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Review

# Clinical, neuropsychological and structural convergences and divergences between Attention Deficit/Hyperactivity Disorder and Borderline Personality Disorder: A systematic review

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ABSTRACT

Attention Deficit/Hyperactivity Disorder (ADHD) symptoms overlap with Borderline Personality Disorder (BPD). Since ADHD presents earlier than BPD, ADHD might be either a risk factor or a prodromal stage in the development of BPD or in the reinforcement of its symptoms. However, despite the similar phenomenological origin of the two disorders, ADHD and BPD patients often present discrete profiles. The present study reviews literature data of the clinical, neuropsychological and structural convergences and divergences of ADHD and BPD. A total of 185 studies were identified that address the association of ADHD and BPD and relate to clinical, neuropsychological and structural parameters. The total number of articles included was 45. ADHD exhibits a more outwardly expressed symptomatology, with difficulties in inhibition control and dysfunction in ventrolateral prefrontal regions. BPD presents a more mixed picture of externalizing and interrelating clinical features with emotionally conditioned cognitive disturbances and dysfunction in the orbitofrontal and dorsolateral prefrontal regions. When considering the three abovementioned parameters there is no unique clear-cut point that can differentiate the two disorders in a definitive way. Both disorders share impulsivity, emotional dysregulation, deficits in attention and decision making, brain volume reductions and connectivity impairments in prefrontal and limbic areas.


## 1. Introduction

### 1.1. Attention Deficit Hyperactivity Disorder

ADHD is the most common neurodevelopmental disorder of childhood, that persists into adulthood in the majority of cases (Kooij et al., 2010; Pehlivanidis, Spyropoulou, Galanopoulos, Papachristou, & Papadimitriou, 2012; Storebø & Simonsen, 2014) and is characterized mainly by the symptoms of inattention, hyperactivity, impulsiveness, disorganization and emotional instability, at levels that are inconsistent with age or developmental level (American Psychiatric Association, 2013). The requirement that several symptoms be present before age 12 years conveys the importance of substantial clinical presentation during childhood (American Psychiatric Association, 2013). Inattention and disorganization manifest behaviorally as wandering off task, lacking persistence, having difficulty sustaining focus, and being disorganized, which cannot be attributed to defiance or lack of comprehension. Hyperactivity refers to over-activity (when it is inappropriate), excessive fidgeting, tapping, or talkativeness and/or inability to wait that are excessive for age or developmental level. In adults, hyperactivity may manifest as extreme restlessness or wearing others out with their activity. Impulsivity may reflect a desire for immediate rewards or an inability to delay gratification and it may present as social intrusiveness and/or as acting hastily in a potentially harmful way, without consideration of long-term consequences. It has been suggested that these disturbances might be linked to poorly developed executive functions (Gallacher & Blader, 2001).

ADHD has been estimated to affect 5% of children and often persists into adult life in a rate of 2.5% (American Psychiatric Association, 2013). Due to the persistent nature of the condition adults with ADHD are more likely than the general population to have long-term consequences in social, academic and occupational functioning and to be accompanied by other mental health symptoms such as anxiety, depression, emotional lability, and sleep disturbances (Asherson et al., 2014; Faraone et al., 2000). In some studies the estimates of the proportion of children with ADHD who continued to meet full DSM-IV-consistent ADHD criteria as adults varied from 30% to 66% (Barkley, Fischer, Smallfish, & Fletcher, 2002; Faraone, Biederman, & Mick, 2005). The DSM-IV criteria were developed for children, while the "Utah" operational criteria for adult ADHD, which include a childhood history consistent with ADHD, involve a broader range of features, i.e. hyperactivity, inattention, mood lability, short-fuse temper, disorganization, stress sensitivity and impulsivity (Wender, Wolf, & Wasserstein, 2001). Nevertheless the DSM-5 criteria refer to both children and adults

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(9 regarding inattention and 9 regarding hyperactivity and impulsivity), with the basic difference being the number of symptoms needed to confirm the diagnosis (≥6 for children, ≥5 for ≥17 years of age). In addition in case of adults, apart from the current symptomatology and its impact in at least two major areas of functioning, the other pivotal factor for the assessment procedure is the reliable trace of the symptoms' onset back in early childhood (Pehlivanidis et al., 2012). Since adult recall of childhood symptoms tends to be unreliable, it is beneficial to obtain ancillary (collateral) information (American Psychiatric Association, 2013).

In childhood, ADHD frequently overlaps with disorders that are considered to be "externalizing disorders", such as oppositional defiant disorder and conduct disorder (American Psychiatric Association, 2013). It is estimated that more than 50–60% of the cases develop a comorbid disorder (Gilberg et al., 2004; Pehlivanidis, Papanikolaou, Spyropoulou, & Papadimitriou, 2014). In adults comorbidity is the rule (Kessler et al., 2006) (approximately 75% of cases), with anxiety, mood disorders, substance abuse, impulse control and personality disorders being the most prevalent ones. The documentation that the disorder had a childhood onset and the various comorbid symptomatologies present both in childhood and adult life represent the most significant obstacles for the accurate clinical diagnosis of the disorder in adults (Kooij et al., 2010).

### 1.2. Borderline Personality Disorder

BPD belongs to the cluster B personality disorders (PDs), along with anti-social, histrionic and narcissistic PDs, which begin by early adulthood and present in a variety of dramatic, emotional and erratic contexts. The essential feature of BPD is a pervasive pattern of instability of interpersonal relationships, self-image and affects, and marked impulsivity (American Psychiatric Association, 2013), with emotional dysregulation being an important core feature (Leichsenring, Leibing, Kruse, New, & Leweke, 2011; Skodol et al., 2002).

Individuals with BPD are characterized by frantic efforts to avoid real or imagined abandonment; their perception of impending separation or rejection, or the loss of external structure, potentially leads to profound changes in self-image, affect, cognition, and behavior (American Psychiatric Association, 2013). In addition they display great sensitivity in terms of environmental circumstances. Their pattern of relationships is one of intensity and instability, being usually prone to sudden and dramatic shifts in their view of others, who may alternatively be seen as beneficent supports or as cruelly punitive (American Psychiatric Association, 2013). Moreover BPD patients may have a markedly and persistently unstable self-image or sense of self, due to identity disturbances. All these clinical manifestations are often experienced with considerable subjective suffering (Storebø & Simonsen, 2014).

Another key feature in BPD is impulsivity (Skodol et al., 2002), with possible negative consequences, but the nature of this phenomenon is not yet fully understood (Bornovalova, Lejuez, Daughters, Zachary Rosenthal, & Lynch, 2005). Given the state-dependent nature of impulsivity, emotional stimuli might impair inhibitory functioning (Domes et al., 2006) and co-occurring psychiatric conditions are likely to influence performance on behavioral tasks in patients with BPD (Bornovalova et al., 2005). The inhibitory dysfunction resulting in maladaptive choices might be mediated by complex impairments of cognitive processes (Bazanis et al., 2002). Also patients with BPD may exhibit recurrent self-mutilating behavior or suicidality in combination with affective instability, that is due to a marked reactivity of mood and may be troubled both with chronic feelings of emptiness and with inappropriate, overwhelming anger. During periods of extreme stress, transient psychotic-like or dissociative symptoms may occur (American Psychiatric Association, 2013).

The median population prevalence of BPD is estimated to be between 1.6% and 5.9% (American Psychiatric Association, 2013), with the diagnosis being the fourth most common psychiatric diagnosis (Storebø & Simonsen, 2014). These patients often have other concurrent or lifelong diagnoses, such as anxiety, affective, eating or other personality disorders or disorders with predominantly behavioral disturbances (Storebø & Simonsen, 2014). The course of BPD varies considerably, with the most common pattern being one of chronic instability in early adulthood, accompanied by episodes of serious affective and impulsive dyscontrols; the impairments from the disorder are usually greatest in the young-adult years and gradually wane with advancing age (American Psychiatric Association, 2013).

### 1.3. Overlap and comorbidity between ADHD and BPD

Many studies have showed that ADHD and BPD share diverse behavioral impairments and show overlapping functional and neuroanatomical deviations (Carlotta, Borroni, Maffei, & Fossati, 2013; Stepp, Burke, Hipwell, & Loeber, 2012). In addition the rate of adults with BPD who had a childhood history of ADHD was up to 60%, and 15–38% of BPD patients showed a co-occurring adult ADHD diagnosis (Andrulonis, Glueck, Stroebel, & Vogel, 1982; Dowson et al., 2004a; Ferrer et al., 2010; Fossati, Novella, Donati, Donini, & Maffei, 2002; Philipsen et al., 2008; van Dijk, Lappenschaar, Kan, Verkes, & Buitelaar, 2011, 2012). The risk for ADHD children in later developing BPD was found to be greater than would be expected by chance (odds ratio 5:56) (Fischer, Barkley, Smallfish, & Fletcher, 2002). Several hypotheses have been suggested to explain the interrelationship of the two disorders: a) BPD and ADHD are different expressions of the same disorder rather than two distinct clinical entities; b) ADHD may be an early manifestation (precursor) of BPD; c) ADHD and BPD are distinct disorders sharing common genetic and environmental risk factors; d) the disorders reinforce one another resulting in a synergistic effect; and e) the presence of one disorder increases the risk of developing the other (ADHD presenting a risk factor for the development of BPD) (Carlotta et al., 2013; Davids & Gastpar, 2005; Koumoula, 2012; Matthies et al., 2011; Philipsen, 2006; Philipsen et al., 2008; Prada et al., 2014; Speranza et al., 2011; Storebø & Simonsen, 2014).

The high degree of similarity between ADHD and BPD and the chronic trait-like course that is common to both disorders may represent a risk in misdiagnosing ADHD patients as if they suffered from BPD (and vice versa) (Asherson et al., 2014; Carlotta et al., 2013; Kernberg & Yeomans, 2013). It is therefore important to clarify whether the shared symptoms are pointing to the same underlying psychopathology or whether BPD and ADHD can be differentiated at the level of structural, clinical or neuropsychological processes.

### 1.4. Objective

The aim of our study is to review in a descriptive way the articles that have been addressing either directly or indirectly the association between ADHD and BPD, in terms of clinical, neuropsychological and structural convergences and divergences.

## 2. Methods

### 2.1. Literature selection, data collection, and preparation

Our objective was to identify all studies fulfilling the following criteria:

1) The articles should specifically or non-specifically address the association between ADHD and BPD.
2) The association of the two disorders should relate to structural, neuropsychological, or clinical parameters.
3) The literature data included should reflect collectively a more coherent understanding of the ADHD–BPD relationship through the interrelation of the clinical, neuropsychological and structural dimensions of the two disorders.

We conducted a systematic literature search of PubMed database to identify relevant studies published until the 4th week of Feb 2015. The