

Neuropsychological performance in adult attention-deficit hyperactivity disorder: Meta-analysis of empirical data

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Abstract

Attention-deficit hyperactivity disorder (ADHD) is increasingly recognized not only in children but also in adults. Neuropsychological tests are important tools to quantify the attentional and/or cognitive deficits of patients compared to controls. The present meta-analysis integrates 24 empirical studies reporting results of at least one of 50 standard neuropsychological tests comparing adult ADHD patients with controls. The 50 tests were categorized into the following 10 functional domains: verbal ability, figural problem solving, abstract problem solving, executive function, fluency, simple attention, sustained attention, focused attention, verbal memory, figural memory. For each domain a pooled effect size d' was calculated. Complex attention variables and verbal memory discriminated best between ADHD patients and controls. Effect sizes for these domains were homogeneous and of moderate size (d' between 0.5 and 0.6). In contrast to results reported in children, executive functions were not generally reduced in adult ADHD patients.

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1. ADHD in adults

The diagnosis of attention-deficit hyperactivity disorder (ADHD) is attracting more and more attention in adult psychiatry ([National Academy for the Advancement of ADHD Care](#),

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2003). Long-term studies have shown that there is a rather high persistence of ADHD symptoms into adulthood (Biederman, 1998; Hill & Schoener, 1996; Mannuzza, Klein, Bessler, Malloy, & LaPadula, 1998; Yan, 1998). Epidemiological studies have suggested ADHD prevalence rates higher than supposed before (Barkley, Fischer, Smallish, & Fletcher, 2002) and state a high comorbidity with other psychiatric disorders (Hornig, 1998; Weiss & Hechtman, 1993, p. 408). ADHD in adults is accompanied by an increased risk of substance abuse, anxiety and mood disorders (Biederman, Newcorn, & Sprich, 1991; Biederman et al., 1993; Marks, Newcorn, & Halperin, 2001), as well as a disruptive family environment, which may impair offspring development (Biederman, Faraone, & Monuteaux, 2002). It accounts for social and economic problems and impairs academic achievement and work performance. In consequence, health costs increase (Barkley, 2002; Trollor, 1999). Specific medical treatments have been proposed and scientifically investigated (Wilens, Spencer, & Biederman, 2002). Adult ADHD is more difficult to diagnose than childhood ADHD because symptoms are less obvious and more unspecific. Lack of concentration, unhappiness due to emotional and organizational overload, and disinhibition-deficit as well as difficulties in affect integration may be the result or the core symptoms of ADHD, but they also occur as unspecific symptoms in depression, anxiety disorders, and personality disorders, to mention only a few. Childhood ADHD as a necessary condition for the diagnosis of adult ADHD is sometimes difficult to assess retrospectively (Mannuzza, Klein, Klein, Bessler, & Shrout, 2002; Murphy, 2003), although one study by Murphy and Schachar (2000) reported high validity figures. As a whole, adult ADHD today is judged as being a valid distinct clinical diagnosis (Spencer, Biederman, Wilens, & Faraone, 1998).

The pivotal instruments most often used in the diagnostic process are observer- and self-rating scales for both children and adults. These rating instruments focus on patients' attention, hyperactivity and other behavioral categories. Based on natural observations such as in classrooms or at home, they are easy to use with children, but less easy to implement with adults. Moreover the spectrum of behavior and complaints covered by the instruments has a large overlap with behavior sampled in other diagnostic categories. The core symptoms of ADHD are of neurocognitive nature. Neurocognitive symptoms in general can be assessed not only by observer- or self-ratings, but also by objective neuropsychological tests. In the literature on ADHD, a few studies have reported neuropsychological test results of ADHD patients compared to control groups. The studies were usually conducted with small samples of patients, and each used a different set of neuropsychological standard tests. Individual studies could therefore not establish the significance and value of neuropsychological tests in the diagnostic process; nevertheless, usefulness of neuropsychological evaluation is supported by the reviews of Woods, Lovejoy, and Ball (2002) and Gallagher and Blader (2001).

The present paper reviews quantitatively the existing data by categorizing each neuropsychological measure into one of 10 neuropsychological functional domains. Published studies reporting neuropsychological test results comparing ADHD patients with a control group are analyzed by means of a meta-analysis. The aim is to review the empirical evidence that patients' subjective complaints of cognitive deficits are reflected in objective measures of such deficits. Further, it is intended to describe the quality and extent of specific cognitive deficits of ADHD patients.

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