactivity disorder: Impairments in behavioral, social, and school functioning. *Journal of the American Academy of Child and Adolescent Psychiatry, 40*. doi: 10.1097/00004583-200105000-00009
- Edelbrock, C., Costello, A. J., Dulcan, M. K., Conover, N., & Kalas, R. (1986). Parent-child agreement on child psychiatric symptoms assessed via structured interview. *Journal of Child Psychology and Psychiatry, 27*, 181-190.
- Eiser, C., & Morse, R. (2001). The measurement of quality of life in children: past and future perspectives. *Developmental and Behavioral Pediatrics, 22*, 248-256. doi: 0196-206X/00/2204-0248
- Escobar, R., Montoya, A., Polavieja, Pepa, Cardo, E., Artigas, J., Hervas, A., & Fuentes, J. (2009). Evaluation of patients' and parents' quality of life in a randomized placebo-controlled atomoxetine study in attention-deficit/hyperactivity disorder. *Journal of Child and Adolescent Psychopharmacology, 19*, 253-263. doi: 10.1089/cap.2008.0109
- Fabian, E. S. (1990). Quality of life: A review of theory and practice implications for individuals with long-term mental illness. *Rehabilitation Psychology, 35*, 161-170.
- Faraone, S. V., & Biederman, J. (1997). Do attention deficit hyperactivity disorder and major depression share familial risk factors? *The Journal of Nervous & Mental Disease, 185*, 533-541.

- Frazier, T. W., Youngstrom, E. A., Glutting, J. J., & Watkins, M. W. (2007). ADHD and achievement: Meta-analysis of the child, adolescent, and adult literatures and a concomitant study with college students. *Journal of Learning Disabilities, 40*, 49-65.
- Frazier, T. W., Demaree, H. A., & Youngstrom, E. A. (2004). Meta-analysis of intellectual and neuropsychological test performance in attention-deficit/hyperactivity disorder. *Neuropsychology, 18*, 543-555. doi: 10.1037/0894-4105.18.3.543
- Freeman, A. J., Youngstrom, E. A., Michalak, E., Siegel, R., Meyers, O. I. & Findling, R. L. (2009). Quality of life in pediatric bipolar disorder. *Pediatrics, 123*, 446-452. doi: 10.1542/peds.2008-0841.
- French, J. R. P., Rodgers, W., & Cobb, S. (1974). Adjustment as person-environment fit. In C. V. Coelho, D. A. Hamburg, J. E. Adams (Eds.), *Coping and adaptation* (pp. 123- 151). New York: Basic Books.
- George, L. K., & Bearon, L. B. (1980). Gladis, M. M., Gosch, E. A., Disuk, N. M., & Crits-Christoph, P. (1999). Quality of life: Expanding the scope of clinical significance. *Journal of Consulting and Clinical Psychology, 67*, 320-331.
- Ghanizadeh, A., & Shams, F. (2007). Children's perceived parent-child relationships and family functioning in attention-deficit/hyperactivity disorder. *Child & Family Behavior Therapy, 29*, 1-11. doi: 10.1300/J019v29n03\_01
- Gladstone, T. R. G., Kaslow, N. J., Seeley, J. R., & Lewinsohn, P. M. (1997). Sex difference, attributional style, and depressive symptoms among adolescents. *Journal of Abnormal Child Psychology, 25*, 297-305.
- Guterk, B. A., Allen, H., Tyler, T. R., Lau, R. R., & Majchrzak, A. (1983). The importance of internal referents as determinants of satisfaction. *Journal of Community Psychology, 11*, 111-120.
- Hammerness, P., Geller, D., Petty, C., Lamb, A., Bristol, E., & Biederman, J. (2010). Does ADHD moderate the manifestation of anxiety disorders in children. *European Journal of Child and Adolescent Psychiatry, 19*, 107-112. doi: 10.1007/s00787-009-0041-8
- Herjanic, B., & Reich, W. (1997). Development of a structured psychiatric interview for children: Agreement between child and parent on individual symptoms. *Journal of Abnormal Child Psychology, 25*, 21-31.
- Herman, K. C., Lambert, S. F., Ialongo, N. S., & Ostrander, R. (2007). Academic pathways between attention problems and depressive symptoms among urban African American children. *Journal of Abnormal Child Psychology, 35*, 265-274. doi: 10.1007/s10802-006-9083-2

- Heiman, T. (2005). An examination of peer relationships of children with and without attention deficit hyperactivity disorder. *School Psychology International*, 26, 330-339. doi: 10.1177/0143034305055977
- Hoffman, D. L., Dukes, E. M., Wittchen, H. (2008). Human and economic burden of generalized anxiety disorder. *Depression and Anxiety*, 25, 72-90.
- Holmbeck, G. N. (1997). Toward terminological, conceptual, and statistical clarity in the study of mediators and moderators: Examples from the child-clinical and pediatric psychology literatures. *Journal of Consulting and Clinical Psychology*, 65, 599-610.
- Hoza, B., Gerdes, A. C., Mrug, S., Hinshaw, S. P., Bukowski, W. M., Gold, J. A., Arnold, L. E., Abikoff, H. B., Conners, C. K., Elliot, G. R., Greenhill, L. L., Hechtman, L., Jensen, P. S., Kraemer, H. C., March, J. S., Newcorn, J. H. Severe, J. B., Swanson, J. M., Vitiello, B., Wells, K. C., & Wigal, T. (2005). Peer-assessment outcomes in the multimodal treatment study of children with attention deficit hyperactivity disorder. *Journal of Clinical Child and Adolescent Psychology*, 34, 74-86.
- Hurtig, T., Ebeling, H., Taanila, A., Miettunen, J., Smalley, S. L., McGough, J. J., Loo, S. K., Jarvelin, M., & Moilanen, I. K. (2007). ADHD symptoms and subtypes: Relationship between childhood and adolescent symptoms. *Journal of the American Academy of Child and Adolescent Psychiatry*, 46, 1605-1613.
- Jarrett, M. A., & Ollendick, T. H. (2008). A conceptual review of the comorbidity of attention-deficit/hyperactivity disorder and anxiety: Implications for future research and practice. *Clinical Psychology Review*, 28, 1266-1280. doi: 10.1016/j.cpr.2008.05.004
- Jensen, P. S., Hinshaw, S. P., Kraemer, H. C., Lenora, N., Newcorn, J. H., Abikoff, H. B., et al. (2001). ADHD comorbidity findings from the MTA study: Comparing comorbid subgroups. *Journal of the American Academy of Child & Adolescent Psychiatry*, 40, 147-158.
- Jensen, P. S., Martin, D., & Cantwell, D. P. (1997). Comorbidity in ADHD: Implications for research, practice, and DSM-V. *Journal of the American Academy of Child and Adolescent Psychiatry*, 36, 1065-1079.
- Jho, M. (2001). Study on the correlation between depression and quality of life for Korean women. *Nursing and Health Sciences*, 3, 131-137.
- Karustis, J. L., Power, T. J., Rescorla, L. A., Eiraldi, R. B., & Gallagher, P. R. (2000). Anxiety and depression in children with ADHD: Unique associations with academic and social functioning. *Journal of Attention Disorders*, 4, 133-149.

- Kazdin, A. E. (1990). Childhood depression. *Journal of Child Psychology and Psychiatry*, 31, 121-160.
- Klassen, A. F., Miller, A., & Fine, S. (2006). Agreement between parent and child report of quality of life in children with attention-deficit/hyperactivity disorder. *Child: Care, Health & Development*, 32, 397-406. doi: 10.1111/j.1356-2214.2006.00609.x
- Klimkeit, E., Graham, C., Lee, P., Morling, M. Russo, D. & Tonge, B. (2006). Children should be seen and heard: Self-report of feelings and behaviors in primary-school-age children with ADHD. *Journal of Attention Disorders*, 10, 181-191. doi: 10.1177/1087054706289926
- Koivumaa-Honkanen, H., Kaprio, J., Honkanen, R., Viinamaki, H., & Koskenvuo, M. (2004). Life satisfaction and depression in a 15-year follow-up of healthy adults. *Social Psychiatry and Psychiatric Epidemiology*, 39, 994-999. doi: 10.1007/s00127-004-0833-6
- Kortte, K. B., Gilbert, M., Gorman, P., & Wegener, S. T. (2010). Positive psychological variables in the prediction of life satisfaction after spinal cord injury. *Rehabilitation Psychology*, 55, 40-47. doi: 10.1037/a0018624
- Kovacs, M., Akiskal, H. S., Gatsonis, C., & Parrone, P. L. (1994). Childhood-onset dysthymic disorder: Clinical features and prospective naturalistic outcome. *Archives of General Psychiatry*, 51, 365-374.
- Kraemer, H. C., Stice, E., Kazdin, A., Offord, D., & Kupfer, D. (2001). How do risk factors work together? Mediators, moderators, and independent, overlapping, and proxy risk factors. *American Journal of Psychiatry*, 158, 848-856.
- Landgraf, J.M., & Abetz, L.N. (1996). Measuring health outcomes in pediatric patients: Issues in psychometrics and applications. In B. Spilker (ed.), *Quality of life and pharmacoeconomics in clinical trials* (pp. 793–802). Philadelphia: Lippencott-Raven.
- Lange, G., Sheerin, D., Carr, A., Dooley, B., Barton, V., Marshall, D., Mulligan, A., Lawlor, M., Belton, M., & Doyle, M. (2005). Family factors associated with attention deficit hyperactivity disorder and emotional disorders in children. *Journal of Family Therapy*, 27, 76-96.
- Lavigne, J. V., Gibbons, R. D., Christoffel, K. K., Arend, R., Rosenbaum, D., Binns, H., Dawson, N., Sobel, H., & Isaacs, C. (1996). Prevalence rates and correlates of psychiatric disorders among preschool children. *Journal of the American Academy of Child & Adolescent Psychiatry*, 35, 204-214.

- Lehman, A. F. (1988). A Quality of Life Interview for the chronically mentally ill (QOLI). *Evaluation and Program Planning*, 11, 51-62.
- Lee, S. S., & Hinshaw, S. P. (2006). Predictors of adolescent functioning in girls with attention deficit hyperactivity disorder (ADHD): The role of childhood ADHD, conduct problems, and peer status. *Journal of Clinical Child and Adolescent Psychology*, 35, 356-368.
- Lewinsohn, P. M., Steinmetz, J. L., Larson, D. W., & Franklin, J. (1981). Depression-related cognitions: Antecedent or consequence? *Journal of Abnormal Psychology*, 90, 213-219.
- Lewinsohn, P. M., Rhode, R., & Seeley, J. R. (1993). Psychosocial characteristics of adolescents with a history of suicide attempt. *Journal of the American Academy of Child and Adolescent Psychiatry*, 32, 60-68.
- Lilienfeld, S. O. (2003). Comorbidity between and within childhood externalizing and internalizing disorders: Reflections and directions. *Journal of Abnormal Child Psychology*, 31, 285-291.
- Loe, I. M., & Feldman, H. M. (2007). Academic and educational outcomes of children with ADHD. *Journal of Pediatric Psychology*, 32, 643-654. doi: 10.1093/jpepsy/jsl054
- Lubke, G. H., Hudziak, J. J., Derks, E. M., van Bijsterveldt, T. & Boomsma, D. I. (2009). Maternal ratings of attention problems in ADHD: Evidence for the existence of a continuum. *Journal of the American Academy of Child and Adolescent Psychiatry*, 48, 1085-1093. doi: 10.1097/CHI.0b013e3181ba3dbb
- MacKinnon, D. P. (2008). *Introduction to Statistical Mediation Analysis*. New York: Lawrence Erlbaum Associates.
- March, J. S., Swanson, J. M., Arnold, E. L., Hoza, B., Conners, C. K., Hinshaw, S. P., et al. (2000). Anxiety as a predictor and outcome variable in the multimodal treatment study of children with ADHD (MTA). *Journal of Abnormal Child Psychology*, 28, 527-541.
- Martenyi, F., Treuer, T, Gau, S. S., Hong, S. D., Palaczky, M., Suba, J., Tiberiu, M., Uhlikova, P., Xu, T., Zoroglu, S., Gadow, K. D., Wallon, R., & Harrison, G. (2009). Attention-deficit/hyperactivity disorder diagnosis, co-morbidities, treatment patterns, and quality of life in a pediatric population in central and eastern Europe and Asia. *Journal of Child and Adolescent Psychopharmacology*, 19, 363-378. doi: 10.1089/cap.2008.0148
- Mash, E. J., & Wolfe, D. A. (2007). *Abnormal Child Psychology*, 3<sup>rd</sup> Edition. Belmont, CA: Thomson Wadsworth.



- Masi, G., Sbrana, B., Poli, P., Tomaiuolo, F., Favilla, L., & Marcheschi, M. (2000). Depression and school functioning in non-referred adolescents: A pilot study. *Child Psychiatry and Human Development*, 30, 161-171.
- Matza, L. S., Swensen, A. R., Flood, E. M., Secnik, K., & Leidy, N. K. (2004a). Assessment of health-related quality of life in children: A review of conceptual, methodological, and regulatory issues. *Value in Health*, 7, 79-92.
- Matza, L. S., Rentz, A. M., Secnik, K., Swensen, A. R., Revicki, D. A., Michelson, D., Spencer, T., Newcorn, J. H., & Kratochvil, C. J. (2004b). The link between health-related quality of life and clinical symptoms among children with attention-deficit hyperactivity disorder. *Developmental and Behavioral Pediatrics*, 25, 166-174.
- Matza, L. S., Secnik, K., Mannix, S., & Sallee, F. R. (2005). Parent-proxy EQ-5D ratings of children with attention-deficit hyperactivity disorder in the US and the UK. *Pharmacoeconomics*, 23, 777-790.
- Mechanic, D., McAlpine, D., Rosenfield, S., & Davis, D. (1994). Effects of illness attribution and depression on the quality of life among persons with serious mental illness. *Social Science & Medicine*, 39, 155-164.
- Michael, G., Bisegger, C., Fuhr, D. C., Abel, T., & The KINDSCREEN group. (2009). Age and gender differences in health-related quality of life of children and adolescents in Europe: a multilevel analysis. *Quality of Life Research*, 18, 1147-1157.
- Milberger, S., Biederman, J., Faraone, S. V., Murphy, J., & Tsuang, M. T. (1995). Attention deficit hyperactivity disorder and comorbid disorders: Issues of overlapping symptoms. *American Journal of Psychiatry*, 152, 1793-1799.
- Moses, T., Leuchter, A. F., Cook, I., & Abrams, M. (2006). Does the clinical course of depression determine improvement in symptoms and quality of life? *The Journal of Nervous and Mental Disease*, 194, 241-248. doi: 10.1097/01.nmd.0000207358.15230.80
- MTA Cooperative Group. (1999). A moderators and mediators of treatment response for children with attention deficit hyperactivity disorder. *Archives of General Psychiatry*, 56, 1088-1096.
- Mychailyszyn, M. P., Mendez, J. L., & Kendall, P. C. (2010). School functioning in youth with and without anxiety disorders: Comparisons by diagnosis and comorbidity. *School Psychology Review*, 39, 106-121.

- Nelson, J. M. & Harwood, H. (2011). Learning disabilities and anxiety: A meta-analysis. *Journal of Learning Disabilities*, 44, 3-17.
- Newcorn, J. H., Miller, S. R., Ivanova, I., Schulz, K. P., Kalmar, J., Marks, D. J., & Halperin, J. M. (2004). Adolescent outcome of ADHD: Impact of childhood conduct and anxiety disorders. *CNS Spectrums*, 9, 668-678.
- Nolen-Hoeksema, S. Gender differences in depression. *Current Directions in Psychological Science*, 10, 173-176.
- Perwien, A. R., Kratochvil, C. J., Faries, D. E., Vaughan, B. S., Spencer, T., & Brown, R. T. (2006). Atomoxetine treatment in children and adolescents with attention-deficit hyperactivity disorder: What are the long-term health-related quality-of-life outcomes? *Journal of Child and Adolescent Psychopharmacology*, 16, 713-724.
- Pliszka, S. R., Carlson, C., & Swanson, J. M. (1999). *ADHD with comorbid disorders: Clinical assessment and management*. New York: Guilford.
- Prasad, S., Harpin, V., Poole, L., Zeitlin, H., Jamdar, S., & Puvanendran, K. (2007). A multi-centre, randomized, open-label study of atomoxetine compared with standard current therapy in UK children and adolescents with attention-deficit/hyperactivity disorder (ADHD). *Current Medical Research and Opinion*, 23, 379-394. doi: 10.1185/030079906X167309
- Raes, F., Hermans, D., & Williams, J. M. G. (2006). Negative bias in the perception of others' facial emotional expressions in major depression: The role of depressive rumination. *The Journal of Nervous and Mental Disease*, 194, 796-799. doi: 10.1097/01.nmd.0000240187.80270.bb
- Ravens-Sieberer, U., Bullinger, M. (1998). Assessing health-related quality of life in chronically ill children with German KINDL: first psychometric and content analytical results. *Quality of Life Research*, 7, 399-407.
- Ravens-Sieberer, U., Erhart, M., Wille, N., Bullinger, M. and the BELLA study group. (2008). Health-related quality of life in children and adolescents in Germany: results of the BELLA study. *European Child and Adolescent Psychiatry*, 17 (suppl. 1), 148-156.
- Ravens-Sieberer, U., Erhart, M., Wille, N., Wetzel, R., Nickel, J., & Bullinger, M. (2006). Generic health-related quality-of-life assessment in children and adolescents. *Pharmacoeconomics*, 24, 1199-1220.
- Ravindran, A. V., Matheson, K., Griffiths, J., Merali, Z., & Anisman, H. (2002). Stress, coping, uplifts, and quality of life in subtypes of depression: A conceptual frame and emerging data. *Journal of Affective Disorders*, 71, 121-130.

- Richters, J. E. (1992). Depressed mothers as informants about their children: A critical review of the evidence for distortion. *Psychological Bulletin*, 112, 485-499.
- Rietveld, M. J. H., Hudziak, J. J., Bartels, M., van Beijsterveldt, C. E. M., & Boomsma, D. I. (2004). Heritability of attention problems in children: Longitudinal results from a study of twins, age 3-12. *Journal of Child Psychology and Psychiatry*, 45, 577-588.
- Roth, R. M., Wishart, H. A., Flashman, L. A., Riordan, H. J., Huey, L., & Saykin, A. J. (2004). Contribution of organizational strategy to verbal learning and memory in adults with attention-deficit/hyperactivity disorder. *Neuropsychology*, 18, 78-85.
- Rowland, A. S., Lesesne, C. A., & Abramowitz, A. J. (2002). The epidemiology of attention-deficit/hyperactivity disorder (ADHD): A public health view. *Mental Retardation and Developmental Disabilities Research Reviews*, 8, 162-170.
- Rudolph, K. D., Kurlakowsky, K. D., & Conley, C. S. (2001). Developmental and social-contextual origins of depressive control-related beliefs and behavior. *Cognitive Therapy and Research*, 25, 447-475.
- Sanson, A., Prior, M., & Smart, D. (1996). Reading disabilities with and without behaviour problems at 7-8 years: Prediction from longitudinal data from infancy to 6 years. *Journal of Child Psychology and Psychiatry*, 37, 529-541.
- Schatz, D. B., & Rostain, A. L. (2006). ADHD with comorbid anxiety: A review of the current literature. *Journal of Attention Disorders*, 10, 141-149. doi: 10.1177/1087054706286698
- Schmeck, K., & Poustka, F. (1997). Quality of life and child psychiatric disorders. In H. Katschnig, H. Freeman & N. Sartorius (Eds.), *Quality of life in mental disorders* (pp. 179-192). New York: John Wiley & Sons.
- Shaywitz, S. E., & Shaywitz, B. A. (2008). Paying attention to reading: The neurobiology of reading and dyslexia. *Development and Psychopathology*, 20, 1329-1349. doi:10.1017/S0954579408000631
- Siu, A. M. H., & Shek, D. T. L. (2010). Social problem solving as a predictor of well-being in adolescents and young adults. *Social Indicators Research*, 95, 393-406. doi: 10.1007/s11205-009-9527-5
- Smart, D., Sanson, A., & Prior, M. (1996). Connections between reading disability and behavior problems: Testing temporal and causal hypotheses. *Journal of Abnormal Child Psychology*, 24, 363-375.

- Smith, E. M., Gomm, S. A., & Dickens, C. M. (2003). Assessing the independent contribution to quality of life from anxiety and depression in patients with advanced cancer. *Palliative Medicine*, 17, 509-513.
- Spitzer, R. L. (1983). Psychiatric diagnosis: Are clinicians still necessary? *Comprehensive Psychiatry*, 24, 399-411.
- Stein, R.E., & Jessop, D.J. (1989). What diagnosis does not tell: The case for a noncategorical approach to chronic illness in childhood. *Social Science and Medicine*, 29, 769-778.
- Steinmayr, R., Ziegler, M., & Trauble, B. (2010). Do intelligence and sustained attention interact in predicting academic achievement? *Learning and Individual Differences*, 20, 14-18. doi: 10.1016/j.lindif.2009.10.009
- Tabachnick, B. G., & Fidell, L.S. (2001). *Using Multivariate Statistics, Fourth Edition*. Needham Heights, MA: Allyn & Bacon.
- Tannock, R. (2000). Attention-deficit/hyperactivity disorder with anxiety disorders. In T. E. Brown (Ed.), *Attention-deficit disorders and comorbidities in children, adolescents, and adults* (pp. 125-170). Washington, DC: American Psychiatric Press.
- Tannock, R., & Schachar, R. (1995). Differential-effects of methylphenidate on working-memory in ADHD children with and without comorbid anxiety. *Journal of the American Academy of Child & Adolescent Psychiatry*, 34, 886-896.
- Thiruchelvam, D., Charach, A., & Schachar, R. J. (2001). Moderators and mediators of long-term adherence to stimulant treatment in children with ADHD. *Journal of the American Academy of Child and Adolescent Psychiatry*, 40. doi: 10.1097/00004583-200108000-00014
- Topolski, T. D., Edwards, T. C., Patrick, D. L., Varley, P., Way, M. E., & Buesching, D. P. (2004). Quality of life of adolescent males with attention-deficit hyperactivity disorder. *Journal of Attention Disorders*, 7, 163-173.
- Upton, P., Lawford, J., Eiser, C. (2008). Parent-child agreement across child health-related quality of life instruments: a review of the literature. *Quality of Life Research*, 17, 895-913. doi: 10.1007/s11136-008-9350-5
- Varni, J. W., & Burwinkle, T. M. (2006). The PedsQL as a patient-reported outcome in children and adolescents with attention-deficit/hyperactivity disorder: A population-based study. *Health and Quality of Life Outcomes*, 4, 1-10. doi: 10.1186/1477-7525-4-26

- Vitiello, B., Rohde, P., Silva, S., Wells, K., Casat, C., Waslick, B., Simons, A., Reinecke, M., Weller, E., kratochvil, C., Walkup, J., Pathak, S., Robins, M., March, J., & The TADS team. (2006). Functioning and quality of life in the treatment for adolescents with depression study (TADS). *Journal of the American Academy of Child & Adolescent Psychiatry*, 45, 1419-1426. doi: 10.1097/01.chi.0000242229.52646.6e
- Watanabe, N., Furukawa, T. A., Chen, J., Kinoshita, Y., Nakano, Y., Ogawa, S., Funayama, T., Ietsugu, T., & Noda, Y. (2010). Change in quality of life and their predictors in the long-term follow-up after group cognitive behavioral therapy for social anxiety disorder: a prospective cohort study. *BMC Psychiatry*, 10.
- Watson, S. M. R., & Keith, K. D. (2002). Comparing the quality of life of school-age children with and without disabilities. *Mental Retardation*, 40, 304-312.
- Weary, G., Marsh, K. L., & McCormick, L. (1994). Depression and social comparison motives. *European Journal of Social Psychology*, 24, 117-129.
- Wehmeier, P. M., Dittman, R. W., Schacht, A., Minarzyk, A., Lehmann, M., Sevecke, K., & Lehmkuhl, G. (2007). Effectiveness of atomoxetine and quality of life in children with attention-deficit/hyperactivity disorder as perceived by patients, parents, and physicians in and open-label study. *Journal of Child and Adolescent Psychopharmacology*, 17, 813-829. doi: 10.1089/cap.2007.0025
- Wehmeier, P. M., Schacht, A., & Barkley, R. A. (2010). Social and emotional impairment in children and adolescents with ADHD and the impact on quality of life. *Journal of Adolescent Health*, 46, 209-217.
- Wilens, T. E., & Spencer, T. J. (2000). The stimulants revisited. *Child and Adolescent Psychiatric Clinics of North America*, 9, 573-603.
- Wilson, J. M., & Marcotte, A. C. (1996). Psychosocial adjustment and educational outcome in adolescents with childhood diagnosis of attention deficit disorder. *Journal of the American Academy of Child and Adolescent Psychiatry*, 35, 579-587.
- Wood, J., Michela, J. L., & Giordano, C. (2000). Downward comparison in everyday life: Reconciling self-enhancement models with the mood-cognition priming model. *Journal of Personality and Social Psychology*, 79, 563-579.
- World Health Organization, Division of Mental Health. Measurement of quality of life in children. MNH/PSF/94.5. Geneva: World Health Organization, 1994.

