



## Review

# Attention Deficit Hyperactivity Disorder (ADHD) and disordered eating behaviour: A systematic review and a framework for future research



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## HIGHLIGHTS

- Symptoms of Attention Deficit Hyperactivity Disorder (ADHD) are associated with disordered eating.
- Impulsivity symptoms of ADHD are positively associated with bulimic behaviours.
- A causal effect of ADHD on disordered eating cannot be inferred.
- Mechanistic studies on the link between ADHD and disordered eating are required.

## ARTICLE INFO

## Article history:

Received 22 June 2016

Received in revised form 28 February 2017

Accepted 1 March 2017

Available online 6 March 2017

## Keywords:

Attention Deficit Hyperactivity Disorder  
ADHD

Eating disorders

Disordered eating behaviour

Systematic review

## ABSTRACT

Preliminary findings suggest that Attention Deficit Hyperactivity Disorder (ADHD) may be associated with disordered eating behaviour, but whether there is sufficient evidence to suggest an association between ADHD and specific types of disordered eating behaviour is unclear. Furthermore, it is uncertain whether specific features associated with ADHD are differentially associated with disordered eating behaviour. A systematic review of seventy-five studies was conducted to evaluate the potential association between ADHD symptomatology and disordered eating behaviour and to provide an estimate of the strength of evidence for any association. Overall, a moderate strength of evidence exists for a positive association between ADHD and disordered eating and with specific types of disordered-eating behaviour, in particular, overeating behaviour. There is consistent evidence that impulsivity symptoms of ADHD are positively associated with overeating and bulimia nervosa and more limited evidence for an association between hyperactivity symptoms and restrictive eating in males but not females. Further research is required to assess the potential direction of the relationship between ADHD and disordered eating, the underlying mechanisms and the role of specific ADHD symptoms in the development and/or maintenance of disordered eating behaviour. We propose a framework that could be used to guide the design of future studies.

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## 1. Introduction

Attention Deficit Hyperactivity Disorder (ADHD) is one of the most common neurodevelopmental disorders of childhood (Polanczyk, Willcutt, Salum, Kieling, & Rohde, 2014) and has a worldwide prevalence of 5% in school-age children (Polanczyk, de Lima, Horta, Biederman, & Rohde, 2007). The symptoms of ADHD persist in adults in up to 65% of cases (Faraone, Biederman, & Mick, 2006) and the prevalence of ADHD in adults is estimated at 2.5% (Simon, Czobor, Bálint, Mészáros, & Bitter, 2009). Despite the high prevalence of the disorder, fewer than 20% of adults with ADHD are diagnosed or treated (Ginsberg, Quintero, Anand, Casillas, & Upadhyaya, 2014). Moreover, up to 90% of adults with ADHD have comorbid psychiatric disorders (Nutt et al., 2007), which may obscure the symptoms of ADHD. Depression and other mood disorders, anxiety, personality disorders and substance use disorders (SUDs), in addition to oppositional defiant disorder, sleep problems and learning disabilities are often comorbid with ADHD (Corbisiero, Stieglitz, Retz, & Rosler, 2013; Gillberg et al., 2004; Lin, Yang, & Gau, 2015; Miller, Nigg, & Faraone, 2007; Sobanski et al., 2007).

It has also been reported that there is an association between ADHD and eating disorders (EDs) (Bleck & DeBate, 2013; Mikami et al., 2010; Mikami, Hinshaw, Patterson, & Lee, 2008). A scoping search retrieved four reviews relevant to the relationship between ADHD and eating disorders (Cortese, Bernardina, & Mouren, 2007; Curtin, Pagoto, & Mick, 2013; Nazar et al., 2008; Ptacek et al., 2016). Three of these reviews were narrative rather than systematic reviews (Cortese et al., 2007; Nazar et al., 2008; Ptacek et al., 2016). The only published systematic review focussed on individuals aged 12–21 years (Curtin et al., 2013) and thus it is unclear whether disordered eating behaviours are also present in younger children with ADHD. Furthermore, the onset of some EDs such as Binge Eating Disorder (BED) is usually later in adult life (Fairburn & Harrison, 2003), between the ages of 30 and 40 years, highlighting the importance of assessing older individuals. Our aim is to address this gap in the literature by conducting the first systematic review of the association between ADHD and disordered eating in both children and adults.

The present review will also extend knowledge of the relationship between ADHD and disordered eating by including studies that adopt a broader sampling frame than previous reviews. There is evidence that patterns of eating behaviour span a spectrum from extreme over-control of eating to loss of control and binge eating (Lowe et al., 1996; Wierenga et al., 2014), and that disordered eating patterns which do not meet clinical criteria are, nevertheless, often associated with psychopathology, and may eventually develop into a diagnosed eating disorder (Tanofsky-Kraff, Engel, Yanovski, Pine, & Nelson, 2013). Hence, greater insight into the relationship between ADHD and EDs will be

gained from studying the full range of variation of eating traits and behaviours, including restrained eating, food craving and loss of control over eating (Herman & Mack, 1975; Nammi, Koka, Chinnala, & Boini, 2004; van Strien, Herman, & Verheijden, 2012; Zeeck, Stelzer, Linster, Joos, & Hartmann, 2011). This is especially relevant for young children and adolescents, for whom diagnostic criteria for EDs may not be applicable (Bravender et al., 2007; Bravender et al., 2010).

We also aim to identify studies that have investigated whether specific features of ADHD are differentially associated with specific types of disordered eating. Recent research has emphasised the role of cognitive processes in the control of eating behaviour (Higgs, 2016). Studying the relationship between individual variations in attention and cognitive control and disordered eating in ADHD provides an opportunity to identify core processes that cut across diagnostic categories and could be targeted by therapeutic interventions.

The first aim of this paper was to systematically review the literature for an association between ADHD and disordered eating. The following four questions were addressed:

- (1) Is there an association between ADHD symptoms and disordered eating behaviour?
- (2) Are specific features of ADHD differentially associated with specific types of disordered eating behaviour?
- (3) Are there factors that affect the direction and/or strength of any relationship between ADHD symptoms and disordered eating (moderators)?
- (4) Which factors could explain the relationship between ADHD symptoms and disordered eating behaviour (mediators)?

A second aim was to use our evaluation of the current evidence base to make suggestions for future research. The proposed framework could also be applied to the study of other psychiatric disorders, such as schizophrenia and mood disorders, that are associated with disordered eating.

## 2. Materials and methods

### 2.1. Literature search strategy

Original research studies examining the association between ADHD and disordered eating were selected through a literature search in 3 electronic databases: PubMed, Ovid Databases (MEDLINE, PsycINFO, EMBASE + EMBASE CLASSIC) and Web of Science-Core Collection (from 1900). The literature search was performed during May 2016 by a single investigator (PK). Searches included a combination of key words relevant to disordered eating behaviour and ADHD. For the full search strategy used, see Supplemental material. Search limiters

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