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TOWARD AN UNDERSTANDING OF TREATMENT MODERATORS BASED ON ETIOLOGICAL MODELS OF DISRUPTIVE BEHAVIOR DISORDERS

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TOWARD AN UNDERSTANDING OF TREATMENT MODERATORS BASED ON
ETIOLOGICAL MODELS OF DISRUPTIVE BEHAVIOR DISORDERS

DISSERTATION

A dissertation submitted in partial fulfillment of the
requirements for the degree of Doctor of Philosophy in the
College of Arts and Sciences
at the University of Kentucky

By
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Lexington, Kentucky
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2021

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ABSTRACT OF DISSERTATION

TOWARD AN UNDERSTANDING OF TREATMENT MODERATORS BASED ON ETIOLOGICAL MODELS OF DISRUPTIVE BEHAVIOR DISORDERS

Extant research suggests negative outcomes associated with Attention-Deficit/Hyperactivity Disorder (ADHD) and Oppositional Defiant Disorder (ODD) can be avoided with early intervention, with the most efficacious being behavioral parent training. However, parent training suffers from limitations including high drop-out rates, adherence, and long-term maintenance. Yet, consistent predictors of differential outcomes among individuals have not been identified. Etiological work suggests traits may be an early marker of disruptive behaviors. The goal of the current study is to examine child traits as a moderator of treatment outcomes for ADHD and ODD, using an efficacious short parent training treatment, Brief Behavioral Intervention (BBI). Twenty-six parent-child dyads completed BBI; measures of traits and symptoms were completed by parents pre-treatment, and measures of symptoms were completed by parents again post-treatment. Results suggested interactions between traits and pre-treatment symptoms were not significant, but main effects indicated pre-treatment hyperactivity/impulsivity and surgency were significantly related to post-treatment symptoms of hyperactivity/impulsivity. Therefore, child traits did not appear to moderate treatment effects in this small sample. However, the current study was limited by the small sample size that limited statistical power to detect significant interactions. Future work will evaluate effects in a larger sample once additional data is collected.

KEYWORDS: Disruptive Behavior Disorders, ADHD, ODD, Temperament, Treatment Moderators

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CHAPTER 1. INTRODUCTION

1.1 Background

ADHD affects about 5% of children and is associated with substantial societal costs including treatment, other health care costs, and educational and legal expenses (Pelham, Foster, & Robb, 2007; Polanczyk et al., 2007). Additionally, individuals with ADHD exhibit difficulties with academic achievement, social relationships, comorbidity, accidental injury or death, and higher rates of unemployment and divorce as adults (reviewed by Barkley, 2014). Similarly, ODD affects about 5% of children and is also associated with a number of negative and costly outcomes, such as poor family relations, academic problems, and high comorbidity with other disruptive behavior problems including conduct problems, aggression, and hyperactivity-impulsivity (APA, 2013; Campbell, Spieker, Burchinal, Poe, & National Institute of Child Health and Human Development Early Child Care Research Network, 2006; Posner et al., 2007; Spira & Fischel, 2005). ODD tends to co-occur in 40-60% of individuals with ADHD (Biederman et al., 2007), and comorbid ADHD and ODD is associated with more adverse outcomes than either disorder alone (Angold et al., 1999).

Yet, despite the negative outcomes associated with these two commonly co-occurring disorders, these negative outcomes can be avoided with early intervention. The most efficacious method of treating both ADHD and ODD is parent training, which focuses on training parents to use more effective parenting skills, including responding to the child in a positive way, establishing clear rules and consequences, better monitoring the child, staying calm, and implementing methods for better supporting the child. Substantial research indicates that child externalizing problems, including ADHD, are

significantly improved following parent training treatments and these treatments seem to work particularly well during early childhood or between ages 2.5 and 6 (Axelrad et al., 2009; Hood & Eyberg, 2003; Schuhmann, Foote, Eyberg, Boggs, & Algina, 1998).

Although we know these types of treatments work, parent training treatment is not without limitations. Specifically, parent training treatments suffer from high dropout rates, with approximately 50% of families dropping out of these kinds of treatments (Fernandez & Eyberg, 2009). In addition, treatment adherence by parents outside of sessions presents another challenge of parent training treatments. Further, research examining long-term maintenance of treatment gains suggests approximately only half of young children who complete parent training treatment maintain long-term positive outcomes (Eyberg, Edwards, Boggs, & Foote, 1998). It is unknown what predicts different outcomes of treatment among these individuals, and therefore, a major limitation is it is still not fully understood how and perhaps most critically for whom such treatments work best.

1.2 Etiological Work

Etiological work has developed substantially and can provide theoretically-informed theory about differential treatment response. However, etiological work has been underutilized for this task (Kazdin, 2014). One potential way to bridge the gap between treatment and theoretical work is through examining traits, including negative affect, surgency, and effortful control. Not only can traits be easily and reliably measured, but they can also be measured as early as infancy (Gartstein & Rothbart, 2003). Further, much of the work on markers of disruptive behaviors have focused on traits, in particular, as possible markers given that research suggests traits may be part of

the pathway to psychopathology, such that temperament traits might make individuals more vulnerable to psychopathology or that psychopathology and traits lie on the same continuum, with psychopathology being synonymous with extreme temperament-based traits (De Bolle, Beyers, DeClercq, & De Fruyt, 2012; Nigg, 2006; Tackett, 2006). Therefore, it is quite possible these extreme traits impact treatment and may serve as useful moderators or personalization targets of treatment efforts.

Etiological research suggests strong associations between temperament traits and ADHD and ODD. Research examining trait associations with ADHD suggests low effortful control is associated with inattentive symptoms of ADHD, high surgency is associated with hyperactive/impulsive symptoms of ADHD, and high negative affect is associated with both inattentive and hyperactive/impulsive symptoms of ADHD (Martel & Nigg, 2006; Martel, 2009). Additionally, research suggests these traits are predictive of worsening symptoms and development of comorbidity. One study found over a one-year follow-up trait-based profiles were found to be the best predictor of later comorbid disorders, compared to DSM-5 ADHD presentations (Karalunas et al., 2014). Work examining traits in relation to ODD is less developed; however, the research that does exist suggests traits as a potential early marker of the development of ODD (Zastrow, Martel, and Widiger, 2016), as well as distinct comorbidity and outcomes for individuals with differing traits (Stringaris & Goodman, 2009). Theoretical work suggests that negative affect, and irritability in particular, may be at the core of ODD symptoms, explaining the disorder's comorbidity with many other disorders, including mood disorders, other disruptive behavior problems, and ADHD (Burke, Hipwell, & Loeber, 2010; Martel, 2009; Stringaris & Goodman, 2009). Empirical work in a preschooler

sample with ODD suggest differential levels of negative affect, surgency, and agreeableness uniquely predict impairment and manifestation of ODD symptoms, with high negative affect associated with all symptom domains, low agreeableness associated with affective symptoms, and high surgency associated with behavioral symptoms (Zastrow, Martel, and Widiger, 2016). Although less research has examined trait dimensions in relation to ODD, the existing work suggests that similar to ADHD, traits are potentially an early marker of ODD with the possibility that personalized interventions might more accurately treat ODD and prevent the development of later comorbid diagnoses by targeting the common pathway to both disorders.

1.3 Trait Associations

In particular, research on trait models of ADHD and ODD has suggested worse outcomes for kids with high negative affect (Karalunas et al., 2014; Martel, 2016). Further, work on treatment of ADHD and ODD suggest self-regulation is also involved, related to effortful control (Klingberg et al., 2005), and more speculatively attention-seeking, related to surgency, which could be useful treatment targets. This suggests possible differential treatment effects based on trait profiles; however research has yet to examine traits as a potential moderator of treatment outcomes for ADHD and ODD. Some research has examined traits as moderators of treatment outcomes in other contexts, such as chronic pain, substance use, and eating disorders. For example, higher levels of neuroticism predicted poorer treatment response in individuals with chronic pain (Koh et al., 2014). Another study examined traits as predictors of alcoholism treatment outcomes and found lower levels of extraversion and neuroticism predicted better treatment outcomes (Saini & Khan, 1997). Other work suggests traits predict recovery

and symptom improvement after treatment for eating disorders (Levallius, Roberts, Clinton & Norring, 2016). Therefore, limited research does suggest traits potentially moderate treatment outcomes. Yet, no work has examined trait moderators of early childhood ADHD and ODD, despite existing etiological work. Further, this line of work has several treatment implications, including suggesting the possible utility of personalized treatment interventions based on trait profiles. Such interventions could target symptoms specific to the individual, as well as decrease risk for later comorbidity.

1.4 Current Study

Treatments for disruptive behaviors often suffer from large drop-out rates, which suggests a need of understanding of for whom such treatments work best. Despite research developing etiological models suggesting traits as early markers of ADHD and ODD, as well as personalized interventions for both prevention and treatment outcomes, research has yet to examine traits as a potential moderator of treatment outcomes for ADHD and ODD. The goal of the current study is to examine traits as a potential moderator of treatment outcomes, in order to gain better understanding of for whom these treatments work best. Based on extant etiological work on trait associations, it was hypothesized that 1) negative affect would moderate treatment outcomes for both individuals with ADHD and ODD such that individuals with high negative affect would have worse ADHD and ODD symptoms immediately post-treatment 2) effortful control would moderate treatment outcomes for inattentive symptoms of ADHD such that individuals with low effortful control would exhibit the largest improvement in inattentive ADHD symptoms immediately post-treatment and 3) surgency would moderate treatment outcomes for hyperactive-impulsive symptoms of ADHD and

argumentative, defiant, and spiteful symptoms of ODD such that individuals with high surgency would exhibit the largest improvement in hyperactive-impulsive and argumentative, defiant, and spiteful symptoms immediately post-treatment. Results of the current study might suggest personalization of treatment based on child temperament traits and a shift our manner of conceptualizing differential treatment outcomes, with the ultimate goal of improving interventions.

CHAPTER 2. METHODS

2.1 Participants

Participant demographics are presented in Table 1. Participants were 26 parent-child dyads with a disruptive behavior disorder between the ages of 3.17 and 6.58 ($M = 4.49$; $SD = .79$) referred for BBI at Texas Children's Hospital. The majority of children in the sample were male (69.2%) and Caucasian (73.1%), with the remainder of the sample Hispanic (15.4%), Asian (3.8%), African American (3.8%), or other (3.8%). The primary caregiver who completed the treatment for the majority of children were their mother (92.3%), with the remainder being the father (3.8%) or grandmother (3.8%) and the majority had completed a college degree or higher (53.9%), with the remainder completing some college (11.5%) or high school (15.4%; data missing for $n = 5$). The majority of the sample were diagnosed with disruptive behavior disorder, not otherwise specified (61.5%).

2.2 Procedures

2.2.1 Recruitment and Study Eligibility

Participants were recruited from families referred to parent management training in the BBI program at Texas Children's Hospital. In order to be eligible for the study, children had to score within the clinical range on the Eyberg Child Behavior Inventory (Eyberg, 1999), which is a parent reported measure of child disruptive behavior that demonstrates good internal consistency in this age range (Eyberg & Pincus, 1999). Individuals were excluded from the study if parents reported the presence of severe

receptive language disorder or significant medical health impairment capable of affecting behavior, such as seizure disorder or premature birth prior to 30 weeks gestation.

2.2.2 Intervention Protocol

All participants completed the Brief Behavioral Intervention, or BBI, which is a parent training designed specifically to have fewer sessions in order to limit attrition (Axelrad & Chapman, 2016; https://doi.org/10.15766/mep_2374-8265.10376). The treatment involves 6 weekly 1-hour sessions. Specifically, the first two sessions of BBI focus on child-directed play, or increasing parent responsiveness to appropriate child play. Sessions 3, 4, & 5 address parent-directed behavioral intervention. More specifically, the third session focuses on differential attention, or attending to positive behavior by providing labeled praise, and ignoring minor misbehaviors or attention seeking behaviors. The fourth week of BBI addresses effective commands. The fifth week addresses the development of a time-out procedure for serious misconduct or aggressive behaviors. Finally session 6 focuses on problem-solving parent-reported or therapist-observed difficulty with any of skills learned. In addition, any additional optional topics are discussed, based on the needs of the family and child. Finally, termination includes a discussion of future management of child misbehavior. In order for treatment completion to occur, all skills must be introduced and parents must indicate treatment goals are met and they are happy with their child's behavior. Most families attend an average of approximately 6-7 sessions to complete the intervention (Axelrad, Butler, Dempsey, & Chapman, 2013; current sample $M = 5.68$). Research examining the efficacy of BBI, suggests the treatment is effective in significantly reducing

hyperactivity, aggression, attention problems, and general behavior problems from pre-to post-treatment and these effects are maintained at the 1-year follow-up (Axelrad, Butler, Dempsey, & Chapman, 2013). Further, drop-out rates for BBI are lower than those of other parent management training interventions (approximately 15% vs. 50%; Axelrad, Butler, Dempsey, & Chapman, 2013; Fernandez & Eyberg, 2009).

Advanced psychology graduate students and postdoctoral fellows are the clinicians providing the intervention. Clinicians receive live supervision from a licensed clinical psychologist or postdoctoral fellow with at least 1 year of experience in the program. In addition, clinicians are required to complete a standardized checkout procedure for each session demonstrating competency in delivering the intervention prior to providing the intervention to participants. In addition, live supervision to ensure treatment fidelity is provided, and clinicians take a short break halfway through each session to receive feedback from a licensed psychologist or psychology postdoctoral fellow. Measures of traits were completed by parents pre-treatment, and measures of symptoms are completed by parents pre-treatment and post-treatment.

2.3 Measures

2.3.1 Temperament Traits

Pre-treatment parents completed the Child Behavior Questionnaire-Very Short Form (CBQ-VSF), which uses 36-items to assess negative affectivity, surgency extraversion, and effortful control (Putnam & Rothbart, 2006). Each domain is assessed with 12-items rated by parents on a scale of 1 (*extremely untrue*) to 7 (*extremely true*). The CBQ-VSF has demonstrated acceptable internal consistency (alphas range from .72

to .75) and confirmatory factor analyses has indicated marginal fit of the items to a three-factor model (CFI=.96) (Putnam & Rothbart, 2006).

2.3.2 Symptoms

Symptoms were assessed pre-treatment and post-treatment using the the Disruptive Behaviors Rating Scale (DBRS) and the Behavior Assessment System for Children-Third Edition (BASC-3).

2.3.2.1 Disruptive Behavior Rating Scale (DBRS)

Parents completed the DBRS as a direct assessment of symptoms of ADHD and ODD (Barkley & Murphy, 1998). Parents rate the frequency (*never to very often*) in which their child exhibited each symptom of ADHD and ODD over the past 6 months. The DBRS shows strong internal consistency and evidence of convergent/divergent and discriminative validity in this age range (Friedman-Weieneth, Doctoroff, Harvey, & Goldstein, 2009). The current study utilized the ADHD inattention, ADHD hyperactive-impulsive, and ODD symptoms scales.

2.3.2.2 Behavior Assessment System for Children-Third Edition (BASC-3)

Parents also completed the BASC-3, which is a broad-band measure of child symptomatology. The BASC-3 includes several subscales pertaining to disruptive behaviors, which will be the focus of the proposed study; specifically, the Hyperactivity, Aggression, Externalizing Problems, and Attention Problems scales. The BASC-3 demonstrates good reliability and validity in this age range (Reynolds & Kamphaus, 2015).

2.3.3 Treatment Adherence

In order to assess parental adherence to treatment outside of session, clinicians provided an overall adherence rating on a scale of 1 (*no adherence*) to 5 (*strong adherence*) at the completion of treatment. The adherence rating scale provides detailed descriptions of each level of adherence based on parent's frequency of completion of behavior logs, ability to provide examples of use of skills outside of session, and ability to demonstrate use of skills within session.

Table 2.1 Demographics

	<i>N</i> (%)
Sex	
Male	18 (69.2)
Female	8 (30.8)
Age [<i>M</i> (<i>SD</i>)]	4.49 (.77)
Race	
Caucasian	19 (73.1)
Hispanic	4 (15.4)
African American	1 (3.8)
Asian	1 (3.8)
Other	1 (3.8)
Parent Education	
High School	4 (15.4)
Some College	3 (11.5)
Bachelors Degree	6 (23.1)
Masters Degree or Higher	8 (30.8)

Note. *N* = 26; Parent Education *n* = 21.

CHAPTER 3. RESULTS

Analyses were conducted using Mplus (Muthen & Muthen, 1998-2007) which allowed for the statistical control of non-normality and outliers through the use of robust maximum likelihood estimation (Curran, West, & Finch, 1996). Full information likelihood estimation (i.e., FIML or direct fitting), a method of directly fitting models to raw data without imputing values (McCartney, Burchinal, & Bub, 2006) was utilized to address missingness. Repeated measures ANOVAs were conducted to examine pre-intervention and post-intervention differences in child gender, race/ethnicity, parent education, and medication status. Results indicated pre-intervention and post-intervention differences in hyperactivity/impulsivity was significantly related to gender ($p = .04$) such that males experienced a greater decrease in symptoms than females, therefore analyses related to hyperactivity/impulsivity were conducted with gender entered as a covariate. To test the hypothesis that treatment outcomes are a function of children's traits, more specifically whether negative affect, surgency, and effortful control moderate the relationship between pre and post treatment change in ADHD and ODD symptoms, a series of hierarchical multiple regression analyses were conducted.

Paired samples t-tests were run to examine change in parent-reported pre and post treatment inattentive, hyperactive-impulsive, and ODD symptoms. The change in pre ($M = 3.85$) and post ($M = 2.85$) treatment inattentive ADHD symptoms was not significant ($p = .12$). The change in pre ($M = 5.81$) and post ($M = 4.27$) treatment hyperactive-impulsive ADHD symptoms was significant ($p = .001$), such that parents reported fewer symptoms of hyperactive-impulsive symptoms following treatment. The change in pre ($M = 4.23$) and post ($M = 3.19$) treatment ODD symptoms was not significant ($p = .13$).

3.1 ADHD Inattentive Symptoms

Results of moderation analyses for post-treatment ADHD inattentive symptoms are presented in Table 2. In order to determine if negative affect moderated the relationship between pre and post treatment symptom change in inattentive ADHD symptoms, a hierarchical multiple regression model was run with pre-treatment inattentive symptoms and negative affect entered as predictors of post treatment inattentive symptoms at Step 1 and the interaction between pre-treatment inattentive symptoms and negative affect entered at Step 2. The main effect of pre-treatment inattention was not significant, $\beta = .30, p = .16$. The main effect of negative affect was not significant, $\beta = -.07, p = .78$. The interaction between pre-treatment inattention and negative affect was not significant, $\beta = -.06, p = .79$.

In order to determine if surgency moderated the relationship between pre and post treatment symptom change in inattentive ADHD symptoms, a hierarchical multiple regression model was run with pre-treatment inattentive symptoms and surgency entered as predictors of post treatment inattentive symptoms at Step 1 and the interaction between pre-treatment inattentive symptoms and surgency entered at Step 2. The main effect of pre-treatment inattention was not significant, $\beta = .21, p = .31$. The main effect of surgency was not significant, $\beta = .33, p = .11$. The interaction between pre-treatment inattention and surgency was not significant, $\beta = .11, p = .62$.

In order to determine if effortful control moderated the relationship between pre and post treatment symptom change in inattentive ADHD symptoms, a hierarchical multiple regression model was run with pre-treatment inattentive symptoms and effortful

control entered as predictors of post treatment inattentive symptoms at Step 1 and the interaction between pre-treatment inattentive symptoms and effortful control entered at Step 2. The main effect of pre-treatment inattention was not significant, $\beta = .33, p = .10$. The main effect of effortful control was not significant, $\beta = -.04, p = .86$. The interaction between pre-treatment inattention and effortful control was not significant, $\beta = .14, p = .62$.

3.2 ADHD Hyperactive-Impulsive Symptoms

Results of moderation analyses for post-treatment ADHD hyperactive-impulsive symptoms are presented in Table 3. In order to determine if negative affect moderated the relationship between pre and post treatment symptom change in hyperactive/impulsive ADHD symptoms, a hierarchical multiple regression model was run with pre-treatment hyperactive/impulsive symptoms and negative affect entered as predictors of post treatment hyperactive/impulsive symptoms at Step 1 and the interaction between pre-treatment hyperactive/impulsive symptoms and negative affect entered at Step 2. The main effect of pre-treatment hyperactivity/impulsivity was significant, $\beta = .61, p = .002$. The main effect of negative affect was not significant, $\beta = .03, p = .89$. The interaction between pre-treatment hyperactivity/impulsivity and negative affect was not significant, $\beta = -.02, p = .92$.

In order to determine if surgency moderated the relationship between pre and post treatment symptom change in hyperactive/impulsive ADHD symptoms, a hierarchical multiple regression model was run with pre-treatment hyperactive/impulsive symptoms and surgency entered as predictors of post treatment hyperactive/impulsive symptoms at Step 1 and the interaction between pre-treatment hyperactive/impulsive symptoms and

surgency entered at Step 2. The main effect of pre-treatment hyperactivity/impulsivity was significant, $\beta = .52, p = .01$. The main effect of surgency was significant, $\beta = .35, p = .03$ such that lower levels of surgency predicted lower levels of hyperactivity/impulsivity symptoms post treatment (and the converse). The interaction between pre-treatment hyperactivity/impulsivity and surgency was not significant, $\beta = .12, p = .44$.

In order to determine if effortful control moderated the relationship between pre and post treatment symptom change in hyperactive/impulsive ADHD symptoms, a hierarchical multiple regression model was run with pre-treatment hyperactive/impulsive symptoms and effortful control entered as predictors of post treatment hyperactive/impulsive symptoms at Step 1 and the interaction between pre-treatment hyperactive/impulsive symptoms and effortful control entered at Step 2. The main effect of pre-treatment hyperactivity/impulsivity was significant, $\beta = .63, p = .001$. The main effect of effortful control was not significant, $\beta = .15, p = .35$. The interaction between pre-treatment hyperactivity/impulsivity and effortful control was not significant, $\beta = .12, p = .44$.

Since preliminary analyses indicated pre-intervention and post-intervention differences in hyperactivity/impulsivity was significantly related to gender ($p = .04$), all analyses for hyperactivity/impulsivity were also examined with gender entered as a covariate. Results of the hierarchical regression models above did not differ significantly when gender was entered into the models (i.e. main effects for pre-treatment hyperactivity/impulsivity and surgency remained significant).

3.3 ODD Symptoms

Results of moderation analyses for post-treatment ODD symptoms are presented in Table 4. In order to determine if negative affect moderated the relationship between pre and post treatment symptom change in ODD symptoms, a hierarchical multiple regression model was run with pre-treatment ODD symptoms and negative affect entered as predictors of post treatment ODD symptoms at Step 1 and the interaction between pre-treatment ODD symptoms and negative affect entered at Step 2. The main effect of pre-treatment ODD was not significant, $\beta = .26, p = .27$. The main effect of negative affect was not significant, $\beta = -.03, p = .91$. The interaction between pre-treatment ODD and negative affect was not significant, $\beta = -.15, p = .59$.

In order to determine if surgency moderated the relationship between pre and post treatment symptom change in ODD symptoms, a hierarchical multiple regression model was run with pre-treatment ODD symptoms and surgency entered as predictors of post treatment ODD symptoms at Step 1 and the interaction between pre-treatment ODD symptoms and surgency entered at Step 2. The main effect of pre-treatment ODD was not significant, $\beta = .23, p = .31$. The main effect of surgency was not significant, $\beta = .01, p = .94$. The interaction between pre-treatment ODD and surgency was not significant, $\beta = -.26, p = .18$.

In order to determine if effortful control moderated the relationship between pre and post treatment symptom change in ODD symptoms, a hierarchical multiple regression model was run with pre-treatment ODD symptoms and effortful control entered as predictors of post treatment ODD symptoms at Step 1 and the interaction between pre-treatment ODD symptoms and effortful control entered at Step 2. The main

effect of pre-treatment ODD was not significant, $\beta = .32, p = .15$. The main effect of effortful control was not significant, $\beta = -.12, p = .62$. The interaction between pre-treatment ODD and effortful control was not significant, $\beta = -.07, p = .77$.

Overall, interactions between traits and pretreatment symptoms were not significant, but main effects indicated pre-treatment hyperactivity/impulsivity and surgency were significantly related to post treatment symptoms of hyperactivity/impulsivity.

3.4 Secondary Analyses

Secondary analyses were conducted to examine differences in drop-out, adherence, and long-term outcomes. Chi-square statistics were conducted to examine treatment completing versus drop-out differences in child traits, as well as gender, race/ethnicity, parent education, and medication status. Results indicated there were no significant differences between treatment completing versus individuals that dropped-out in child traits, gender, race/ethnicity, parent education, or medication status. Chi-square statistics were also conducted to examine differences in adherence based on child traits, as well as gender, race/ethnicity, parent education, and medication status. Results indicated there were no significant differences in adherence for child traits, gender, race/ethnicity, parent education, or medication status. Repeated measures ANOVAs examining differences in pre-intervention and post-intervention symptom levels based on adherence were also conducted. Results suggested adherence was not a significant predictor of change in pre-intervention and post-intervention symptoms.

Secondary analyses also included an examination of a series of hierarchical multiple regression analyses to determine whether negative affect, surgency, and effortful

control moderated the relationship between pre and post treatment change in symptoms utilizing the BASC scales of attention problems, hyperactivity, aggression, and externalizing problems. Results of these analyses indicated significant main effects for pre-treatment symptoms of attention problems, hyperactivity, aggression, and externalizing problems on post-treatment symptoms of attention problems, hyperactivity, aggression, and externalizing problems, respectively. However, all main effects for traits were not significant and interactions between traits and pretreatment symptoms were not significant.

Table 3.1 Moderators of Post-Treatment ADHD Inattentive Symptoms

Predictor	Estimate	<i>SE</i>	<i>p</i>
Pre-treatment Inattention	.30	.22	.16
Negative Affect	-.07	.23	.78
Pre-treatment Inattention x Negative Affect	-.06	.23	.79
Pre-treatment Inattention	.21	.21	.31
Surgency	.33	.21	.11
Pre-treatment Inattention x Surgency	.11	.22	.62
Pre-treatment Inattention	.33	.20	.10
Effortful Control	-.04	.24	.86
Pre-treatment Inattention x Effortful Control	.14	.29	.62

Table 3.2 Moderators of Post-Treatment ADHD Hyperactive-Impulsive Symptoms

Predictor	Estimate	SE	p
Pre-treatment Hyperactivity/Impulsivity**	.61	.20	.002
Negative Affect	.03	.22	.89
Pre-treatment Hyperactivity/Impulsivity x Negative Affect	-.02	.23	.92
Pre-treatment Hyperactivity/Impulsivity*	.52	.21	.01
Surgency*	.35	.16	.03
Pre-treatment Hyperactivity/Impulsivity x Surgency	.12	.15	.44
Pre-treatment Hyperactivity/Impulsivity**	.63	.19	.001
Effortful Control	.15	.16	.35
Pre-treatment Hyperactivity/Impulsivity x Effortful Control	.12	.16	.44

Note. * $p < .05$; ** $p < .01$.

Table 3.3 Moderators of Post-Treatment ODD Symptoms

Predictor	Estimate	<i>SE</i>	<i>p</i>
Pre-treatment ODD	.26	.24	.27
Negative Affect	-.03	.24	.91
Pre-treatment ODD x Negative Affect	-.15	.27	.59
Pre-treatment ODD	.23	.22	.31
Surgency	.01	.19	.94
Pre-treatment ODD x Surgency	-.26	.19	.18
Pre-treatment ODD	.14	.10	.17
Effortful Control	-.14	.29	.64
Pre-treatment ODD x Effortful Control	-.03	.13	.81

CHAPTER 4. DISCUSSION

Consistent predictors of differential outcomes among young children in treatment for ADHD and ODD have not been identified, and therefore a crucial treatment limitation is the lack of understanding of for whom such treatments work best. The goal of the current study was to examine traits as moderators of treatment outcomes in children with ODD and ADHD in order to gain better understanding of for whom these treatments work best. It was hypothesized that 1) negative affect would moderate treatment outcomes for both individuals with ADHD and ODD such that individuals with high negative affect would have worse ADHD and ODD symptoms immediately post-treatment 2) effortful control would moderate treatment outcomes for inattentive symptoms of ADHD such that individuals with low effortful control would exhibit the largest improvement in inattentive ADHD symptoms immediately post-treatment and 3) surgency would moderate treatment outcomes for hyperactive-impulsive symptoms of ADHD and argumentative, defiant, and spiteful symptoms of ODD such that individuals with high surgency would exhibit the largest improvement in hyperactive-impulsive and argumentative, defiant, and spiteful symptoms immediately post-treatment.

Results were largely inconsistent with hypotheses. Overall, main effects of changes in pre-treatment and post-treatment symptoms were largely insignificant, main effects of traits on post-treatment symptoms were largely insignificant, and interactions between traits and pretreatment symptoms were all insignificant, suggesting traits did not moderate treatment outcomes in the current study. However, results found significant declines in hyperactivity-impulsivity across treatment and that surgency was significantly related to post treatment symptoms of hyperactivity/impulsivity, although the relationship

between pre-treatment and post-treatment hyperactive-impulsive symptoms was not significantly moderated by surgency. These results are in line with work suggesting surgency is an early marker of ADHD, particularly hyperactivity/impulsivity (Martel, 2016).

Results of secondary analyses examining differences in drop-out, adherence, and long-term outcomes based on child traits, gender, race/ethnicity, parent education, or medication status were also nonsignificant. Secondary analyses also examined traits as moderators of symptoms utilizing a broad-band measure of symptoms (the BASC). Results of these secondary analyses found significant declines in pre-treatment to post-treatment symptoms of attention problems, hyperactivity, aggression, and externalizing problems. These results are consistent with results utilizing the symptom-specific DBRS for hyperactivity/impulsivity; however, the narrowband measure did not find a significant change in inattentive symptoms from pre to post-treatment. This is likely due to differences in the item content across scales and may be due to the BASC attention problems scale being broader than inattention (Collett, Ohan, & Myers, 2003). For example, the BASC attention problem scale utilizes items such as, “Has short attention span” and “Has trouble concentrating”, while the DBRS utilizes items such as “Has difficulty sustaining attention in tasks or play activities” and “Fails to give close attention to details or makes careless mistakes in schoolwork” to assess inattention. However, all main effects for traits were not significant and interactions between traits and pretreatment symptoms were not significant, consistent with results utilizing the narrowband symptom rating scale.

The lack of significant findings in the current study is likely due to the fact that there was insufficient power to detect significance due to the small sample size. Initial power analyses indicated 30-35 individuals would be adequate to detect a moderate effect size, as suggested by prior literature (Martel, 2009; Smith & Martel, 2018). Given the current study achieved an N of 26, the study was below our target N. Unfortunately, recruitment occurred at a slower pace than anticipated. Additionally, while 46 individuals were enrolled, completed pre-treatment measures, and completed treatment, only 50% of these individuals completed post-treatment measures, which limited the N. While data for the current study occurred at one treatment site, in the future it will be important to include multiple treatment sites and clinical collaborators, as well as provide incentive for completing follow-up measures to ensure sufficient power. The majority of results suggested there was no significant change in symptoms from pre-treatment to post-treatment. However, numerous studies have shown the efficacy of BBI in reducing symptoms of ADHD and ODD (Axelrad, Butler, Dempsey, & Chapman, 2013). Therefore, it is likely the results of the current study are limited due to insufficient power. Results did find a significant within-person main effect of pre-treatment to post-treatment decline in hyperactivity/impulsivity. Research suggests, that hyperactivity/impulsivity is much more prevalent in preschool than inattention before declining in school-age children (Lahey et al., 2005; O'Neill, Rajendran, Mahbubani, & Halperin, 2017). It could be that the significant decline seen was due to developmental changes in hyperactivity/impulsivity rather than treatment improvements.

While it is likely that the lack of significant findings is due to limited power in the current study, it is possible that these results represent true findings and suggest traits do

not moderate treatment outcomes in children with ADHD and ODD. Data collection is ongoing, and results will be rerun when a larger sample size is achieved; however, if these results remain the same and are replicated in larger samples, an important next step will be examining parent traits as potential moderators of treatment since treatments in this age range are parent-focused. Therefore, it is possible that perhaps parent traits moderate treatment outcomes, rather than child traits.

4.1 Limitations and Future Directions

While this study is an important first step in examining traits as moderators of treatment outcomes for individuals with ADHD and ODD, this study is not without limitations. A major limitation of the current study was the small sample size, which resulted in limited power to detect significant findings. In addition, the current study examined child traits as a moderator of treatment, without an examination of parent traits, which may be an important moderator to examine since BBI is a parent-focused treatment. The adherence rating scale was developed for the current study and therefore, little information is known about the utility of this measure. The adherence ratings in the current study were provided by clinicians, and therefore may be biased. Finally, symptoms were not assessed session-to-session, which did not allow for an examination of moderators at different time points in treatment.

Future studies should examine traits as moderators of treatment outcomes in individuals with ADHD and ODD utilizing a larger sample size in order to ensure sufficient power to detect results. In order to ensure sufficient power, it will be important for future studies to provide incentive for completing post-treatment measures, as well as potentially utilize multiple treatment sites. Additionally, it will be important for future

work to examine moderating effects at different time points over the course of treatment, as well as examine possible mediators of treatment. Finally, examining traits as moderators of treatment over longer follow-up periods is an important future direction.

4.2 Conclusions

The current study was an important first step to gain better understanding of for whom treatments for ADHD and ODD work best by examining traits as moderators of treatment outcomes in children. However, the current study was limited by the small sample size and lack of sufficient power to detect significance. As previously mentioned, data collection is ongoing, and results will be rerun when a larger sample size is achieved.

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