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The Moderating Effects of Anxiety on the Relationship Between Attention-Deficit Hyperactivity Disorder and Oppositional Defiant Disorder

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THE MODERATING EFFECTS OF ANXIETY ON THE RELATIONSHIP BETWEEN
ATTENTION-DEFICIT HYPERACTIVITY DISORDER AND OPPOSITIONAL DEFIANT
DISORDER

A Dissertation

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Agricultural and Mechanical College
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by
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ABSTRACT

Attention-Deficit/Hyperactivity Disorder (ADHD) and Oppositional Defiant Disorder (ODD) are two of the most prevalent childhood disorders, and the co-occurrence of these disorders is associated with an exacerbation of certain behavioral difficulties such as opposition, defiance, and anger when compared to the independent presentation of either disorder. Several researchers have demonstrated that anxiety may buffer against oppositional behavior by inhibiting responses that may lead to aversive consequences. Thus, the current study sought to examine the potentially suppressing role of anxiety when symptoms of ADHD and ODD are both present. A hierarchical regression analysis was conducted to determine the extent to which anxiety moderates moderated the relationship between symptoms of ADHD and ODD in a sample of 1409 clinic-referred children. It was hypothesized that increased levels of anxiety would attenuate the relationship between the two disorders and would be associated with decreased levels of ODD. No significant findings were revealed during the regression, indicating that anxiety did not have an effect on the relationship between ADHD and symptoms of ODD in this model.

INTRODUCTION

Within the realm of childhood psychological disorders, two broad symptom domains exist and represent clinically impairing levels of behavior and emotional problems. Externalizing disorders include Attention-Deficit/Hyperactivity Disorder – Predominately Combined Type (ADHD-C), Oppositional Defiant Disorder (ODD), and Conduct Disorder (CD). Individuals with externalizing disorders frequently present with difficult behaviors such as poor social skills, aggression, negative affect, noncompliance, and rule-breaking. Conversely, individuals with internalizing disorders such as Generalized Anxiety Disorder (GAD), Social Anxiety Disorder, and Major Depressive Disorder frequently exhibit impairing levels of withdrawal, depression, fear, and worry (American Psychiatric Association, 2013).

Disorders within the same domain frequently co-occur and there is a plethora of research that examines factors associated with the comorbidity of diagnoses within the same symptom domain (Angold, Costello, & Erkanli, 1999; Fanti & Henrich, 2010). However, there is little research that examines the relationship between internalizing and externalizing symptoms. Further, the existing research is methodologically limited due to referral bias, sample characteristics, and diagnostic criteria (Cunningham & Ollendick, 2010).

The purpose of this study was to clarify the relationship between ADHD-Combined and ODD and whether the presence of anxiety symptoms moderates the relationship due to increased behavioral inhibition. Research in this area is sparse and inconclusive. For example, Humphreys, Aguirre, and Lee (2012) found that the presence of anxiety increased symptoms of ODD. In contrast, Epstein, Goldberg, Conners, and March (1997) found that comorbid anxiety and ADHD decreased impulsive responding, and others have found that anxiety had no effect on

impulsivity (Bilgic et al., 2013). Thus, further research in this area is needed in order to clarify the relationship between these three variables.

Attention-Deficit/Hyperactivity Disorder and Oppositional Defiant Disorder

ADHD and ODD are two of the most studied childhood disorders and research indicates that the two disorders very often co-occur (Angold et al., 1999). ADHD is characterized by two distinct symptoms clusters: hyperactive/impulsive and inattention (Barkley, 1997). Children presenting with the hyperactive/impulsive subtype tend to show excessive levels of fidgeting, talking, blurting out answers, interrupting, and intruding on other's conversations. Children diagnosed with the inattentive subtype struggle with tasks such as sustaining attention, completing activities that require attention to detail, and they are frequently distracted by extraneous stimuli. These symptoms frequently present at a young age and occur across multiple settings (American Psychiatric Association, 2013). Much of the research on ADHD focuses on youth who present with both hyperactive/impulsive and inattentive symptoms; thus, the current literature review will focus on ADHD, Combined Presentation and the term "ADHD" will be used when referring to this subset of children. Symptoms frequently displayed by children who struggle with ODD include clinically impairing levels of anger/irritability, argumentativeness/defiance, and vindictiveness (American Psychiatric Association, 2013).

The prevalence rates of ADHD during a 12 month period is estimated to be 6.4%, while the lifetime prevalence approaches 10% (Kessler et al., 2009). Likewise, the prevalence rate for ODD has been found to be 9.2% during a 12 month period and estimates of lifetime prevalence range from 10 - 15% (Kessler et al., 2009; Nock, Kazdin, Hiripi, & Kessler, 2007).

The literature consistently shows that ADHD and ODD are the most frequently co-occurring disorders in children and adolescents (Angold et al., 1999; Maughan, Rowe, Messer, Goodman, & Meltzer, 2004; Nock et al., 2007; Speltz, McClellan, DeKlyen, & Jones, 1999). Some estimated suggest that 40 to 84% of children and adolescents with ADHD also meet diagnostic criteria for ODD (Barkley, DuPaul, & McMurray, 1990; Pfiffner et al., 1999; Pliszka, Carlson, & Swanson, 1999). For example, Wilens et al. (2002) examined 164 preschool aged children with ADHD and found that 62% of these children also met criteria for ODD. This comorbidity continues into the teenage years and often persists into adulthood (August, Realmuto, MacDonald, Nugent, & Crosby, 1996; Barkley, Murphrey, & Fischer, 2008; Biederman et al., 2008; Speltz et al., 1999).

Although both disorders are associated with adverse social, psychological, and educational outcomes, several researchers have found that comorbidity is associated with an exacerbation of these problems. For instance, Humphreys and Lee (2011) examined 203 school-age children and found that those in the comorbid ADHD and ODD group engage in more risk taking behavior when compared to children with ADHD or ODD alone. Newcorn et al. (2001) examined 498 children who participated in the NIMH Collaborative Multisite Multimodal Treatment Study of Children with ADHD (MTA) and found that comorbid ODD was predictive of higher levels of impulsivity compared to ADHD children with and without anxiety disorders. Family functioning also appears impaired to a greater degree when a child is diagnosed with ADHD and ODD relative to families of children diagnosed with either but not both ADHD and ODD. Specifically, children who are dually diagnosed are more likely to be placed in foster care and have parents who divorce, have psychological impairments, and have a preponderance of

negative interactions with their children (August & Stewart, 1983; Goldstein et al., 2007; Reeves, Werry, Elkind, & Zametkin, 1987; Wymbs et al., 2008). Despite the research examining these risk factors, few studies have focused on possible protective factors in dually diagnosed children.

An initial step toward identifying protective factors that may ameliorate behavior problems may be to identify risk factors that contribute to comorbid ADHD and ODD. Barkley (2014) posited that one of the more significant factors associated with the comorbidity is emotion dysregulation, which is defined as an inability to inhibit primary emotional responses to frustrating situations and modulate this response in order to display the appropriate emotion at that time. Children diagnosed with ADHD have been shown to have increased emotional lability when compared to control children (Sobanski et al., 2010). Given that many of the core symptoms of ODD (e.g., often loses temper, easily annoyed, angry and resentful) resemble those exhibited by ADHD children who struggle with emotional impulsivity (e.g., short temper, irritability, impatience, emotional excitability, difficulty regulating emotions), children with ADHD are, by default, predisposed to meeting diagnostic criteria for ODD (Barkley, 2014). As such, any variable that enhances a child's ability to inhibit impulsive, emotional responses may, in turn, reduce the likelihood of oppositional behavior.

Comorbidity Between Attention-Deficit/Hyperactivity Disorder and Anxiety

The presence of anxiety symptoms may foster behavioral inhibition in children with ADHD. When compared to community controls, those diagnosed with ADHD are significantly more likely to experience anxiety, with some estimates suggesting that they display impairing symptoms at a rate three times that of the normal population (Angold et al., 1999; Pliszka,

Carlson, Swanson, 1999). Some authors have found that 27% of ADHD children struggle with multiple anxiety disorders compared to 5% of children found in the normal population (Biederman et al., 1996; Kitchens, Rosen, & Braaten, 1999; Spencer, Biederman, & Wilens, 1999).

The literature consistently suggests that there is little evidence to support genetic influence of the transmission of comorbid ADHD and anxiety (Biederman, Faraone, Keenan, Steingard, & Tsuang, 1991; Jarrett & Ollendick, 2008). However, the independent expression of both disorders has been found to be associated with shared environmental factors such as parental anxiety, overprotectiveness, poor parenting practices, and less independence (Kepley & Ostrander, 2007; Pfiffner & McBurnett, 2006). Temperamental variables (e.g., negative affect, extraversion, effortful control, cognitive regulation) have also been indicated as a possible explanatory link between ADHD and anxiety (Nigg, Goldsmith, & Sacheck, 2004; Rothbart, 2004).

Researchers have also suggested that children with anxiety and ADHD experience greater maladjustment and decreased daily functioning than youth with ADHD or an anxiety disorder alone (Kepley & Ostrander, 2007; Sciberras et al., 2014). In addition, when multiple anxiety disorders are present in ADHD children, impairment is even worse than with a single comorbid anxiety disorder (Hammerness et al., 2010; Sciberras et al., 2014). Comorbidity between ADHD and anxiety disorders has also been found to be associated with increased mood concerns, school avoidance, and problematic social interactions with peers (Bowen, Chavira, Bailey, Stein, & Stein, 2008).

Difficulties maintaining sustained attention is a core symptom of ADHD and research suggest that youth dually diagnosed with an anxiety disorder and ADHD have greater impairment maintaining sustained attention than ADHD youth without anxiety (Schatz & Rostain, 2006). These attention difficulties in anxious youth have been theorized to be due to a bias toward looking for threatening and potentially adverse encounters in their environment (Cisler & Koster, 2010). As such, their attention resources are solely dedicated to this process, leaving little cognitive resources for important activities and encounters in their everyday life (Beck & Clark, 1997; Cisler & Koster, 2010; Michelini, Eley, Gregory, & McAdams, 2014).

Several authors suggest that comorbidity between ADHD and anxiety is largely due to the mutually experienced attention deficits rather than any other symptom such as hyperactivity or impulsivity (Epstein et al., 1997; Michelini et al., 2014). Some studies additionally indicate that presence of anxiety in children with ADHD is associated with increased cognitive difficulties. For example, children in the NIMH Collaborative Multisite Multimodal Treatment Study of Children with ADHD were assessed via a continuous performance tasks and were found to be significantly more inattentive than the ADHD only group (Newcorn et al., 2001). Schatz and Rostain (2006) found that participants with comorbid ADHD and anxiety disorders had decreased levels of impulsivity but significantly worse performance on tasks measuring working memory.

Although greater difficulties staying focused are often observed in children with ADHD and anxiety than those with either disorder alone, research suggests that these same individuals are less impulsive than pure ADHD groups (Pliszka, 1992; Schatz & Rostain, 2006). This may reduce the likelihood of responding in an aggressive manner when presented with threatening

stimuli or engaging in oppositional behaviors that would likely lead to aversive consequences.

As ADHD youth are at increased risk for experiencing comorbid ODD, examination of how anxiety may play a role in inhibiting symptoms of ODD is a worthy endeavor.

Comorbidity Between Oppositional Defiant Disorder and Anxiety

Oppositional behavior has been found to be present in 20% of anxious youth, while significant levels of anxiety is estimated to be present in 40% of clinic referred children with conduct problems (i.e., ODD and CD; Garland & Garland, 2001; Greene et al., 2002). Angold et al. (1999) found similar results within children in the general population, with 10% of anxiety disordered children meeting diagnostic criteria for ODD or CD, and 40% of youth with ODD/CD meeting criteria for any anxiety disorder.

There is limited research on the etiological factors that contribute to the development of comorbid anxiety and ODD as well as the unique phenomenology of this comorbid group. The available research does suggest, however, that a shared risk factor may contribute to each disorder or that separate risk factors for each disorder are associated with each other or a third variables (Caron & Rutter, 1991; Fergusson, Lynskey, & Horwood, 1996). Among the variables that have been studied, family and environmental factors have been indicated as the most likely contributor to comorbid anxiety and ODD (Gregory, Eley, & Plomin, 2004).

There is some evidence that anxiety may function to attenuate externalizing behaviors such as those characteristic of children with ODD. Early theoretical explanations posited that behavior is influenced by both a behavioral activation system (BAS) and a behavioral inhibition system (BIS), which drive approach and avoidance behaviors, respectively (Gray, 1971). The BIS is theorized to be sensitive to punishment cues and elicits a behavioral suppression response

(e.g., anxiety) while the BAS is sensitive to reward cues and initiates approach responses (e.g., behavioral disinhibition, Carver & White, 1994; Dodge, Lochman, Harnish, Bates, & Pettit, 1997; Vitaro, Brendgen, & Tremblay, 2002). Anxious children are theorized to have an overactive BIS, which contributes to the withdrawal and avoidance behavior often displayed in anxious youth (O'Brien & Frick, 1996).

Given this information, it is reasonable to assume that comorbid anxiety/ODD youth may have an increased ability to inhibit behaviors that may lead to aversive consequences. However, the evidence for this is mixed. Some authors suggest that comorbid anxiety and ODD is associated with increased risk for more severe symptoms and worse treatment outcomes, particularly because the supposed inhibiting effects of anxiety may decrease as the child ages (Berman, Weems, Silverman, & Kurtines, 2000; Russo et al., 1993; Walker et al., 1991; Zoccolillo, 1992). Other research suggests that anxiety has no influence over the expression of oppositional behaviors (Abikoff et al., 2002; Becker, Luebbe, Stoppelbein, Greening, & Fite, 2012). O'Brien and Frick (1996) as well as Drabick, Ollendick, and Bubier (2010) both suggest that two outcomes are possible for children with comorbid ODD and anxiety: one in which ODD is exacerbated, and one in which it is suppressed. Variables theorized to contribute to this divergence include level of emotionality, regulation of emotions, executive functioning, and social information processing.

Moderating Role of Anxiety

Given the potential role of anxiety in suppressing ODD symptoms, a clinically important area of exploration is whether anxiety continues to operate as a protective factor when symptoms of ADHD and ODD are both present. There has been some research that explores this question,

however, interpretation is made difficult not only by mixed findings but also by the use of different methods to assess levels of behavioral functioning. Some authors have found that anxiety in children with ADHD was associated with improved behavior on tasks that assess response inhibition such as the CPT (Epstein et al., 1997) and behavioral measures of impulsivity (Pliszka, 1989). Others have found no effects of anxiety when using observational measures of behavior (Abikoff et al., 2002), parent report questionnaire data (Becker et al., 2012; Bilgic et al., 2013), and neuropsychological measures of impulsivity (Vloet, Konrad, Herpertz-Dahlmann, Polier, & Günther, 2010). In one of the only studies to examine ADHD, ODD, and anxiety specifically, Humphreys et al. (2012) assessed rates of ODD in children divided into comorbid ADHD and anxiety, pure ADHD, pure anxiety, and control groups. The authors found that the comorbid group exhibited significantly higher levels of ODD than all other groups when assessed via parent and teacher report.

It is apparent that additional research is needed in order to make a conclusive statement about the effect anxiety may have on the relationship between ADHD and ODD. Given that ODD is frequently a precursor to CD, especially in children with ADHD, understanding the suppressing role of anxiety may have implications for early identification and intervention with those at risk for these more severe behavior problems (Biederman et al., 1996). The goal of the current study is to clarify and contribute to the literature on internalizing and externalizing disorders and also gain a better understanding of the relationship between ADHD, anxiety, and ODD. Given the potentially suppressing role of anxiety, it is hypothesized that anxiety will function to decrease symptoms of ODD in children who display symptoms of ADHD.

METHODS

Participants

Participants in the current study were 1409 (57% female) children and adolescents between the age of 6 and 18 ($M = 10.52$, $SD = 3.42$) who were referred by their physician to a Pediatric Psychology health clinic located within the pediatrics department of a large, freestanding outpatient clinic. This clinic serves youth up to age 18 who are referred for various psychological concerns. The majority of children served at this clinic are diagnosed with an internalizing or externalizing disorder, the most common being ADHD. To maintain external validity of study results, participants with other comorbid internalizing disorders were not excluded from participation.

Procedure

Participants were referred for a psychological evaluation, which was conducted by a graduate level clinician under the supervision of a licensed psychologist. Parental consent and child assent were obtained at the time of the initial appointment. Clinicians used a multi-method, multi-informant assessment method to determine diagnostic status and collect relevant demographic information. This consisted of a semi-structured diagnostic interview with the parent and child as well as administration of a standard set of broadband and narrowband questionnaires distributed to parents, children, and often to teachers as well. Diagnoses were based on the child and parent structured interview (symptom count and impairment) as well as elevations on questionnaires. Information regarding the child's age, gender, and ethnicity were also collected and parents were asked to provide information regarding the referral concern,

associated symptoms, onset and duration of symptoms, medical and developmental history, and current functioning.

Measures

Child Behavior Checklist (CBCL). The CBCL (Achenbach & Rescorla, 2001) is a broadband parent-report measure of psychopathology in pre-school and school-aged children. The CBCL consists of 112 items rated on a three point likert scale with 0 representing “not true” and 2 representing “very true or often true.” The CBCL assesses for common behavior and emotional problems and consists of 8 syndrome scales and 6 DSM-oriented scales.

Scores from the Attention Deficit/Hyperactivity Problems (7 items), Anxiety Problems (6 items), and Oppositional Defiant Problems (5 items) DSM-oriented scales were used in the current study. Given previous evidence that suggests that ADHD is associated with increased risk for multiple anxiety disorders, the Anxiety Problems scale was used as a general indicator of anxiety status rather than one specific anxiety disorder. As recommended by the questionnaire authors, raw scores were used in all statistical analyses.

The CBCL scales have good internal consistency (Attention Deficit/Hyperactivity Problems $\alpha = .84$, Anxiety Problems $\alpha = .72$, Oppositional Defiant Problems $\alpha = .86$) as well as adequate convergent and discriminant validity (Achenbach & Rescorla, 2001; Nakamura, Ebetsutani, Bernstein, & Chorpita, 2009).

Data Analysis

Hierarchical Regression Analysis. Becker et al. (2012) examined ADHD and anxiety comorbidity via CBCL measures categorically rather than dimensionally. As noted by the authors, the categorical approach often limits the sample size and statistical power to identify

meaningful effects. In addition, Becker et al. (2012) suggested that the use of arbitrary cutoff scores to determine group membership may affect outcomes, as participants in the nonclinical groups who score in the borderline range (e.g., *T*-score of 69) may resemble clinical groups more so than nonclinical groups. Therefore, a continuous approach was used in the current study, in an attempt to obtain a more accurate picture of the moderating role of anxiety.

A hierarchical regression analysis was conducted to determine the extent to which anxiety moderates the relationship between symptoms of ADHD and ODD. To control for the potential effects of age and gender on ODD symptoms, these variables were entered in the first step. ADHD and anxiety scores were entered in the second step to determine whether either predicted symptoms of ODD after controlling for youth age and gender. Finally, participants' ADHD and anxiety scores were multiplied and entered in the final step as an interaction term to determine the extent to which it predicted symptoms of ODD.

RESULTS

Descriptive Statistics

The mean CBCL scores were 6.43 ($SD = 3.45$) for ADHD, 2.75 ($SD = 2.67$) for anxiety, and 3.50 ($SD = 2.63$) for ODD. Significant correlations were obtained between all variables and ranged from $r = -0.14$ to $r = 0.49$, with ADHD and ODD being the most highly related variables. Of the 1409 participants in the sample, 18% were reported to have significantly elevated scores on the ADHD scale, 17% on the anxiety scale, and 14% on the ODD scale.

Table 1. Means, standard deviations, and correlation between age and study variables

	Mean	SD	Range	Zero Order Correlations		
				1	2	3
1. Age	10.52	3.42	6 - 18	-		
2. ADHD Problems	6.43	3.45	0 - 14	-0.14**	-	
3. Anxiety Problems	2.75	2.67	0 - 12	-0.06**	0.22**	-
4. ODD Problems	3.50	2.63	0 - 10	-0.06**	0.49**	0.27**

* Significant at the 0.05 level, ** Significant at the 0.01 level

Moderation Analysis

A hierarchical regression analysis was conducted to determine whether anxiety effected the relationship between ADHD and ODD. Specifically, it was hypothesized that the interaction between ADHD and anxiety would be significantly predictive of symptoms of ODD and that the relationship between ADHD and ODD would be attenuated by increased rates of anxiety.

Variables entered in Step 1 were age and gender which were significant predictors of ODD, $F(2,1406) = 11.27, p < .01, R^2 = .02$. Gender ($B = -0.58, p < .01$) and age ($B = -0.04, p < .05$) also were individually predictive of ODD.

The addition of ADHD and anxiety scores into the model explained an additional 26% of the variance in ODD scores and this change was statistically significant, $F(4,1404) = 132.94, p < .01, R^2 = 0.28$. In this step, ADHD scores were significantly and positively associated with ODD and uniquely accounted for 18% of the variance ($\beta = 0.45, p < .01, Sr^2 = 0.18$). Anxiety scores also were positively predictive of ODD and uniquely accounted for 2% of the variance ($\beta = 0.18, p < .01, Sr^2 = 0.02$). Thus, a large portion of ODD variance was accounted for by ADHD and anxiety symptoms, with ADHD being more strongly predictive.

Table 2. Regression analysis predicting symptoms of ODD

	R^2	ΔR^2	B	β	Sr^2	F Model
Step 1	0.02	0.02	—	—	—	$F(2, 1406) = 11.27^{**}$
Gender			-0.58**	-0.11	0.00	
Age			-0.04*	-0.06	0.01	
Step 2	0.28	0.26	—	—	—	$F(4, 1404) = 132.94^{**}$
ADHD			0.34**	0.45	0.18	
Anxiety			0.17**	0.18	0.02	
Step 3	0.28	0.00	—	—	—	$F(5, 1403) = 106.29$
ADHDxAnxiety			0.00	-0.02	0.00	

* Significant at the 0.05 level, ** Significant at the 0.01 level

Results of the regression analysis revealed that the inclusion of the interaction term in the final step was not significant $F(5, 1403) = 106.29, p = .76, R^2 = 0.28$. This indicated that anxiety did not moderate the relation between ADHD and ODD; the relationship remained consistent regardless of the level of anxiety.

DISCUSSION

The aim of the current study was to examine the influence of anxiety on the relationship between ADHD and ODD based on previous evidence that supports the potentially inhibitory effects of anxiety on externalizing behavior. Specifically, the study hypothesized that anxiety would moderate the relationship between ADHD and ODD and that this relationship would be attenuated by increased anxiety. Contrary to expectations, however, the results did not find evidence to support the hypothesis. These findings suggest that the relationship between ADHD and ODD is neither exacerbated nor attenuated by anxiety. Significant main effects in the hierarchical model were consistent with previous literature and suggested that both ADHD and anxiety were positively and significantly related to symptoms of ODD.

Although the hypothesis was not supported, the findings were not entirely surprising. Findings from previous research in this area have been mixed and the buffering effects of anxiety have yet to be consistently demonstrated in children with ADHD. The current study supports neither the attenuation or exacerbation hypothesis but does provide some evidence for a third explanation proposed by some authors, which is that anxiety has no effect on disruptive or impulsive behaviors (Abikoff et al., 2002; Oosterlaan et al., 1998). For example, Becker (2012) examined the relationship between ADHD and aggression in children referred for psychiatric inpatient treatment. The authors similarly found that comorbid anxiety had no effect on the presentation of aggressive symptoms in children diagnosed with ADHD.

Other contributing factors may also need to be considered when examining the suppressing role of anxiety. Drabick et al.'s (2010) dual-pathway hypothesis is especially important to consider when examine these effects in the ADHD population. The authors suggest

comorbidity between ODD and anxiety may confer risk for either exacerbation or attenuation of ODD symptoms depending on the type and severity of certain processes: limbic system activity, function of aggressive behaviors, social information processing, emotionality, and effortful control of emotions (Drabick et al., 2010). Several studies have indicated the existence of a subgroup of people whose anxiety is associated with decreased ODD and argue that this group demonstrates low anger and frustration, high levels of fear, normal effortful control of emotions, and an increased ability by the prefrontal cortex (PFC) to attenuate social information processing deficits (e.g., hostile attribution of other's intentions; Fraire et al., 2013). Many of these characteristics are inconsistent with those displayed by children with ADHD (e.g., increased emotionality, emotion dysregulation, and impaired PFC functioning); therefore, individuals with ADHD may not have adequate functioning in certain areas to sufficiently benefit from the potential impact of anxiety on ODD.

Other considerations are necessary when interpreting the finding from this study. For example it may be important to consider the temporal relationship between ODD and anxiety, especially given some mixed evidence about which disorder precedes the other (Bilgic, 2013). It also may be the case that different anxiety disorders have a different temporal relationship to ODD. For examples some authors have found that ODD precedes certain anxiety disorders such as Generalized Anxiety Disorder, but may be subsequent to others such as Separation Anxiety Disorder (Bubier and Drabick, 2009; Costello et al., 2003). Each of these potential relationships would require different theoretical and empirical considerations when examining moderating effects of anxiety. Similar consideration should be kept in mind regarding the directionality of the influence between ADHD and ODD. The assumption that ODD behaviors are secondary to

ADHD symptomatology was made in the current study; however, examining the inverse relationship might also yield some evidence to support the attenuating role of anxiety on the relationship between ODD and ADHD.

Strengths and Limitations

Although the study contained several strengths such as a utilization of a continuous approach, which allowed for a larger sample size and adequate variability in study variables, there are several limitations that may have contributed to nonsignificant findings.

The methodology of the current study prevented examination of effects by ADHD subtype. Previous research indicated that ADHD-C children present with different symptoms and difficulties than other subtypes, such as those who display primarily inattentive symptoms (Milich, Balentine, & Lynam, 2001). The current study did not evaluate ADHD diagnostic status and was unable to examine how anxiety might function differently depending on the ADHD subtype. As stated earlier, however, this method also has its limitations and also may be subject to limited generalizability.

This study utilized clinic-referred children who were referred for psychological services by their physician. This may have increased the likelihood of referral bias, as only children who displayed severe enough behaviors to warrant concern from the parent and physician were referred for services. Similarly, ADHD children may have been referred more frequently compared to anxious children because their behaviors may have been more bothersome to others, and the associated impairments (e.g., office referral, academic decline) may have been more immediate, concerning, and overt than those displayed by children with anxiety (e.g., social skill

deficits). This referral bias may also be evidenced by the lower than expected mean anxiety reported in this sample.

Similarly, the source of the information collected may have also limited the ability to detect significant interaction effects. In this study, parent-reported data was used as an indicator of the child's anxiety status. As anxiety symptomatology is difficult to detect by the child's parents and likely more accurately reported by the child, this too could have contributed to the lower than expected rates of anxiety in this sample. Future studies should make an effort to include several sources of information, including teacher report, to ensure that an accurate reflection of the child's anxiety is being presented.

Given the high correlation between study variables as well as the mixed findings regarding the temporal relationship between anxiety and other externalizing disorder, research is needed that examines the relationship between anxiety and ADHD over time. In addition, correlation between study variables may impact the relationship between anxiety, ADHD, and ODD. Other possible areas of exploration of the moderating effects of anxiety by ADHD subtype may also be a worth endeavor. Lastly, there is some evidence that an often overlooked symptom, anxiety sensitivity, may have some attenuating effects (Bilgic, 2013). Additional research on this construct may shed some light on the specific symptoms of anxiety that contribute to decreased ODD symptoms.

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APPENDIX: IRB APPROVAL

ACTION ON EXEMPTION APPROVAL REQUEST



TO: Jamarri Aikins
Psychology

FROM: Dennis Landin
Chair, Institutional Review Board

DATE: June 16, 2015

RE: IRB# E9388

TITLE: Moderating effects of anxiety on the relationship between symptoms of ADHD and ODD

Institutional Review Board
Dr. Dennis Landin, Chair
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Baton Rouge, LA 70803
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irb@lsu.edu | lsu.edu/irb

New Protocol/Modification/Continuation: New Protocol

Review Date: 6/16/2015

Approved X **Disapproved** _____

Approval Date: 6/16/2015 **Approval Expiration Date:** 6/15/2018

Exemption Category/Paragraph: 4a

Signed Consent Waived?: NA. All data are aggregated and from archival sources

Re-review frequency: (three years unless otherwise stated)

LSU Proposal Number (if applicable):

Protocol Matches Scope of Work in Grant proposal: (if applicable)

By: Dennis Landin, Chairman Dennis Landin

PRINCIPAL INVESTIGATOR: PLEASE READ THE FOLLOWING –

Continuing approval is CONDITIONAL on:

1. Adherence to the approved protocol, familiarity with, and adherence to the ethical standards of the Belmont Report, and LSU's Assurance of Compliance with DHHS regulations for the protection of human subjects*
2. Prior approval of a change in protocol, including revision of the consent documents or an increase in the number of subjects over that approved.
3. Obtaining renewed approval (or submittal of a termination report), prior to the approval expiration date, upon request by the IRB office (irrespective of when the project actually begins); notification of project termination.
4. Retention of documentation of informed consent and study records for at least 3 years after the study ends.
5. Continuing attention to the physical and psychological well-being and informed consent of the individual participants, including notification of new information that might affect consent.
6. A prompt report to the IRB of any adverse event affecting a participant potentially arising from the study.
7. Notification of the IRB of a serious compliance failure.
8. **SPECIAL NOTE:**

*All investigators and support staff have access to copies of the Belmont Report, LSU's Assurance with DHHS, DHHS (45 CFR 46) and FDA regulations governing use of human subjects, and other relevant documents in print in this office or on our World Wide Web site at <http://www.lsu.edu/irb>

VITA

Jamarri Aikins is a native of Mount Pleasant, Texas and graduated with a Bachelor of Science degree in psychology from Texas Christian University in 2010. He began his graduate studies at Louisiana State University under Dr. Mary Lou Kelley in August of 2010 and received his Master of Arts degree in July 2012. After completion of his doctoral studies in August 2015, Jamarri plans to continue his clinical work with children and adolescents in his home state of Texas.