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Medications Do Not Necessarily Normalize Cognition in ADHD Patients

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Objective: Although ADHD medications are effective for the behavioral components of the disorder, little information exists concerning their effects on cognition, especially in community samples. **Method:** A cross-sectional study of ADHD patients treated with three different ADHD drugs was conducted. Patients' performance on a computerized neurocognitive screening battery was compared to untreated ADHD patients and normal controls (NML). A total of 177 ADHD patients aged 10 to 18, achieved a favorable response to one of the following medications: Adderall XR (AMP), atomoxetine (ATMX), and Concerta (MPH-OROS) compared to 95 untreated ADHD patients and 101 NML. **Results**: Significant differences were detected between normals and untreated ADHD patients. Treated patients performed better than untreated patients but remained significantly impaired compared to normal subjects. **Conclusion:** Even with optimal treatment, based on parents' and teachers' opinions, subtle and not-so-subtle neurocognitive impairments persisted in the ADHD patients. Some ADHD patients may require additional educational assistance, even in the face of successful medication treatment. (*J. of Att. Dis. 2008; 11(4) 459-469*)

Keywords: *ADHD; cognition; amphetamine; methylphenidate; atomoxetine*

Psychostimulant drugs affect diverse cognitive functions, including executive function, reaction time, fine motor coordination, and various aspects of attention. Neuropsychological studies of ADHD children and adults indicate impairments in many cognitive areas: selective attention (Brodeur & Pond, 2001); memory (Muir-Broaddus, Rosenstein, Medina, & Soderberg, 2002; Roth et al., 2004); reaction time (Leth-Steensen, Elbaz, & Douglas, 2000) and information processing speed (Weiler, Bernstein, Bellinger, & Waber, 2000); motor speed (Mitchell, Chavez, Baker, Guzman, & Azen, 1990) and visuomotor ability (Kalff et al., 2002); and executive control functions, such as set-shifting (Cepeda, Cepeda, & Kramer, 2000), inhibitory control (Schachar et al., 2002), and working memory (Barnett et al., 2001). It has never been established, however, that the cognitive effects of stimulant drugs are central to their therapeutic utility. In ADHD treatment, cognitive and behavioral improvement are not necessarily dissociated, but neither are they closely correlated (Konrad, Gunther, Hanisch, & Herpertz-Dahlmann, 2004).

It has been suggested that neurocognitive testing has predictive value in determining individual differences in drug response (Mehta, Goodyer, & Sahakian, 2004), although studies have also shown that cognition may improve in ADHD patients, excluding behavioral improvement (Gimpel et al., 2005; Vance, Maruff, & Barnett, 2003). Conversely, behavior may improve absent detectable changes in cognition (Everett, Thomas, Cote, Levesque, & Michaud, 1991; Lufi, Parish-Plass, & Gai, 1997). Computerized tests of attention and vigilance

Authors' Note: Drs Gualtieri and Johnson are two of the developers of the CNS Vital Signs screening battery. Dr Gualtieri has conducted clinical trials on behalf of Astra-Zeneca, Bristol-Myers Squibb, Celltech, Cephalon, Eli Lilly, Glaxo-Smith-Kline, Medeva, Organon, Shire, Wyeth-Ayerst, and UCB. He has been a speaker for and/or consultant to Eli Lilly, GSK, Pfizer, Shire, and Wyeth. This research was supported by North Carolina Neuropsychiatry, PA, in Chapel Hill and Charlotte. No external support was sought or received on behalf of this research. Address correspondence to Dr C. Thomas Gualtieri, NC Neuropsychiatry, 400 Franklin Square, 1829 East Franklin Street, Chapel Hill, NC 27514; e-mail: tg@ncneuropsych.com.