

Possible Neglected Factors: The Relationship Between ADHD,  
Impulsivity, and Borderline Personality Disorder Traits

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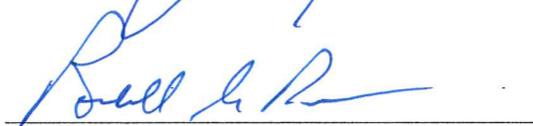
Possible Neglected Factors: The Relationship Between ADHD,  
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## Abstract

The current study examines how impulsivity may be a key feature that influences the relationship between symptoms of attention-deficit/hyperactivity disorder (ADHD), oppositional defiant disorder (ODD), conduct disorder (CD), and borderline personality disorder (BPD).

Developmental pathways were tested similar to those proposed for antisocial personality disorder (ASPD) and BPD. The following measures were used to assess each disorder and impulsivity:

Barkley forms for the evaluation of adults, McLean Screening Instrument for Borderline

Personality Disorder, and the Barratt Impulsiveness Scale – 11. Three hundred and fifteen

participants were recruited from a medium sized midwest university, demographics matching

those of the region. Results indicate that impulsivity does not significantly predict BPD traits

above and beyond ADHD, ODD, and CD symptoms. This suggests that BPD does share similar

developmental route to ASPD, and the expression of these disorders may differ by gender. In

addition, this provides support of future studies examining the symptomology from each disorder

which contributes to the later development of a personality disorder. This in turn provides

clinicians with knowledge on both the etiology and treatment of these comorbid disorders.

Possible Neglected Factors: The Relationship Between ADHD,  
Impulsivity, and Borderline Personality Disorder Traits

Attention-deficit/hyperactivity disorder (ADHD) has been examined within the research literature as a precursor to a range of functional impairments observed in children, adolescents, college students, and adults (DuPaul & Jimerson, 2014; DuPaul, Weyandt, O'Dell, & Varejao, 2009; Kuriyan et al., 2013). One area of impairment which can develop from a history of ADHD is personality dysfunction which may manifest as personality disorders. Longitudinal research on ADHD has shown that male adolescents diagnosed with ADHD are more likely to develop Antisocial Personality Disorder (ASPD) in adulthood (Loeber, Burke, Lahey, Winter, & Zera, 2000). Similarly, female adolescents diagnosed with ADHD have shown a greater likelihood of developing Borderline Personality Disorder (BPD) as adults (Davids & Gastpar, 2005; Ferrer et al., 2010; Nigg, Silk, Stavro, & Miller, 2005; Philipsen, 2006; Stepp, Burke, Hipwell, & Loeber, 2012). These findings provide support for the importance of studying the developmental progression of these disorders and the factors that promote such development. Impulsivity has been proposed as a common link between these disorders (Nigg et al., 2005; van Dijk, Lappenschaar, Kan, Verkes, & Buitelaar, 2011) but has not been adequately defined in either disorder. The current study seeks to explore the role of impulsivity to assist in understanding and counteracting the impairing developmental progression of ADHD to these personality disorders. Until a clear cut definition for impulsivity is provided to assist in the differential diagnosis of ASPD and BPD, symptom measurement and effective interventions will continue to be imprecise.

**ADHD and ASPD**

Individuals diagnosed with ADHD and lacking treatment can develop additional comorbid psychological disorders later in life (e.g., oppositional defiant disorder [ODD], conduct disorder [CD], antisocial personality disorder [ASPD], and borderline personality disorder [BPD]; APA, 2013). According to the Diagnostic and Statistical Manual of Mental Disorders, 5<sup>th</sup> Edition (DSM-5; APA, 2013) ASPD occurs between 0.2% and 3.3% of the general population. ASPD is characterized by disregard of others and the violation of their rights. In order for an individual to receive a diagnosis of ASPD the following criterion must be met: must be at least 18 years of age and “have had a history of some symptoms of conduct disorder before the age of 15 years” (APA, 2013, p. 659). The behaviors of aggression and impulsivity are demonstrated in persons who receive a diagnosis of conduct disorder, and those labeled ASPD.

Impulsivity is also a core characteristic of ADHD. Impulsivity as observed in ADHD is described as “hasty actions that occur in the moment without forethought and that have a high potential for harm to the individual” (APA, 2013, p. 61). Individuals may also be socially intrusive or quick to make decisions without considering long-term ramifications. Other common characteristics of ADHD consistent with impulsivity are low frustration threshold and mood lability.

**Developmental route.** In recognition of symptomatic connections between ADHD and ASPD, Loeber and colleagues (2000) proposed a developmental course from ADHD to ASPD based on previous studies (Koumoula, 2012; Lahey, Walkman, & McBurnett, 1999). Children diagnosed with ADHD may be predisposed to develop symptoms of ODD, which could possibly develop into CD. In fact, male children diagnosed with ADHD were found to experience an earlier onset of CD symptomology. While adolescents diagnosed with CD were not necessarily

predisposed toward developing symptoms of ASPD, those who expressed higher levels of ASPD symptom severity before the age of 18 were shown to have a higher risk of qualifying for a diagnosis of ASPD in adulthood. Impulsivity was also proposed as an important link between the development of CD from ADHD. Impulsivity was found to be associated with an earlier onset of antisocial behaviors, and these behaviors were related to behavioral impulsivity. From an ASPD perspective, impulsivity is an individual's inability to plan ahead which manifests as sudden changes and spur of the moment decisions related to their employment, relationships, and residency. Other common features of ASPD include a higher prevalence among males, high comorbidity with addictions, and high prevalence in in prison and forensic settings.

Burke, Loeber, and Birmaher (2002) have proposed three developmental pathways for children who progress from childhood ADHD to ASPD in adulthood. The three pathways have been labeled overt, covert, and authority conflict. However, there was a consensus among these authors that children follow more than one developmental pathway which results in multi-problem children. The overt pathway is characterized by minor aggression progressing to physically fighting which then escalates to violence. Children who follow the covert pathway engage in minor behaviors such as fire setting or vandalism before the age of 15, and then progress on to moderate and/or severe forms of delinquency. The authority conflict pathway is characterized by children progressing from stubborn behaviors on to defiance and avoidance of authority before the age of 12 years.

Interestingly, the age of onset for CD may be different for males and females (Loeber et al., 2000), with females showing symptoms at a later age. While the common age of onset for females is not yet known, Loeber et al. (2000) indicate that a later onset is observed with females (e.g., late adolescence). Females were shown to have equal if not more stable prevalence of

disruptive behaviors. However, antisocial and aggressive behaviors are expressed differently among female and male children. While males may express overt antisocial and aggressive behaviors physically, females tend to utilize indirect and socially related forms of aggression and antisocial behaviors such as social alienation, ostracism, and defamation of character. Burke et al. (2002) emphasized the lack of clear evidence that female children diagnosed with ADHD, who later suffered from CD, also endorsed symptoms of ODD. This may be due to the late onset of CD symptoms for females, which suggests alternative developmental routes from ADHD to ASPD for female children.

### **ADHD and BPD**

A few previous studies have examined the shared characteristics and comorbidity of ADHD and BPD (Cumyn, French, & Hechtman, 2009; Ferrer et al., 2010; Philipsen, 2006). According to the DSM-5 (APA, 2013) BPD occurs between 1.6% and 5.9% of the general population. BPD is characterized by significant levels of impulsivity and a pattern of instability in emotions, self-image, and an individual's interpersonal relationships (APA, 2013). Individuals are typically diagnosed with BPD as young adults around the age of eighteen, however, unlike ASPD there is no specific age of onset required. The population prevalence rates have been estimated to range between 1.6% and 5.9%, with the disorder being primarily diagnosed (approximately 75%) in females (APA, 2013). Impulsivity and emotionality are two features shared by ADHD and BPD. However, these two features are expressed differently by females and males. Davids and Gastpar (2005) have stated that males diagnosed with ADHD commonly control emotional lability through "excessive sports, sexual behaviors, or sometimes impulsive aggressive behaviors" (p. 872), while females diagnosed with BPD typically regulate emotional lability through either "freezing behavior" or "dissociative states" (p. 872).

Based on previous research, impulsivity may actually be a shared etiology between ADHD and BPD (Nigg et al., 2005; van Dijk, Lappenschaar, Kan, Verkes, & Buitelaar, 2011). Higher rates of BPD, especially in women, have been associated with the combined presentation of ADHD (Cumyn et al., 2009). Individuals diagnosed with comorbid BPD and ADHD tend to endorse higher rates of substance abuse disorders (e.g., cannabis and cocaine), suicidal behaviors, and higher Barratt Impulsiveness Scale – 11 (BIS-11) scores (Ferrer et al., 2010). Krause-Utz et al. (2013) found individuals diagnosed with comorbid BPD and ADHD reported higher rates of impulsivity after experiencing stress. Overtime, empirical and epidemiological research continues to point to a possible developmental progression between ADHD and BPD (Davids & Gastpar, 2005; Ferrer et al., 2010; Nigg et al., 2005; Philipsen, 2006; Stepp et al., 2012).

**Developmental routes.** While research has not specifically addressed a developmental progression between ADHD and BPD, two studies have investigated the possible association of childhood ADHD and BPD in adulthood (Davids & Gastpar, 2005; Ferrer et al., 2010). Three studies in particular have theorized possible developmental routes of BPD beginning with symptomology of ADHD, ODD, and CD (Nigg et al., 2005; Philipsen, 2006; Stepp et al., 2012). Stepp, et al. (2012) stipulated that childhood disorders which share similar characteristics (e.g., ADHD and ODD) may act as precursors of BPD. In this study, girls who endorsed symptoms of ADHD, ODD, and BPD were assessed over an eight-year period from the ages of eight to fourteen. ADHD and ODD were found to be significantly associated when participants were eight years old. Higher levels of BPD symptoms at age 14 were predicted by ADHD and ODD at the age of eight years. Increases in ADHD symptoms between ages 10 and 13 predicted increased levels of BPD symptoms at age 14. Similar increases of ODD symptoms between ages

8 and 10 predicted increased levels of BPD symptoms at age 14. These results indicated that while these two conditions of ADHD and ODD appeared to become less related overtime, they remained significantly correlated.

Nigg et al. (2005) noted that when ADHD was accompanied by negative life events such as sexual abuse, the likelihood of developing BPD in adulthood increased. These researchers discovered similar patterns for children who meet criteria for CD, and identified ADHD and CD as childhood precursors to cluster B personality disorders, which include BPD and ASPD. The proposed developmental course is supported by the probable shared etiology of ADHD and BPD manifesting as impulsive behavior (Nigg et al., 2005; Philipsen, 2006). The researchers view the possible role of abuse in BPD as creating a breakdown in an individual's cognitive and neural mechanisms which allow them to inhibit or suppress their behaviors, cognitions, and/or affect. This results in an inability to effectively regulate one's behaviors and thought processes, with a resultant increase in impulsive behaviors. Nigg et al. (2005) specifically examined executive response inhibition within BPD in relation to ADHD and personality disorders, and found that BPD symptoms were correlated with poor performance on executive function measures. Results concerning problems with response inhibition led the researchers to theorize three developmental routes of BPD: primary impulsive, traumatogenic, and inhibitory dysfunction. The primary impulsive route suggests symptoms of ADHD and/or CD in addition to interpersonal and executive functioning problems lead to the development of BPD. Individuals following the traumatogenic route experience traumatic or abusive disruptions during their childhood which leads to an underdevelopment of affect regulation. They are more likely to perceive the world in a more negative manner. Individuals following the inhibitory dysfunction route typically express

temperamental hostility in addition to a negative affect. This combination produces an impaired ability to restrain behavior or cognitive processes.

Philipsen (2006) posited that additional external events and experience in combination with ADHD potentially lead to the later development of BPD symptomology, which is similar to the primary impulsive route proposed by Nigg et al. (2005). This would imply that ADHD may serve as a possible risk factor to the later development of BPD. ADHD and cluster B personality disorders have been shown to co-occur. However, symptoms of ADHD in isolation do not fully explain the development of BPD. Organic brain structure deficits accompanying reactions to internal stimulation may be better explained by BPD symptoms, while deficits in how external stimulation are processed may account for ADHD symptoms. Shared etiologies and symptoms indicate ADHD may serve as a risk factor for children, especially females, of developing symptoms of BPD during late adolescence and adulthood. These theories provide initial support for a developmental route from ADHD in childhood to BPD during adolescence and adulthood.

Unlike the identified developmental route from ADHD to ASPD (Loeber et al., 2000) the hypothesized route from ADHD to BPD has not been firmly established in the literature. This may be due to a gender bias, since male children predominantly receive diagnoses of ADHD, while females are not as readily identified or diagnosed with this disorder. Another possibility is that female children do not express symptoms of ADHD and impulsivity in the same manner as their male counterparts. The lack of understanding of how impulsivity is expressed by either gender could lead to misdiagnosis. Young girls may be particularly prone to being underdiagnosed, and not receiving appropriate interventions at an early age may promote the development of personality disorders like ASPD and BPD.

**Differentially Diagnosing ADHD, BPD, and ASPD**

Differentially diagnosing ADHD, BPD, and ASPD can become exceedingly difficult due to a shared characteristic of impulsivity. Impulsivity manifests as inattention and hyperactivity in ADHD, as interpersonal deficits, emotion dysregulation, and an unstable self-image in BPD, and as the disregard and violation of others' rights in ASPD. All three disorders share impulsivity which is identified as a diagnostic criterion (APA, 2013). The expression of these symptoms can become difficult to separate into a clinical conceptualization. In turn this leads to either comorbidity or the lack of a clear primary diagnosis.

Emotional dysregulation is a key feature of BPD, can also occur in individuals diagnosed with ADHD, but is not a criterion for ASPD (APA, 2013). Scott, Stepp, and Pilkonis (2014) examined individuals diagnosed with BPD who were found to endorse and perceive greater levels of emotional dysregulation and trait impulsivity. Individuals diagnosed with BPD who experienced emotional dysregulation were more likely to exhibit physical and psychological forms of aggression. In contrast, ASPD individuals who experienced emotional dysregulation exhibited primarily physical forms of aggression. This is similar to individuals diagnosed with ADHD whom have demonstrated an increased likelihood of acting both physically and sexually aggressive with their intimate partners (DuPaul et al., 2009).

Aggression is an additional core feature of BPD typically manifested against one's self or others (Látalová & Praško, 2010). Differential diagnosis between BPD and ASPD is simplified because aggressive behaviors exhibited in BPD are considered more impulsive, in comparison to ASPD aggressive behaviors which are considered more instrumental (e.g., planning toward attaining a goal). Fossati et al. (2004) offered additional support when they examined levels of impulsivity and aggressiveness as predictors of both BPD and ASPD. Individuals diagnosed with

BPD and ASPD were found to share impulsivity (e.g., motor impulsivity), but did not exhibit aggression in the same manner. DuPaul and Jimerson (2014) highlighted the fact that girls may not be identified as endorsing symptoms of ADHD due to not exhibiting aggression and/or defiant behaviors like boys. These findings suggest that aggression has become more easily identifiable, while impulsivity continually lacks sufficient operational definitions within disorders like ADHD, ASPD, and BPD.

DeShong and Kurtz (2013) found four factors of impulsivity which contribute to differentiating between ASPD and BPD. Individuals diagnosed with BPD were found to exhibit impulsivity through increased urgency and a lack of perseverance. Urgency was defined as “the tendency to commit rash or regrettable actions as a result of intense negative affect” and perseverance as “the ability to remain with a task until completion” (p. 145). Individuals diagnosed with ASPD exhibited impulsivity through a lack of premeditation, increased sensation seeking, and urgency. Premeditation was defined as “the tendency to delay action in favor of careful thinking and planning” and sensation seeking as “the tendency to pursue excitement” (p. 145). Differentially diagnosing ASPD and BPD may be improved through specification of each disorder’s impulsivity criterion.

### **Impairment of College Students and Impulsivity**

College students endorsing symptoms of one, or comorbidity between, the disorders of ADHD, BDP and/or ASPD may experience significant levels of impairment across their academic, personal, and occupational lives. Due to the lack of developmental research concerning comorbidity of ADHD and BPD (Nigg et al., 2005; Philipsen, 2006; Stepp et al., 2012) it can become increasingly difficult to apply appropriate intervention strategies for college students. During late adolescence and young adulthood, symptoms of ADHD may have created

a great deal of impairment, most notably in academic performance and social adjustment.

Personality disorders like ASPD and BPD begin to become more noticeable, with the dysfunctional patterns becoming more stable, during the college-age years. Young adulthood can become incredibly dysfunctional for individuals diagnosed with comorbid disorders of ADHD, BPD, and/or ASPD. By effectively differentiating definitions of impulsivity between these disorders during childhood and adolescence, individuals can be provided appropriate and empirically validated treatment before they experience clinically significant impairment throughout a variety of areas in their lives.

Current interventions address the symptoms of inattention exhibited by individuals diagnosed with ADHD. With the exception of pharmacotherapy, treatment does not always provide adequate interventions for impulsivity. Examples of this would be a college student's inability to remain seated during lectures, maintaining structure to complete assignments, and taking actions that match their long-term academic goals. These difficulties result with college students experiencing additional difficulties in their attempt to maintain their academic standing. The shared feature of impulsivity amongst ADHD, BPD, and ASPD requires a differential diagnosis due to overlap of symptoms (APA, 2013). However, there is a significant lack of a sufficient delineation for impulsivity within all three disorders.

Impulsivity consists of only three diagnostic symptoms with ADHD (APA, 2013). These symptoms are: blurting out answers before a question has been completed, difficulty waiting one's turn, and interrupting and/or intruding on others' conversations or activities. ASPD impulsivity is identified within only one of seven diagnostic symptoms, and characterized by hasty decisions made without forethought and sudden life changes. BPD impulsivity is represented by one of nine diagnostic symptoms, and identified as being damaging and occurring

within two areas of an individual's life (e.g., reckless behaviors and interactions, and suicidal behaviors). While the presence of symptoms of impulsivity within the criteria of each disorder marks its importance, the lack of specification and clarification of what constitutes impulsivity within each disorder is amplified by the reliance upon a single symptom in ASPD and BPD. Hoyle, Harris, and Judd (2002) advocate the use of multiple operational definitions for any construct of interest. This means that utilizing only one diagnostic criterion is insufficient when defining a construct of interest. While impulsivity is defined by three diagnostic criteria within ADHD, hyperactivity and inattention are operationally defined by two to three times as many diagnostic criteria. Despite impulsivity appearing in all three disorders there is a significant lack of understanding how it manifests itself in each disorder individually. It is important to objectively define impulsivity as it appears individually in each disorder. If impulsivity can be more specifically defined within each disorder, effective interventions can be devised to help mitigate the level of academic, occupational, and social impairment.

### **Current Study**

In order to examine how impulsivity may influence the relationship between symptoms of ADHD and BPD, or ADHD and ASPD, the current study utilized college age students. The level of impairment experienced by college students due to these disorders makes it important to understand how and why they are comorbid. Examining the role of impulsivity could possibly lead to enhanced operational definitions within each disorder. Thus, differential diagnosis will be enhanced and appropriate interventions could be applied at an earlier age in order to counteract impairment. The participants in the present study were recruited from a community sample. To address the relationship between ADHD, impulsivity, BPD, and ASPD the following hypotheses were tested:

1. If male and female participants' impulsivity score is used as an outcome variable it will be significantly predicted by their ADHD score (predictor variable).
2. If female participants' impulsivity score is used as a mediator variable, then it will significantly predict their BPD score (outcome variable).
3. If female participants' ADHD score is used as a predictor variable and their impulsivity score as a mediator (indirect effect), then these will significantly predict their BPD score above and beyond the effect of the ADHD score alone (direct effect).
4. Based on the varying proposed developmental routes (Nigg et al., 2005; Stepp et al., 2012), if female participants' ADHD score is used as a predictor variable it will significantly predict their BPD scores due to the mediating effects of their impulsivity score above and beyond the effects of their ODD and/or CD scores alone.

## **Methods**

### **Participants**

Data was collected from 372 participants from a midwest university. The majority of participants ( $n = 339$ , 91.1%) represented a non-clinical sample obtained from an introductory psychology course ( $n = 308$ , 82.8%). All participants from the introductory psychology course were offered research participation credit upon completing the survey through the online SurveyMonkey service. All other recruited participants did not receive any compensation for participating in the current study. The informed consent documents for these participants clarified confidentiality and anonymity of responses provided, and included statements regarding their right to withdraw from participation. Any participants who did not complete the full set of measures, or were not eighteen years of age, were excluded from the data analyses.

The final participant sample ( $N = 315$ ) was drawn from the introductory psychology course and Facebook. Participants' average age was 21.4 years ( $SD = 6.18$ ) with a range from 18 to 74 years. Over half of the participants identified as female ( $n = 210, 66.7%$ ) and 33.3% identified as male ( $n = 105$ ). Two hundred and eight-two participants were enrolled in an undergraduate program at college/university (89.5%), with notably smaller proportions reporting not being enrolled in college ( $n = 15, 4.8%$ ), or being enrolled in a graduate program ( $n = 14, 4.4%$ ), community college ( $n = 3, 1.0%$ ), or a technician/vocational program ( $n = 1, 0.3%$ ). The majority reported their ethnicity as Caucasian ( $n = 254, 80.6%$ ) followed by multiple ethnicities including Indigenous American ( $n = 38, 12.1%$ ), Asian-American ( $n = 7, 2.2%$ ), Hispanic ( $n = 6, 1.9%$ ), African-American ( $n = 5, 1.6%$ ), Other ( $n = 4, 1.3%$ ), and Latino ( $n = 1, 0.3%$ ).

## **Materials**

### **McLean Screening Instrument for Borderline Personality Disorder (MSI-BPD).**

The MSI-BPD was created in order to screen for symptoms of BPD endorsed in late adolescence and young adulthood (Zanarini et al., 2003). This measure is based on the borderline module of the Diagnostic Interview for DSM-IV Personality Disorders (DIPD-IV; as cited in Zanarini et al., 2003). The participants used to create and establish validation for this measure consisted of adults who met criteria for BPD and those who met criteria for other disorders (e.g., anxiety, eating, mood, and substance use disorders). The MSI-BPD has been used in a number of studies examining the relationship between BPD and other variables (Gardner & Qualter, 2009; Zanarini et al., 2003), and is considered appropriate for use with college-aged and adult populations (Chanen et al., 2008; Gardner & Qualter, 2009; Patel, Sharp, & Fonagy, 2011).

The MSI-BPD screening measure consists of 10 items that are answered yes or no, which targets the nine DSM-IV BPD criteria (Zanarini et al., 2003). Items 6 and 7 separate the ninth

BPD criterion into two questions targeting paranoid ideation and dissociation symptoms, respectively (APA, 2013). Example items include “Have you had at least two other problems with impulsivity (e.g., eating binges and spending sprees, drinking too much and verbal outbursts)” and “Have you often felt that you had no idea of who you are or that you have no identity.” Completing the MSI-BPD takes approximately one to two minutes.

Total scores are computed by summing the “yes” responses across the ten items. Therefore, scores for this measure can range from a low of zero to a high of ten. The suggested cutoff score designating a high likelihood that the respondent meets criteria for BPD is seven or more, indicating a need for additional clinical assessment to clarify a specific diagnosis of BPD. Zanarini et al. (2003) established an optimal cutoff score of 7 or more items based on logistic regression analysis, which produced satisfactory sensitivity (0.81) and specificity (0.85). For the purposes of this study, total scores were used to estimate severity of symptomatology, as represented by how many symptoms of BPD a participant endorsed. The internal consistency of the MSI-BPD has been shown to be acceptable in several studies of adult participants, with Cronbach’s alphas across a full set of ten items reported in the range of 0.74 to 0.94 (Gardner & Qualter, 2009; Melartin, Häkkinen, Koivisto, Suominen, & Isometsä, 2009; Patel et al., 2011; Zanarini et al., 2003). Convergent validity has been previously established with several other BPD screening measures. Researchers have reported strong positive relationships between the MSI-BPD and the BPD subscale of the Personality Diagnostic Questionnaire ( $r = 0.84$ ) and the Borderline Features Scale of the Personality Assessment Inventory ( $r = 0.85$ ; Gardner & Qualter, 2009). Patel, et al. (2011) found the MSI-BPD to function as a moderately effective screening tool concerning its diagnostic ability ( $AUC = 0.77$ ,  $SE = 0.05$ ). At the time of this study the divergent validity for this measure had not yet been established in the literature.

**The Barratt Impulsiveness Scale – 11.** The BIS-11 is a 30 item self-report questionnaire which takes a multi-factorial approach to assessing the construct of general impulsiveness (Patton, Stanford, & Barratt, 1995). Stanford et al. (2009) conducted a meta-analysis of the history and use of the BIS-11. The BIS-11 has been used to assess impulsiveness in clinical (e.g., substance use and other Axis I disorders, suicide attempters, and forensic populations), college, and normal populations which have examined the nature of impulsivity, developmental issues, and employment screening. Based on this research the BIS-11 is appropriate for use with college-aged and adult samples. The BIS-11 is composed of three factor analytically derived subscales labeled Attentional Impulsiveness, Motor Impulsiveness, and Non-planning Impulsiveness (Patton et al., 1995). The Attentional Impulsiveness scale includes 8 items, 11 items represent the Motor Impulsiveness scale, and the Non-planning Impulsiveness scale consists of 11 items.

Participants are provided a Likert response scale where 1 = rarely/never, 2 = occasionally, 3 = often, and 4 = almost always/always. Completing the BIS-11 takes approximately two to three minutes. To reduce the tendency of respondents to provide global or patterned response, eleven of the 30 items on the BIS-11 are negatively worded. Examples of positively-worded items, where a response of almost always suggests presence of a specific symptom include “I do things without thinking,” “I act ‘on impulse’,” and “I spend or charge more than I earn”. Examples of negatively-worded items, where a response of rarely/never suggests the presence of a specific symptoms, include “I plan tasks carefully,” “I am self-controlled,” and “I am future oriented.” Potential scores participants can receive for the full scale range from 30 to 120.

Stanford et al. (2009) conducted a meta-analysis of prior applications of the BIS-11 to derive empirically reliable cut-off scores. These researchers recommend that total scores greater than or equal to 72 indicate the individual is highly impulsive, total scores from 52 to 71 are within normal limits of impulsiveness, and scores lower than 52 suggest the individual is extremely over controlled and/or may not have completed the questionnaire in a valid manner. At the time of this study the specificity and sensitivity of the measure was not reported in the literature. For the purposes of this study, total scores were used to examine the level of impulsivity a participant may endorse. Acceptable internal consistency for total scores has been established in several studies, with Cronbach's alpha coefficients ranging from 0.79 to 0.83 (Patton, et al., 1995; Stanford et al., 2009). Stanford et al. (2009) also reported strong alpha coefficients for two of the three subscales representing the different types of impulsiveness: Attentional alpha = .74, and Non-planning alpha = .72. Internal consistency of the Motor subscale was reported as more moderate, but still adequate with alpha = .59. Adequate test-retest reliability for a trait-based measure of impulsiveness has also been reported, with  $r_s = .83$  for the total score, and the subscales of Attentional,  $r_s = .61$ ; Motor,  $r_s = .67$ ; and Non-planning,  $r_s = .72$  across a one-month interval. Convergent validity was established when the BIS-11 was compared to other self-report measures of impulsivity (e.g., Eysenck Impulsiveness Scale, I7; Zuckerman Sensation-Seeking Scale, SSS-V). Significant correlations between the subscales for each measure ranged between .11 and .57 ( $p < 0.01$ ). At the time of this study the divergent validity of this measure had not yet been established within the literature.

**Barkley Forms for the Evaluation of Adults.** The Barkley Childhood Symptoms Scale – Self-Report Form consists of 49 items rated on a Likert scale (Barkley & Murphy, 2006). The Likert scale rating used for the ADHD and ODD items has the following anchors to describe

participant's behavior: 0 (never or rarely), 1 (sometimes), 2 (often), and 3 (very often). The final score is derived from counting all items that were recorded as "often" or "very often." If six or more ADHD items are recorded as "often" or "very often" then a diagnosis of ADHD is supported. If four or more ODD items are recorded as "often" or "very often" then a diagnosis of ODD is supported. The CD items are rated as either "yes" or "no," and if three or more items are recorded as "yes" then a diagnosis of the disorder would be supported.

***ADHD items.*** The first set of questions cover the eighteen symptoms of ADHD (APA, 2013) and instruct the participant to provide a Likert rating that best describes their behavior between the ages of five and twelve years. The scale ratings were changed for the purposes of this study to 1 (never or rarely), 2 (sometimes), 3 (often), and 4 (very often). Additionally, all items were summed to provide a total score for this set of questions. The range of possible total scores for this subset of questions ranged between 18 and 72.

***ODD items.*** The next eight items cover the eight symptoms of ODD (APA, 2013), and instruct the participant to provide a Likert rating for each item as it best describes their behavior between the ages of five and twelve years. The scale ratings were changed for the purposes of this study to 1 (never or rarely), 2 (sometimes), 3 (often), and 4 (very often). Additionally, all items were summed to provide a total score for this set of questions. The range of possible total scores for this subset of questions ranged between 8 and 32.

***CD items.*** The last set of fifteen questions instructs the client to answer yes or no to behaviors in which they may have engaged between the ages of five and eighteen years of age. For the purposes of this study "yes" responses were coded as "1" and "no" responses were coded as "0". This resulted with a potential total score range between 0 and 15.

The form takes approximately two to three minutes to complete. Total subscale scores are computed by summing the Likert responses within each subsection of the form. For the purposes of this study, total scores were used to estimate the severity of symptoms of childhood ADHD, ODD, and CD. The following psychometric properties were established through the use of an adult population sample (Barkley, 2011). Internal consistency for the two ADHD subscales of the form was found to be satisfactory: Inattention ( $\alpha = 0.940$ ), Hyperactivity–Impulsivity ( $\alpha = 0.912$ ). The total ADHD score also produced strong internal consistency ( $\alpha = 0.947$ ; all  $F$ -tests significant at  $p < .001$ ; Barkley, 2011). Test-retest reliability was established two to three weeks after 62 participants initially completed the form: Inattention ( $r = 0.73$ ), Hyperactivity–Impulsivity ( $r = 0.82$ ), and total score ( $r = .79$ ). Additional psychometric properties of the ODD and CD subscales were not available at the time of this study.

To establish construct validity, clinical interviews were conducted and compared to a prototype of the measure, and resulted with adequate correlations for both of the ADHD subscales ( $r = .85-.87$ ; Barkley, 2011). Face validity is high for this measure because the items sample ADHD diagnostic criteria. Participants self-ratings were also compared to other ratings to establish construct validity for both current ( $r = .67-.70$ ) and recalled childhood ( $r = .73-.75$ ) symptoms of ADHD.

***ASPD items.*** The Barkley Adult Interview is semi-structured and covers current and childhood symptomology of ADHD (Barkley & Murphy, 2006). This interview can take between ninety minutes to two hours to complete. In addition to symptoms of ADHD the interview covers other comorbid and related disorders: behavior/conduct difficulties, family and past psychiatric history, anxiety and mood disorders, and concludes with school and family psychiatric history. Participants seeking an ADHD evaluation are asked whether or not they

endorse symptoms of ODD, CD, and ASPD. Should the participant meet criteria for CD the interviewer is directed to administer the interview items for ASPD. Before clients answer “yes” or “no” to the seven criterion symptoms ASPD, the interviewer asks them if they have ever been arrested or in trouble with the law. If the answer is yes, participants are prompted to provide details of their experience with being arrested and/or other contacts with law enforcement. For the purposes of the current study, participants were asked the questions found in the original interview concerning symptoms of ASPD. Total scores were used to examine how many symptoms of ASPD a participant endorsed. Responses recorded as “yes” were coded as “1” and responses recorded as “no” were coded as “0.” The possible total score range for this set of items ranged between 0 and 7.

### **Procedure**

Undergraduate students enrolled in introductory psychology courses participated in order to receive research participation credit. Other participants were recruited through SurveyMonkey via Facebook using “posts” providing basic details of the experiment. All posts did not associate the study with the primary researcher in any way in order to avoid possible biases. All introductory psychology course participants were provided a web link to an online survey to participate in the study through SurveyMonkey. Prior to being granted access to the questionnaires, participants were required to review and acknowledge their understanding of the information included in the informed consent by clicking “yes.” If a participant decided to not provide consent, and selected “no,” a disqualification page appeared informing the participant of their disqualification from the study. Participants were required to identify whether they were currently enrolled in a post-high school education program, and if they were eighteen years or older. If participants answered no to either question they were automatically excluded from the

online survey and provided a debriefing statement. During the next step, participants completed the measures in randomized order: Barkley Childhood Symptoms Scale – Self-Report Form, the ASPD items from the Barkley Adult Interview, BIS-11, and MSI-BPD. After completing the questionnaires, participants were provided a debriefing statement that offered a brief overview of the purpose and potential applications of the findings from this study, as well as contact information for the principle investigator and supervisor. The entire process of completing the measures online required approximately eight to thirteen minutes.

### Results

The descriptive statistics generated means and standard deviations for participant demographic information (e.g., age, ethnicity, and gender) on all measures: Barkley Childhood Symptoms Scale for ADHD, ODD, and CD; the BIS-11; the MSI-BPD; and for the ASPD items from the Barkley Adult Interview.

Correlation analyses were conducted in order to determine that each measure did not correlate too strongly with other measures designed to assess different constructs (e.g., discriminant validity). For example, the Barkley Childhood ODD and CD measures were expected to correlate because both examine disorders characterized by disruptive behaviors. However, the Barkley Childhood ODD and MSI-BPD measures were not expected to be strongly correlated because they have been developed to assess different constructs (e.g., ODD versus BPD). All measures were significantly correlated (all  $ps \leq .05$ ) resulting with a range of small ( $\pm .1$ ) to large ( $\pm .5$ ) effect sizes (Field, 2013). A significant correlation coefficient effect was found for the ADHD and ODD total scores,  $r = .58$ , 95% Bias Corrected accelerated (BCa) CI [.46, .68],  $p < .0001$  (see Table 1). The second largest effect size was found for the MSI-BPD and ASPD total scores,  $r = .53$ , 95% BCa CI [.43, .63],  $p < .0001$ . However, this effect size was not

greater than or equal to .80 which indicated the results could be further interpreted with caution. The ADHD and BIS-11 total scores were significantly correlated resulting in a small effect size,  $r = .26$ , 95% BCa CI [.16, .35],  $p < .0001$ . These correlations are expected because ADHD and ODD are behaviorally impulsive disorders, BPD and ASPD are comorbid cluster B personality disorders, and impulsivity is part of an ADHD diagnosis which is also measured by the BIS-11.

The statistical procedure of mediation was conducted, per the recommendation of Baron and Kenny (1986), in order to analyze the first three hypotheses proposed within the current study (see Figure 1). This procedure examines whether the relationship between a predictor and outcome variable can be explained by their relationship to a mediator (e.g., third variable). Pathways “a” and “b” needed to be examined through the use of a single regression analysis, which is a way of predicting values of one variable from another. The first hypothesis posited that males and female participants’ impulsivity score would be significantly predicted by their ADHD score (e.g., pathway *a*). This hypothesis was examined through the use of a single regression analysis to examine whether impulsivity (mediator) was predicted by ADHD (predictor):  $\text{impulsivity}_i = (b_0 + b_1 \text{ADHD}_i) + \varepsilon_i$ . The single regression model produced  $R^2 = .066$ ,  $F(1, 313) = 21.99$ ,  $p < .001$ . As can be seen in Table 2, the ADHD scores had significant positive regression weights, indicating participants with higher ADHD scores were expected to report higher impulsivity scores. Participants’ ADHD scores accounted for 6.6% of the variability in the impulsivity scores.

Based on previous research, gender differences were expected to occur within the current data set. In order to ascertain whether participants’ gender would be associated with BPD or ASPD total scores a multiple analysis of variance (MANOVA) was conducted. Participants’ BPD and ASPD total scores were entered as outcome variables and gender as a fixed factor.

Pillai's trace was used which produced a significant effect of gender on the participants' total scores,  $V = 0.03$ ,  $F(2, 312) = 4.77$ ,  $p < .01$ . There was a significant effect of gender on BPD total scores,  $F(1, 313) = 5.24$ ,  $p = .023$ , indicating that higher MSI-BPD total scores were observed for female participants (see Table 3). However, there was not a significant effect of gender on ASPD scores,  $F(1, 313) = .287$ ,  $p = .592$ , indicating that ASPD scores were not influenced by participants' gender.

The second hypothesis posited that if female participants' impulsivity score was used as a mediator variable then it would significantly predict their BPD score (pathway b, see Figure 1). This hypothesis was examined through the use of a single regression analysis to examine whether BPD (outcome) was predicted by impulsivity (mediator):  $BPD_i = (b_0 + b_1 \text{ impulsivity}_i) + \varepsilon_i$ . This single regression model produced  $R^2 = .020$ ,  $F(1, 208) = 4.27$ ,  $p < .05$ . Female participants' impulsivity score accounted for 2% of the variability in the BPD scores. As can be seen in Table 4, female participants' impulsivity score has a significant positive regression weight, indicating higher impulsivity scores were expected to be accompanied by higher BPD scores. An additional analysis was conducted to examine the same hypothesis within the male participant data set. This single regression model produced  $R^2 = .072$ ,  $F(1, 103) = 8.03$ ,  $p < .01$ . Male participants' impulsivity score accounted for 7.2% of the variability in the BPD score. As can be seen in Table 5, male participants' impulsivity score had a significant positive regression weight, indicating higher impulsivity scores were expected to be accompanied by higher BPD scores.

Hypothesis three posited that higher ADHD scores accompanied by high impulsivity scores in females would significantly predict higher BPD scores than ADHD scores alone. The ADHD score serves as the predictor variable, impulsivity score as the mediator, and BPD score

as the outcome variable in a mediation model. As such this hypothesis was examined through the use of a multiple regression analysis to examine if the relationship between ADHD and BPD could be explained by their relationship to impulsivity:  $BPD_i = b_0 + b_1 ADHD_i + b_2 impulsivity_i + \varepsilon_i$ . The final regression model with participants' ADHD total scores serving as the predictor and impulsivity scores serving as the mediator produced  $R^2 = .208$ ,  $F(2, 207) = 27.24$ ,  $p < .0001$  (see Table 6). Female participants' ADHD and impulsivity scores accounted for 21% of the variability in the BPD scores. Table 7 shows that in the final model ADHD scores had a significant positive regression weight, indicating that a higher ADHD score would be accompanied by a higher BPD score. While the impulsivity score did have a positive regression weight it was not significant, which indicates that the impulsivity score did not contribute to the regression model.

An additional analysis was conducted to examine the third hypothesis within the male participant data set. This multiple regression model produced  $R^2 = .203$ ,  $F(2, 102) = 13.00$ ,  $p < .0001$  (see Table 8). Male participants' ADHD and impulsivity scores accounted for 20.3% of the variability in the BPD scores. As can be seen in Table 9, male participants' ADHD score had a significant positive regression weight. This indicates that higher ADHD scores would be accompanied by higher BPD scores. The impulsivity score had a non-significant positive regression weight, suggesting that the impulsivity score did not contribute to the regression model.

The final hypothesis posited that females who endorsed higher BPD scores would endorse higher ADHD scores due to the mediating effects of the impulsivity score above and beyond the effects of ODD and/or CD scores. This hypothesis was examined through the use of a multiple regression analysis to examine whether BPD score (outcome) was predicted by

ADHD, ODD, CD, and impulsivity scores (predictors):  $BPD_i = b_0 + b_1 ADHD_i + b_2 ODD_i + b_3 CD_i + b_4 impulsivity_i + \varepsilon_i$ . The final regression model with ADHD, ODD, CD, and impulsivity total scores as predictors produced  $R^2 = .311$ ,  $F(4, 205) = 23.13$ ,  $p < .0001$  (see Table 10). Female participants' scores for ADHD, ODD, CD, and impulsivity accounted for 31% of the variability in the BPD scores. Table 11 shows that in the final model ADHD, ODD, and CD scores had a significant positive regression weight, indicating that a higher ADHD, ODD, and CD scores would be accompanied by a higher BPD score. While the impulsivity score did have a positive regression weight it was not significant, which indicates that the impulsivity score did not contribute to the regression model.

This multiple regression analysis was also conducted with the male participant data set. The final regression model with ADHD, ODD, CD, and impulsivity scores as predictors produced  $R^2 = .300$ ,  $F(4, 100) = 10.70$ ,  $p < .0001$  (see Table 12). Male participants' scores for ADHD, ODD, CD, and impulsivity accounted for 30% of the variability in the BPD scores. As can be seen in Table 13, male participants' ODD and CD scores had significant positive regression weights and their ADHD and impulsivity scores had non-significant positive regression weights. This indicates that their ODD and CD scores did contribute to the regression model while their ADHD and impulsivity scores did not.

Participants also completed measures to assess the previously established developmental route proposed by Loeber and colleagues (2000): beginning with ADHD, progressing to ODD, then to CD, and ending with ASPD. However, based on the results of the MANOVA males were not found to report significantly higher ASPD scores. Therefore, both male and female participants' data was used in this analysis. This hypothesis was examined through the use of a multiple regression analysis to examine whether the ASPD score (outcome) was predicted by

ADHD, ODD, CD, and impulsivity scores (predictors):  $ASPD_i = b_0 + b_1 ADHD_i + b_2 ODD_i + b_3 CD_i + b_4 impulsivity_i + \varepsilon_i$ . The final regression model produced  $R^2 = .258$ ,  $F(5, 309) = 21.50$ ,  $p < .001$  (see Table 14). Participants' total scores for ADHD, ODD, CD, and impulsivity total scores accounted for 25.8% of the variability in the ASPD scores. As seen on Table 15, ADHD and CD scores had significant positive regression weights. This suggests that participants with higher ADHD and CD scores were expected to have a higher ASPD total score. While the ODD score had a positive regression weight it was not significant, and the impulsivity score also had a non-significant negative regression weight. This indicates that neither the ODD or impulsivity scores contributed to the overall regression model.

### Discussion

The purpose of this study was to examine the relationship between ADHD, disruptive disorders (ODD and CD), impulsivity, and BPD. Specifically, it was hypothesized that impulsivity would account for some of the difficulties related to BPD above and beyond ADHD symptoms since this construct has not been fully explained in the different diagnoses. The need for a clear explanation of impulsivity is supported by the fact that the hyperactive-impulsive ADHD subtype has been found to be the most prevalent among both genders (DuPaul et al., 2009). These individuals have also reported an internal sense of restlessness, and individuals diagnosed with ADHD and/or BPD have reported more instances of acting on impulse without thinking during stressful situations (Krause-Utz et al., 2013). Previous research also suggests ADHD and BPD may share neuropsychological deficits which interfere with their ability to inhibit behaviors and reactions (Davids & Gastpar, 2005).

The first hypothesis examined the relationship between ADHD and impulsivity scores. Results supported this hypothesis: participants' impulsivity scores did significantly predict their ADHD scores. ADHD and impulsivity scores were also positively correlated. These results suggest that individuals who endorse higher levels of ADHD symptoms are also likely to demonstrate highly impulsive behaviors (e.g., blurting out answers, difficulty awaiting their turn, and interrupting or intruding on others). Within the ADHD diagnostic criteria section of the DSM-5, impulsivity is defined as "hasty actions that occur in the moment without forethought and that have high potential for harm to the individual" (APA, 2013; p. 61). Previous research has shown that individuals with ADHD demonstrate a propensity to act impulsively which leads to a variety of difficulties. Rich, Loo, Yang, Dang, and Smalley (2009) found ADHD symptoms of hyperactive-impulsive symptoms increased the likelihood of a child acting immature (e.g., deficit of interpersonal skills). Results from the analysis testing the first hypothesis provide

evidence that individuals who endorsed high levels of ADHD symptoms also endorsed high levels of impulsive symptoms even when not specifically assigned the hyperactive-impulsive subtype.

As a reminder, it was also expected that gender differences would be found within this study's data set. Specifically, that females would report higher BPD scores while males reported higher ASPD scores. As expected, female participants reported significantly higher BPD scores than their male counterparts. However, males did not report significantly higher scores than females on the ASPD measure. These results provide support for previous research of different expressions of emotional difficulties between men and women for BPD, but were inconclusive with regards to ASPD.

The second hypothesis tested whether female participants' impulsivity score, when used as a predictor variable, would significantly predict their BPD score. This hypothesis was also supported: higher impulsivity scores for female participants predicted significantly higher BPD scores. This result suggests that impulsivity may be serving as a predictor for the later development of BPD in females. In support of the finding, Krause-Utz and colleagues (2013) found females diagnosed with BPD reported acting impulsively without forethought and through physical movement during stressful situations. Examples of this impulsivity may be shown through substance use, multiple intimate relationships and sexual partners, self-harming actions, and suicide attempts. Future research should continue examining both organic and social environmental factors which exacerbate the trait of impulsivity of individuals diagnosed with BPD. Treatment interventions targeted at enhancing both an individual's response inhibition and ability to tolerate urges would provide a better quality of life to these individuals.

Results for the third hypothesis showed that the impulsivity score did not explain a significant portion of the variance in BPD traits. This finding did not support the third hypothesis: the ability of ADHD scores to predict higher BPD scores was not mediated by impulsivity scores. The initial model which included ADHD scores as a predictor explained 20.4% of the variability in BPD scores. The final model which included impulsivity scores was found to be significant, but only explained an additional 0.4%. This suggests that the three impulsivity symptoms within the diagnosis of ADHD may sufficiently account for the impulsivity that predicts BPD symptoms. These results provide further support that ADHD may serve as a strong precursor to BPD (Nigg et al., 2005; Philipsen, 2006; Stepp et al., 2012). Based on these results it appears that the diagnosis of ADHD is providing some explanation for the impulsivity exhibited by individuals diagnosed with BPD. Future research should examine the specific expression of impulsivity in both ADHD and BPD, and then which characteristics are shared by both disorders.

The fourth hypothesis proposed that impulsivity scores, serving as a mediator to ADHD, would account for higher BPD scores above and beyond the disruptive behaviors of ODD and CD. Results did not show support for this hypothesis: higher ADHD, ODD, and CD scores predicted higher BPD scores. Meanwhile impulsivity did not significantly contribute to the regression model. This suggests that ODD and CD, in addition to ADHD, account for the impulsivity within BPD. As has been previously mentioned, these results provide evidence that ADHD, ODD, and CD provide an adequate explanation of the impulsivity exhibited by individuals diagnosed with BPD. These findings also provide evidence for the proposed developmental model beginning with ADHD and ending with BPD (Nigg et al., 2005; Philipsen, 2006; Stepp et al., 2012). However, the results from this study may suggest that higher levels of

ADHD symptoms predispose females to later develop ODD, higher levels of ODD symptoms predispose them to later developing CD, and higher levels of CD symptoms predispose females to later developing BPD.

Approximately 31.1% of the variance in BPD scores was accounted for by ADHD, ODD, CD, and impulsivity. However, this leaves 68.2% variance not explained by this study's results. Other possible predictors may be biological and social environment factors as suggested by Linehan's (1993) biopsychosocial model. Additional predictors may also be individuals' expression of emotion and trauma history. Future research should continue to identify predictors that provide a full explanation for the variance of BPD symptoms. Due to these limitations, the results may be more difficult to generalize beyond the current sample (e.g., clinical and adolescent populations).

Taken together, these results suggest that ADHD and BPD may share the same developmental route that has been established for ASPD. However, this cannot be firmly confirmed by the results of the current study. Loeber and colleagues (2000) have found this route from ADHD to ASPD to be consistent in male children. Findings from the current study also found support for this developmental route among adult female and male participants. However, Burke and colleagues (2002) suggested the developmental route of ADHD to ASPD may differ in children based on gender. The development of these disorders does not occur due to one risk factor, but instead from several influencing the child's outcome. Biological, functional, and psychosocial factors were proposed to contribute to the development and expression of ODD and CD. However, the literature currently provides little information as to how symptoms of ODD and CD develop within girls. Without knowing how exactly these

disorders develop within children and adolescents, differential diagnosis will continue to be difficult.

Interestingly, the idea proposed by Burke and colleagues (2002) that the expression of the ASPD developmental route differs depending on gender is shared by other researchers. Based on the evidence that BPD is predominately diagnosed in females, it would be reasonable to hypothesize that the expression of ODD and CD in this developmental route may differ as well. Currently, the two developmental routes are divided on whether ODD (Stepp et al., 2012) or CD (Nigg et al., 2005) act as the stepping stone from ADHD to BPD. The current study lends evidenced to support both ODD and CD acting as intermediary points along a developmental route between ADHD and BPD. Results demonstrated that ADHD, ODD, and CD accounted for 31.1% of the variance in BPD scores. The developmental routes proposed Nigg et al. (2005) and Stepp et al. (2012) were reflected in this study's results: ADHD, ODD, and CD serving as predictors of BPD. However, the expression of ADHD, ODD, and CD is not yet fully understood with regards to female children and adolescents. Future research is needed in order to more clearly define the female behavioral manifestations of the symptoms for these disorders.

Previous research has shown support for ADHD serving as an early developmental stage to BPD due to their shared etiology (Storebø & Simonsen, 2014). Results from the analyses in the current study in which ADHD, ODD, and CD served as predictors provide additional evidence to this line of research. In fact, there has been a general consensus within the literature that children diagnosed with ADHD have an increased risk to later develop BPD (Cumyn et al., 2009; Ferrer et al., 2010; Nigg et al., 2005; Philipsen, 2006; Stepp et al., 2012; van Dijk et al., 2011). This in turn indicates that early diagnosis and treatment in childhood and adolescence would likely intervene in the later development of BPD. Storebø and Simonsen (2014) suggest

that treatment for ADHD should include parent training, pharmacotherapy, and focus on targeting children's interpersonal difficulties. If clinicians are able to identify ADHD and/or BPD symptomology at an earlier stage this is likely to result in a better quality of life for clients as children or even as adults.

The findings about the connection between ADHD, disruptive disorders, and BPD may also inform appropriate treatments for the symptoms that lead to the later development of BPD. The leading evidenced-based treatment for BPD is dialectical behavior therapy (DBT) which aims to decrease suicide and self-harm (Linehan, 1993). However, DBT also enables individuals diagnosed with BPD to enhance attentional focus to the present moment, increase distress tolerance, improve interpersonal effectiveness, and the ability to regulate emotions. Adults diagnosed with ADHD have demonstrated positive outcomes in these areas upon completion of a DBT-based program (Philipsen, 2006). For example, Hirvikoski and colleagues (2011) found that adults diagnosed with ADHD who adhered to a medication regimen exhibited a significant reduction of ADHD symptoms upon completing a DBT skills training program. They also reported satisfaction with the treatment, an improved ability to cope with ADHD problems, and were more likely to recommend the treatment to a friend.

DBT has also been adapted for adolescents who are highly suicidal and engage in impulsive self-harming behaviors (Rathus & Miller, 2015). Adolescent DBT has also been adapted for those diagnosed with ADHD (Rizvi, Steffel, Carson-Wong, 2013). This adaptation was found to decrease symptoms of depression and improve attention in adolescents. In addition, Marco, García-Palacios, and Botella (2013) found that DBT decreased the ODD symptoms of two case study female adolescents. However, this study must be interpreted with cautious due to the small participant sample. Future research should examine the outcomes for female

adolescents diagnosed with ODD who engage in DBT. Apsche, Bass, and Houston (2006) found that DBT and Mode Deactivation Therapy (MDT) reduced physical aggression in adolescent males diagnosed with CD. In recent years MDT has taken on elements of Acceptance and Commitment Therapy (ACT) as well as DBT (Swart & Apsche, 2014). Male adolescents diagnosed with CD who completed the newest version of MDT showed a significant decrease in aggressive behaviors. Again, female adolescents have not been included in the research of these therapies. In order to provide effective treatments for female adolescents, future research should continue to examine the outcomes of DBT on these different behavioral issues.

There were several limitations to the current study. First, the current study lacked a clinical sample to compare against the community sample. This serves as a caution to readers when interpreting these results. As a community sample, the participants were not formally diagnosed with ADHD, ODD, CD, BPD, or ASPD. As such, these results should only be considered at a theoretical level and not generalized to other populations. However, the present sample report a range of problem symptoms across the different disorders so the findings can provide an initial conceptualization of the relationships in clinical samples. Second, while this study provides new evidence, the majority of participants identified themselves as twenty-year-old Caucasian females. Like previous research, results from the current study may not be generalized to other populations. These biases also mirror the prevalence rates for BPD (APA, 2013). However, the proposal of a developmental model calls for results to generalize across a wide age range: childhood to adulthood. Future research should aim to collect data from a variety of ages, ethnicities, and SES backgrounds. A final limitation is the exclusive use of self-report measures. This limitation likely resulted in participants' either misremembering their past or providing false information. However, the anonymity of the online survey method may have

provided some counterweight to the potential social desirability bias. Future research should aim to collect measures from both participants and at least one collateral contact who knew them well (e.g., caregiver) between the ages of 5 and 12.

Given these limitations, the present results do add to a growing body of literature about the shared etiology and developmental route between ADHD and BPD. This information provides clinicians with a better understanding of how these disorders develop and are expressed in child, adolescent, and adult clients. As a result, clinicians may be able to more accurately diagnose clients which then leads to earlier and more targeted interventions. When clients receive treatment at earlier points in their life they are more likely to have an improved quality of functioning as a result.

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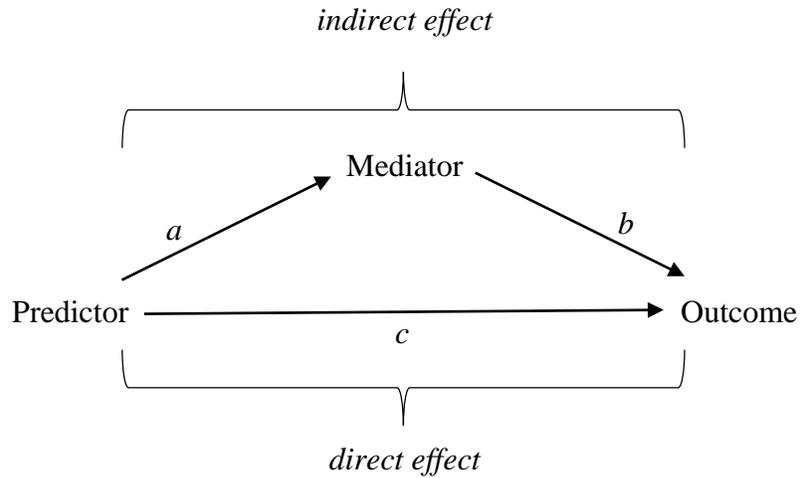
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*Appendix A*

Figure 1.  
*Example of a mediation model.*



*Note.* Pathways labeled *a*, *b*, and *c* are unstandardized regression coefficients which symbolize the strength of the relationship between variables. Pathways *a* and *b* represent the indirect effect, and pathway *c* represents the direct effect.

*Appendix B*

Table 1

*Correlations examining the discriminant validity of measures.*

Measure	1	2	3	4	5	6	<i>M</i>	<i>SD</i>	Range
1. ADHD	-	-	-	-	-	-	32.74	10.29	18-70
2. ODD	.576**	-	-	-	-	-	13.64	4.95	8-32
3. CD	.263**	.298**	-	-	-	-	1.00	1.81	0-13
4. Impulsivity	.256**	.310**	.124*	-	-	-	66.00	7.35	43-100
5. BPD	.437**	.466**	.332**	.185**	-	-	3.15	2.95	0-10
6. ASPD	.385**	.335**	.411**	.111*	.526**	-	0.91	1.26	0-7

*Note.* *N* = 315. ADHD = Attention-Deficit/Hyperactivity Disorder, ASPD = Antisocial Personality Disorder, CD = Conduct Disorder, BPD = Borderline Personality Disorder, ODD = Oppositional Defiant Disorder. \*  $p < .05$ , \*\*  $p < .001$

Table 2

*Linear model of hypothesis 1, ADHD score serving as the predictor variable and impulsivity score as the outcome variable, with 95% bias corrected and accelerated confidence intervals reported in parentheses. Confidence intervals and standard errors based on 1000 bootstrap samples.*

	<i>b</i>	<i>SE B</i>	$\beta$	<i>p</i>
Step 1				
Constant	60.01 (57.15, 63.00)	1.38		$p = .001$
ADHD	0.18 (0.12, 0.26)	0.04	0.26	$p = .001$

*Note.* *N* = 315. ADHD = Attention-Deficit/Hyperactivity Disorder.

Table 3

*MANOVA summary of BPD and ASPD total scores.*

Total Score	Type III Sum of Squares	<i>df1</i>	<i>df2</i>	Mean Square	<i>F</i>	Sig.
BPD	44.80	1	313	44.80	5.24	0.023
ASPD	0.46	1	313	0.46	0.29	0.592

*Note.* *N* = 315. ASPD = Antisocial Personality Disorder, BPD = Borderline Personality Disorder.

Table 4

*Linear model of hypothesis 2, female participants, impulsivity score serving as the predictor variable and BPD score as the outcome variable, with 95% bias corrected and accelerated confidence intervals reported in parentheses. Confidence intervals and standard errors based on 1000 bootstrap samples.*

	<i>b</i>	<i>SE B</i>	$\beta$	<i>p</i>
Step 1				
Constant	-0.47 (-4.00, 4.15)	1.99		<i>p</i> = .798
Impulsivity	0.06 (-0.004, 0.12)	-0.003	0.14	<i>p</i> = .051

*Note.* *N* = 210. BPD = Borderline Personality Disorder.

Table 5

*Linear model of hypothesis 2, male participants, impulsivity score serving as the predictor variable and BPD score as the outcome variable, with 95% bias corrected and accelerated confidence intervals reported in parentheses. Confidence intervals and standard errors based on 1000 bootstrap samples.*

	<i>b</i>	<i>SE B</i>	$\beta$	<i>p</i>
Step 1				
Constant	-0.47 (-4.00, 4.15)	1.99		<i>p</i> = .798
Impulsivity	0.06 (-0.004, 0.12)	-0.003	0.14	<i>p</i> = .051

*Note.* *N* = 105. BPD = Borderline Personality Disorder.

Table 6

*Model summary of female participants' ADHD score serving as the predictor variable for the BPD score due to the mediating effect of the impulsivity score.*

Model	R	R Square	Adjusted R Square	Change Statistics				Sig. F Change	Durbin-Watson
				R Square Change	F Change	df1	df2		
1	0.451 <sup>a</sup>	0.204	0.200	0.204	53.230	1	208	0.000	
2	0.456 <sup>b</sup>	0.208	0.201	0.005	1.194	1	207	0.276	1.983

*Note.*  $N = 210$ . a. Predictors: (Constant) + ADHD score. b. Predictors: (Constant) + ADHD score + Impulsivity score. ADHD = Attention-Deficit/Hyperactivity Disorder, BPD = Borderline Personality Disorder.

Table 7

*Linear model of hypothesis 3, female participants, ADHD score serving as the predictor variable, impulsivity as the mediator, and BPD score as the outcome variable, with 95% bias corrected and accelerated confidence intervals reported in parentheses. Confidence intervals and standard errors based on 1000 bootstrap samples.*

	<i>b</i>	<i>SE B</i>	$\beta$	<i>p</i>
Step 1				
Constant	-0.47 (-4.00, 4.15)	1.99		$p = .798$
ADHD	0.06 (-0.004, 0.12)	-0.003	0.14	$p = .051$
Step 2				
Constant	-2.50 (-5.37, 0.87)	1.66		$p = .123$
ADHD	0.13 (0.09, 0.16)	0.02	0.44	$p = .001$
Impulsivity	0.03 (-0.02, 0.07)	0.03	0.07	$p = .248$

*Note.*  $N = 210$ . BPD = Borderline Personality Disorder.

Table 8

*Model summary of male participants' ADHD score serving as the predictor variable for the BPD score due to the mediating effect of the impulsivity score.*

Model	<i>R</i>	<i>R</i> Square	Adjusted <i>R</i> Square	Change Statistics					
				<i>R</i> Square Change	<i>F</i> Change	<i>df</i> 1	<i>df</i> 2	Sig. <i>F</i> Change	Durbin- Watson
1	0.443 <sup>a</sup>	0.196	0.188	0.196	25.120	1	103	0.000	
2	0.451 <sup>b</sup>	0.203	0.188	0.007	0.907	1	102	0.343	1.718

*Note.* *N* = 105. a. Predictors: (Constant) + ADHD score. b. Predictors: (Constant) + ADHD score + Impulsivity score. ADHD = Attention-Deficit/Hyperactivity Disorder, BPD = Borderline Personality Disorder.

Table 9

*Linear model of hypothesis 3, male participants, ADHD score serving as the predictor variable, impulsivity as the mediator, and BPD score as the outcome variable, with 95% bias corrected and accelerated confidence intervals reported in parentheses. Confidence intervals and standard errors based on 1000 bootstrap samples.*

	<i>b</i>	<i>SE</i>		<i>p</i>
		<i>B</i>	$\beta$	
Step 1				
Constant	-1.61 (-3.19, -0.11)	0.78		<i>p</i> = .033
ADHD	0.13 (0.08, 0.18)	0.03	0.44	<i>p</i> = .001
Step 2				
Constant	-3.47 (-6.80, 0.61)	1.66		<i>p</i> = .031
ADHD	0.12 (0.06, 0.17)	0.03	0.4	<i>p</i> = .001
Impulsivity	0.03 (-0.03, 0.09)	0.03	0.09	<i>p</i> = .263

*Note.* *N* = 105. BPD = Borderline Personality Disorder.

Table 10

*Model summary of female participants' ADHD, ODD, CD, and impulsivity scores serving as predictor variables for the BPD score.*

Model	<i>R</i>	<i>R</i> Square	Adjusted <i>R</i> Square	Change Statistics					
				<i>R</i> Square Change	<i>F</i> Change	<i>df</i> 1	<i>df</i> 2	Sig. <i>F</i> Change	Durbin-Watson
1	0.451 <sup>a</sup>	0.204	0.200	0.204	53.230	1	208	0.000	
2	0.527 <sup>b</sup>	0.278	0.271	0.074	21.330	1	207	0.000	
3	0.558 <sup>c</sup>	0.311	0.301	0.033	9.810	1	206	0.002	
4	0.558 <sup>d</sup>	0.311	0.298	0.000	0.002	1	205	0.966	1.978

*Note.* *N* = 210. a. Predictors: (Constant) + ADHD score. b. Predictors: (Constant) + ADHD score + ODD score. c. Predictors: (Constant) + ADHD score + ODD score + CD score. d. Predictors (Constant) + ADHD score + ODD score + CD score + Impulsivity score. ADHD = Attention-Deficit/Hyperactivity Disorder, BPD = Borderline Personality Disorder, CD = Conduct Disorder, ODD = Oppositional Defiant Disorder.

Table 11

*Linear model of hypothesis 4, female participants, ADHD, ODD, CD, and impulsivity scores serving as predictor variables and BPD score as the outcome variable, with 95% bias corrected and accelerated confidence intervals reported in parentheses. Confidence intervals and standard errors based on 1000 bootstrap samples.*

	<i>b</i>	<i>SE</i> <i>B</i>	$\beta$	<i>p</i>
Step 1				
Constant	-0.72 (-1.84, 0.48)	0.58		<i>p</i> = .220
ADHD	0.13 (0.09, 0.16)	0.02	0.45	<i>p</i> = .001
Step 2				
Constant	-1.67 (-2.78, -0.45)	0.6		<i>p</i> = .004
ADHD	0.08 (0.04, 0.12)	0.02	0.27	<i>p</i> = .001
ODD	0.19 (0.12, 0.27)	0.04	0.33	<i>p</i> = .001
Step 3				

	Constant	-1.43 (-2.73, 0.01)	0.64		$p = 0.21$
	ADHD	0.07 (0.03, 0.10)	0.02	0.25	$p = .002$
	ODD	0.17 (0.08, 0.24)	0.05	0.29	$p = .001$
	CD	0.33 (0.07, 0.80)	0.17	0.19	$p = .037$
Step 4					
	Constant	-1.50 (-4.23, 1.50)	1.42		$p = .303$
	ADHD	0.07 (0.03, 0.10)	0.02	0.25	$p = .002$
	ODD	0.17 (0.08, 0.24)	0.05	0.29	$p = .002$
	CD	0.33 (0.07, 0.80)	0.17	0.19	$p = .036$
	Impulsivity	0.001 (-0.04, 0.05)	0.02	0.003	$p = .964$

*Note.*  $N = 210$ . ADHD = Attention-Deficit/Hyperactivity Disorder, BPD = Borderline Personality Disorder, CD = Conduct Disorder, ODD = Oppositional Defiant Disorder.

Table 12

*Model summary of male participants' ADHD, ODD, CD, and impulsivity scores serving as predictor variables for the BPD score.*

Model	$R$	$R$ Square	Adjusted $R$ Square	Change Statistics					
				$R$ Square Change	$F$ Change	$df1$	$df2$	Sig. $F$ Change	Durbin-Watson
1	0.443 <sup>a</sup>	0.196	0.188	0.196	25.120	1	103	0.000	
2	0.505 <sup>b</sup>	0.255	0.240	0.059	8.070	1	102	0.005	
3	0.546 <sup>c</sup>	0.298	0.277	0.043	6.160	1	101	0.015	
4	0.548 <sup>d</sup>	0.300	0.272	0.002	0.284	1	100	0.595	1.861

*Note.*  $N = 105$ . a. Predictors: (Constant) + ADHD score. b. Predictors: (Constant) + ADHD score + ODD score. c. Predictors: (Constant) + ADHD score + ODD score + CD score. d. Predictors (Constant) + ADHD score + ODD score + CD score + Impulsivity score. ADHD = Attention-Deficit/Hyperactivity Disorder, BPD = Borderline Personality Disorder, CD = Conduct Disorder, ODD = Oppositional Defiant Disorder.

Table 13

*Linear model of hypothesis 4, male participants, ADHD, ODD, CD, and impulsivity scores serving as predictor variables and BPD score as the outcome variable, with 95% bias corrected and accelerated confidence intervals reported in parentheses. Confidence intervals and standard errors based on 1000 bootstrap samples.*

	<i>b</i>	<i>SE</i> <i>B</i>	<i>β</i>	<i>p</i>
Step 1				
Constant	-1.61 (-3.16, -0.12)	0.80		<i>p</i> = .042
ADHD	0.13 (0.08, 0.18)	0.03	0.44	<i>p</i> = .001
Step 2				
Constant	-2.31 (-3.92, -0.91)	0.81		<i>p</i> = .004
ADHD	0.07 (0.01, 0.13)	0.03	0.24	<i>p</i> = .035
ODD	0.19 (0.04, 0.35)	0.07	0.31	<i>p</i> = .005
Step 3				
Constant	-1.94 (-3.56, -0.50)	0.83		<i>p</i> = .028
ADHD	0.06 (0.01, 0.12)	0.03	0.22	<i>p</i> = .047
ODD	0.16 (-0.004, 0.32)	0.07	0.26	<i>p</i> = .033
CD	0.31 (0.02, 0.58)	0.13	0.22	<i>p</i> = .019
Step 4				
Constant	-2.92 (-5.73, -0.12)	1.58		<i>p</i> = .054
ADHD	0.06 (-0.002, 0.12)	0.03	0.2	<i>p</i> = .086
ODD	0.15 (-0.01, 0.32)	0.07	0.25	<i>p</i> = .042
CD	0.31 (0.02, 0.58)	0.14	0.22	<i>p</i> = .021

Impulsivity	0.020 (-0.04, 0.08)	0.03	0.05	$p = .519$
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*Note.*  $N = 105$ . ADHD = Attention-Deficit/Hyperactivity Disorder, BPD = Borderline Personality Disorder, CD = Conduct Disorder, ODD = Oppositional Defiant Disorder.

Table 14

*Model summary of ASPD developmental route with ADHD, ODD, CD, and impulsivity serving as predictor variables.*

Model	R	R Square	Adjusted R Square	Change Statistics				Sig. F Change	Durbin-Watson
				R Square Change	F Change	df1	df2		
1	0.385 <sup>a</sup>	0.148	0.146	0.148	54.51	1	313	0.000	
2	0.409 <sup>b</sup>	0.168	0.162	0.019	7.19	1	312	0.008	
3	0.507 <sup>c</sup>	0.258	0.250	0.090	37.72	1	311	0.000	
4	0.508 <sup>d</sup>	0.258	0.249	0.001	0.24	1	310	0.629	1.788

*Note.*  $N = 315$ . a. Predictors: (Constant) + ADHD score. b. Predictors: (Constant) + ADHD score + ODD score. c. Predictors: (Constant) + ADHD score + ODD score + CD score. d. Predictors: (Constant) + ADHD score + ODD score + CD score + impulsivity score. ADHD = Attention-Deficit/Hyperactivity Disorder, ASPD = Antisocial Personality Disorder, CD = Conduct Disorder, Gender = participant's gender, ODD = Oppositional Defiant Disorder.

Table 15

*Linear model examining the predictors of ASPD, with 95% bias corrected and accelerated confidence intervals reported in parentheses. Confidence intervals and standard errors based on 1000 bootstrap samples.*

	$b$	$SE B$	$\beta$	$p$
Step 1				
Constant	-0.64	0.22		$p = .004$
ADHD	0.05	0.01	0.39	$p = .000$
Step 2				
Constant	-0.84	0.23		$p = .000$
ADHD	0.04	0.01	0.29	$p = .000$

ODD	0.04	0.02	0.17	$p = .008$
Step 3				
Constant	-0.64	0.22		$p = .004$
ADHD	0.03	0.01	0.24	$p = .000$
ODD	0.03	0.02	0.10	$p = .101$
CD	0.22	0.04	0.32	$p = .000$
Step 4				
Constant	-0.39	0.56		$p = .489$
ADHD	0.03	0.01	0.25	$p = .000$
ODD	0.03	0.02	0.11	$p = .089$
CD	0.22	0.04	0.32	$p = .000$
Impulsivity	-0.004	0.01	-0.03	$p = .629$

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*Note.*  $N = 315$ . ADHD = Attention-Deficit/Hyperactivity Disorder, BIS-11 = Barratt Impulsiveness Scale - 11, CD = Conduct Disorder, ODD = Oppositional Defiant Disorder.