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## **The neuropsychological effects of obstructive sleep apnea: a meta-analysis of norm-referenced and case-controlled data.**

**[Beebe DW](#), [Groesz L](#), [Wells C](#), [Nichols A](#), [McGee K](#)**.

Division of Psychology, Cincinnati Children's Hospital Medical Center and the University of Cincinnati, Cincinnati, Ohio 45229, USA. dean.beebe@cchmc.org

**STUDY OBJECTIVES:** The research literature on the neuropsychological effects of obstructive sleep apnea (OSA) has yielded seemingly contradictory findings, and narrative reviews of this literature are prone to interpretive errors. We used sophisticated meta-analytic models to minimize such errors, with the goal of clarifying the effect of OSA on neuropsychological functioning. **DESIGN:** Meta-analytic review of research through 2001. **PARTICIPANTS:** We reviewed studies of neuropsychological functioning among adults with untreated OSA. Twenty-five studies met review criteria, representing 1092 patients with OSA and 899 healthy controls. **MEASUREMENTS AND RESULTS:** Two sets of effect sizes were generated. One compared OSA group means against those of healthy controls in case-controlled studies. The other compared all OSA group means against published normative data. Within each data set, 10 neuropsychological outcome domains were coded. In both data sets, untreated OSA was found to have a negligible impact on intellectual and verbal functioning but a substantial impact upon vigilance and executive functioning. Data were mixed with regard to visual and motor functioning; posthoc inspection of the data suggested that tests of fine-motor coordination or drawing were more sensitive to OSA than were tests of fine-motor speed or visual perception. Data were also mixed with regard to memory functioning, probably related to methodologic differences across studies. **CONCLUSIONS:** Etiologic models should emphasize mechanisms known to affect vigilance, executive functioning, and motor coordination but not intelligence, verbal functioning, or visual perception. Clinicians should be alert to OSA symptoms in patients with declines in vigilance, executive functioning, or coordination.

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